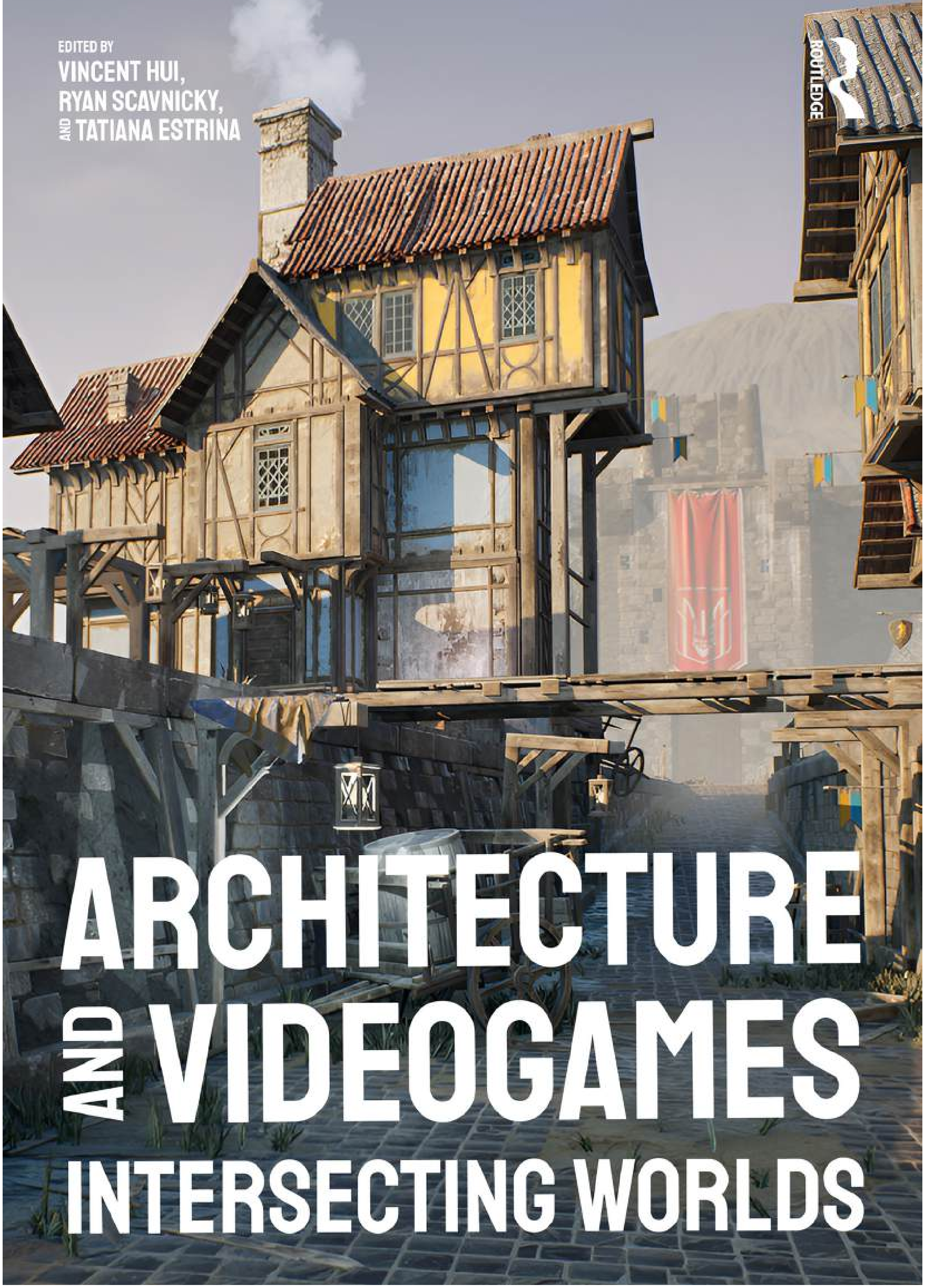
EDITED BY
VINCENT HUI,
RYAN SCAVNICKY,
AND TATIANA ESTRINA

ROUTLEDGE

ARCHITECTURE AND VIDEOGAMES
INTERSECTING WORLDS



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Architecture and Videogames

This book explores and affirms the emergent symbiosis between videogames and architecture, including insights from a diverse range of disciplines.

With contributions from authorities in both architecture and videogame industries, it examines how videogames as a medium have enlightened the public about the built environments of the past, offered heightened awareness of our current urban context, and presented inspiration for the future directions of architecture. A relatively nascent medium, videogames have rapidly transitioned from cultural novelty to architectural prophet over the past 50 years. That videogames serve as an interactive proxy for the real world is merely a gateway into just how pervasive and potent the medium is in architectural praxis. If architecture is a synthesis of cultural value and videogames are a dominant cultural medium of today, how will they influence the architecture of tomorrow?

The book is split into seven sections: Cultural Artifacts, Historic Reproduction, Production Technologies, Design Pedagogy, Proxies and Representation, Bridging Worlds, and Projected Futures.

Vincent Hui is a Full Professor at Toronto Metropolitan University and has been awarded several teaching distinctions across different universities. He has taught a variety of courses, ranging from design studios to advanced architectural computing and digital fabrication. A consummate collaborator, his research work and creative outputs examine intersections between architecture and other disciplines including biology, robotics, artificial intelligence, and videogame technologies. His teaching, creative projects, scholarly output, and outreach initiatives have merited his induction as a Fellow of the Royal Architectural Institute of Canada.

Ryan Scavnicky (Scav) is a storyteller using memes, TikToks, group chats, Twitch broadcasts, Discord servers, print media, and the Extra Office YouTube Channel to create insightful commentary by challenging the status quo of disciplinary boundaries. He is the "Godfather of Architecture Memes" according to *Architectural Digest*, and recently authored the eponymous essay for a book by the renowned photographer Iwan Baan called *Bread and Circuses: Rome and Las Vegas*. Scav is an Assistant Professor at Marywood University School of Architecture, where he launched and now coordinates the groundbreaking Bachelors of Virtual Architecture program.

Tatiana Estrina is a designer and creative coder, currently pursuing a dual degree with architecture and computer science at MIT. Merging her interests in architecture and computer science, her work delves into digital realms, design computation, and the horizon of futurological fabulation.

Architecture and Videogames

Intersecting Worlds

Edited by
Vincent Hui, Ryan Scavnicky, and Tatiana Estrina

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To Deni and John for surprising me with a PlayStation 2 on the morning of December 25, 2000. Kristen for highkey believing in me since the moment we met, and to my daughter Roux, who I can't wait to absolutely destroy in Mario Kart. To Adrienne, who helped me git gud. To my squad I Chubs I, I Boyoles I, jmoney, and Coach, let's make a batch. And lastly thank you to Twitch chat for all of the encouragement *airhorns* *titanic flute* cheers.

−Scav

To my supportive family and my friends, who are always there.
To my sanity, which is hardly anywhere.
To my other work, I'll be right with you.

−Tatiana

"To Josh, Delia, and Ella," for always helping me see where I should be going.
To Donna, for telling all of us why.

−Vincent

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Contributors

Viola Ago (b. Lushnjë, Albania) directs the design-research practice Miracles Architecture and teaches at Toronto Metropolitan University.

Namir Ahmed is an educator, researcher, and digital media artist. His research focuses on innovative methods of combining the humanities and XR technologies.

Kristopher Alexander is an Associate Professor at Toronto Metropolitan University, focused on videogame design, esports broadcasting, and virtual production. Dr. Alexander is the Director of the Red Bull Gaming Hub and gained global attention with his TED Talk "How Video Games Can Level Up Education."

Thoreau Bakker is a PhD candidate in the Media & Design Innovation program at Toronto Metropolitan University, doing research at the intersection of spatial cognition and virtual environments.

Galo Canizares is an artist, designer, writer, and educator. His work blends absurdity, computation, world-making, simulation, and parafiction to address issues in technology and the built environment. He is currently Assistant Professor of Architecture at the University of Kentucky College of Design where he directs the Critical Software Lab and a PhD candidate at the Eindhoven University of Technology.

Michael Carter is a scholar in Digital Media and Digital Cultural Heritage. He has an extensive 25-year, award-winning professional career in the 3D and 2D computer animation and visual effects (VFX) industries. His research includes using virtual reality and gaming to enhance archaeological research.

Luke Caspar Pearson and Sandra Youkhana, You+Pea is the architectural design studio of Sandra Youkhana and Luke Caspar Pearson. Sandra and Luke established the Videogame Urbanism studio at the Bartlett School of Architecture, promoting the use of game technologies in architectural education. This has evolved into a new masters program, Cinematic and Videogame Architecture.

Jon-Paul Dyson, as Vice President for Exhibits at The Strong National Museum of Play, Jon-Paul Dyson oversees the creation of interactive exhibits spanning over 100,000 sq. ft. As Director of ICHEG and World Video Game Hall of Fame, he curates the world's most comprehensive videogame collections.

Zak Fish, licensed architect at ERA Architects, specializes in adaptive reuse strategies, leading CAD, BIM, and LiDAR scanning processes for conservation projects while contributing to architectural discourse.

Graham Harman is Distinguished Professor of Philosophy at the Southern California Institute of Architecture in Los Angeles. His most recent books are *The Graham Harman Reader* (2023, edited by Jon Cogburn and Niki Young) and *Objects Untimely: Object-Oriented Philosophy and Archaeology* (2023, with Christopher Witmore).

Kristian Howald, an accomplished computer graphics artist and dedicated educator at Sheridan College, has seamlessly blended technical skill with artistic vision, shaping the minds of future industry leaders in animation and digital arts for over 20 years.

Damjan Jovanovic is co-founder of the Los Angeles–based game design studio Lifeforms.io and serves as faculty at SCI-Arc. He is an artist and designer working at the intersection of videogames, artificial intelligence, and architecture.

Lena Ma is an artist and designer who challenges conventional norms by infusing playfulness into her creations. Her work focuses on repositioning the digitizing of spaces and reshaping societal paradigms through transformative design interventions.

Jenn McArthur, Associate Professor in Architectural Science at Toronto Metropolitan University, is a Smart Buildings researcher seeking to make buildings better for people and the planet. Her current work focuses on the development of cognitive digital twins to make building data more accessible and usable.

Jose Sanchez is an architect, game designer, and theorist based in Detroit, Michigan. He is the director of the Plethora Project (www.plethora-project.com), a research studio investing in the future of the propagation of architectural design knowledge. He is currently at the University of Michigan, where he is an Associate Professor at the Taubman College School of Architecture.

Kristen Mimms Scavnicky is a Black American artist, Designer at MISC Partners, and an Assistant Professor in the Architecture Program at Kent State University. She investigates the intersections of painting, drawing, and spatial installation, particularly in how they reveal and articulate the unspoken social dynamics of a space.

Christopher Totten is an Assistant Professor in the Modeling, Animation, and Game Creation (MAGC) program at Kent State University. He is the founder of Pie For Breakfast Studios, an award-winning Northeast Ohio independent game company, and has done work as an artist, animator, level designer, and project manager in the game industry.

Leah Wulfman is a carrier bag architect, an educator, a game designer, a digital puppeteer, and an occasional writer. Trained as an architect, they are currently a Visiting Assistant Professor at the University of Utah College of Architecture and Planning.

It’s Dangerous to Go Alone! Take This

Editors’ Preface

For decades, architecture’s main fixation on digital space was the ability to change the physical world, such as the creation of novel forms, generation of actionable climactic simulation data, and increased efficiency of drawing production. Meanwhile, the discipline of game design has been nurturing the cultural knowledge gained through the production of virtual space. While architecture seeks new platforms to restructure its long history to fit a changing world, game design requires further expertise as the field continues to grow in complexity. This book begins a study of virtual space produced and nurtured by videogames through an architectural lens. Each of the following sections is filled with authors in a wide range of positions between academia and practice, gaming and architecture, peppered with images and projects representative of this broader shift.

Our first section, *Cultural Artifacts*, examines the tools and information architecture has been based on for the last few decades and reveals that much of the living history of the profession is always already heavily virtual. The embedded knowledge and history of the development of early computational tools in the discipline shows unexamined intentions, holding the potential for new revelatory ideas.

In the *Historic Reproduction* section, authors discuss facilitating conservation efforts through detailed representations of historical structures. The convergence of technology between heritage conservation and gaming industries offers new opportunities for interactive storytelling and preservation of memory and place.

The evolution of digital twins in architecture offers immersive engagement and data-driven insights, transforming into dynamic tools for engagement and optimization in building design. In the *Production Technologies* section, authors discuss how game engine technology transforms architecture, engineering, and construction (AEC) industries, offering real-time visualization tools that facilitate communication and data management.

The advent of virtual tools has not only changed the practice of architecture, but also how we teach it. The *Design Pedagogy* section shares direct insights from the classroom, showcasing the numerous ways that shift is taking place. In videogame design classrooms, game designers could learn from the history of disciplinary space and cultural production of an architecture studio. In the architecture classroom, the techniques and technologies to understand virtual space should be considered foundational knowledge.

The *Proxies and Representation* section treats videogame worlds as architectural environments and unlocks new design possibilities and critiques, blurring the boundaries between virtual and physical realms as a site to understand the hopes and biases of the human condition. Mapping and analyzing game worlds reveal new types of cultures and societies, posing questions about contemporary architectural practice and methodologies for reframing commercial game worlds as architectural spaces.

With the onset of technological overlap, gaps persist between the time it takes to invent technology and the time it is accepted as common use. *Bridging Worlds* seeks the space between these gaps, where unforeseen crossovers emerge between disciplines, and unexpected territory is nurtured in ways that bring insight into the potential of the decades to come.

Finally, *Projected Futures* builds on the contents of this book to weave some discoveries together and speculate what it might mean for the future of these two disciplines. These essays discuss what theoretical and philosophical groundwork we may rely on to find new ways of behaving in academia, practice, and beyond.

Chapter 1
Cultural Artifacts

This chapter asserts the emergence of videogames as cultural artifacts akin to architecture. Charting its origins as a medium of representing the built environment, it then examines the cultural impacts of contemporary videogames, and concludes with a need to preserve videogames as any other cultural artifact. It traces their evolution from rudimentary representations of built environments, like the Sumerian Game, to the pivotal role of visualized architecture in contemporary gaming. The chapter introduces architecture's influence on gameplay dynamics, mood, and player engagement. Examining contemporary franchises such as *Demon's Souls*, *Fallout*, and *Grand Theft Auto*, the chapter showcases how architecture shapes immersive experiences through comparative analyses, emphasizing the cultural impact of gaming. Additionally, the chapter explores the intersection of historical research methodologies and retro gaming, advocating for the preservation of videogames as cultural artifacts. Through emulation, retro gamers offer insights into understanding outdated digital formats, extending beyond gaming to shape historical studies in the digital age.

1.1

Baby, What's ROM?

The Architectural Historian as Retro-Gamer

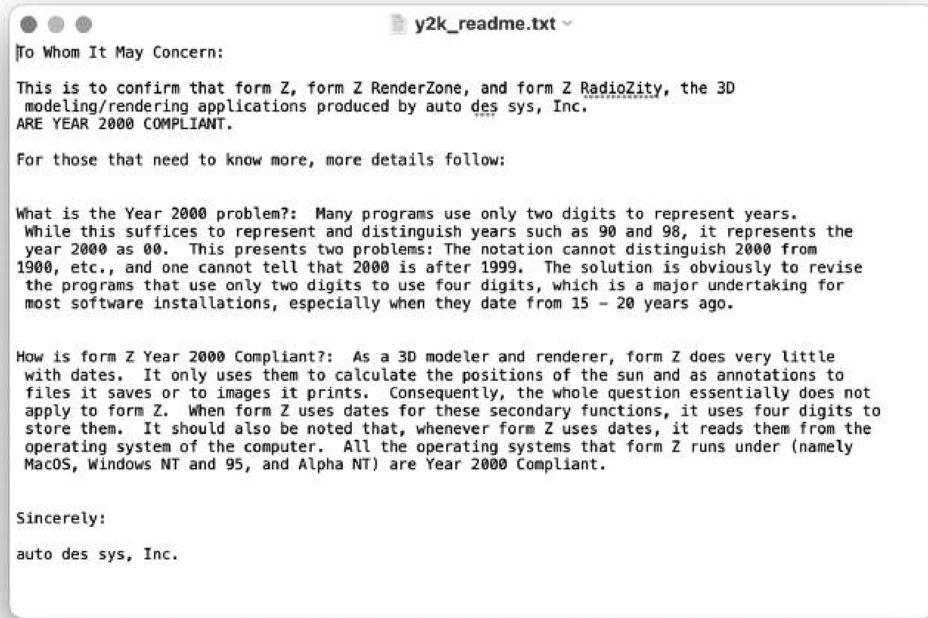
Galo Canizares

DOI: 10.4324/9781003408970-2

File Problems

In his 2017 essay "Inside the Black Box," architectural historian Bernard Colenbrander raised concern of a sea change in architectural historical research methodologies. Colenbrander, then chair of the Eindhoven University of Technology's department of architectural history and theory, had interviewed a set of prominent archivists in the field and came to the conclusion that the traditional tools for historical research in architecture were not enough to study the periods after the shift to digital production. According to Colenbrander, because many buildings after 1990 were designed using various specialized software, architectural design had "become a mysterious activity that is beyond the understanding of outsiders." Although architecture has long been an esoteric and introverted discipline, little outside technical expertise has been required to appreciate the drawings and sketches that constitute the design process. However, where once physical media would provide the evidence and documentation of an architectural act, after the digital turn this evidence is now buried in hard drives as files and data that require many more layers of interpretation than paper documents. For scholars researching recent eras of architectural production, this poses a problem of accessibility—simply having access to files—as well as expertise—experience using the software required to open such files.

Though much has been written about architecture's transition to digital forms of work, few narratives acknowledge the problems of archiving, preservation, and historical research to which Colenbrander was alluding. The simple fact is that if the architectural historian does not know how to access and work with born-digital information, how can they be expected to study in-depth the intricacies of a project's development and history? How can scholars trained as historians but not as architects interact with media formatted strictly for professional architectural software and specific file formats? To address these concerns, the following proposes a set of methodologies and tools from fields outside the classical historical tradition that may augment the architectural historian's toolkit. I propose that researchers can learn from media archaeology and videogame culture and adapt techniques from these fields to better study significant media and archives from recent decades.



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To Whom It May Concern:

This is to confirm that form Z, form Z RenderZone, and form Z RadioZity, the 3D modeling/rendering applications produced by auto des sys, Inc. ARE YEAR 2000 COMPLIANT.

For those that need to know more, more details follow:

What is the Year 2000 problem?: Many programs use only two digits to represent years. While this suffices to represent and distinguish years such as 90 and 98, it represents the year 2000 as 00. This presents two problems: The notation cannot distinguish 2000 from 1900, etc., and one cannot tell that 2000 is after 1999. The solution is obviously to revise the programs that use only two digits to use four digits, which is a major undertaking for most software installations, especially when they date from 15 - 20 years ago.

How is form Z Year 2000 Compliant?: As a 3D modeler and renderer, form Z does very little with dates. It only uses them to calculate the positions of the sun and as annotations to files it saves or to images it prints. Consequently, the whole question essentially does not apply to form Z. When form Z uses dates for these secondary functions, it uses four digits to store them. It should also be noted that, whenever form Z uses dates, it reads them from the operating system of the computer. All the operating systems that form Z runs under (namely MacOS, Windows NT and 95, and Alpha NT) are Year 2000 Compliant.

Sincerely:

auto des sys, Inc.

Figure 1.1.1 Y2K compliance message regarding Form Z software from audo des sys, Inc.

Media Archaeology

Media archaeology has a few definitions. It can refer to a subdiscipline within media studies tasked with researching legacy media and its relationship to culture. In this definition, it is understood as an academic pursuit, that, much like archaeology, is concerned with unearthing, archiving, and examining historical artifacts (media formats and technologies) to understand the present. However, media archeology can also be understood as a method. In *What is Media Archaeology?*, new media theorist Jussi Parikka suggests that the “media-archaeological method” can serve as a “way to investigate the new media cultures through insights from past new media, often with an emphasis on the forgotten, the quirky, the non-obvious apparatuses, practices and inventions” (2012). As a method, media archeology can be a way to analyze both material histories and more abstract phenomena such as cultural or disciplinary memory and creative practices.

Parikka's description of media archeology can be particularly useful for architectural historians concerned with architecture after the shift to digital practice for a variety of reasons. First, it offers a critical position on nostalgia—a longing for or strong affection to the past. Architecture is often plagued by nostalgia, from a devout interest in historical styles to a direct influence of childhood memory on design imagination. Media archaeology puts forth a framework for exploring "revival and retrocultures" as phenomena related directly to cultural memory where technology allows us to revisit and re-engage things from our past (Parikka 2012). Second, media archaeology acknowledges that media cultures are "sedimented and layered" rather than discrete phenomena (Parikka 2012). In other words, despite the rapid adoption of new technologies, our relationship to particular media is built out of layers of interactions between old and new media. Media archaeologists are skeptical of the positivistic march of technological progress, arguing instead that new technologies can shed light on older media and vice versa. Lastly, Parikka's emphasis on the "quirky" dimension of media culture taps directly into the seemingly insignificant relationship between gamer cultures and architectural history. Media archaeology does not dismiss fringe and underground movements; it looks to them as key participants in the shifting nature of media culture. Preservation enthusiasts, hackers, abandonware resurrectionists, retro-gamers, and so on all have particular relationships to media that offer insights into how it affects the way we see and interact with historical materials. Collaborations with these communities may result in new narratives that embrace a multidisciplinary approach to architectural historical scholarship.

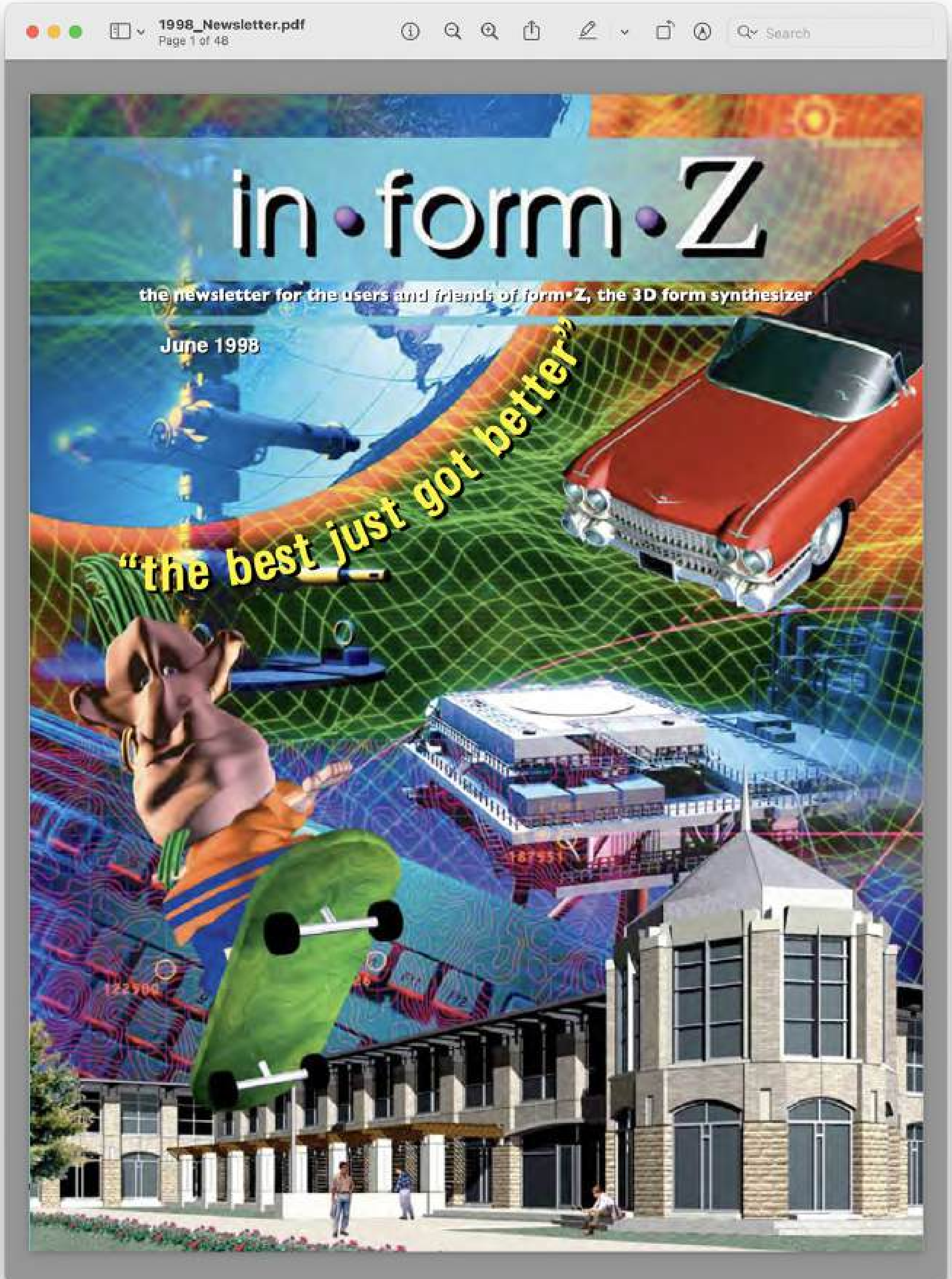

Figure 1.1.2 Form Z newsletter, June 1998.

The "quirkiness" of media archaeology also refers to the perception of historical study in general. There's something decidedly unromantic about media from the recent past. It's in messy file formats and not as tactile as trace paper sketches or mylar drawings. At archives such as the Nieuwe Instituut in the Netherlands, many significant building projects are preserved in chunky laptops and bulky hard drives (Colenbrander 2017). In contrast to the popular image of the historian conducting archival research by digging through blueprints, sketchbooks, and rolled-up construction documents, research at these newer institutions has more in common with retro-gaming than traditional approaches. Researchers of the recent past must rely on either gaining access to a dedicated machine preserved in a kind of frozen state—like a nostalgic millennial resurrecting an old Nintendo 64 from their parents' basement—or a virtualized version of an outdated computer system. Both are emerging methodologies that have been not only employed by media scholars, but also by contemporary librarians concerned with preserving and accessing legacy media (Rosenthal 2015).

Emulation

A prominent technique for media preservation and access is emulation. Emulation in the contexts of digital media and computing refers to a machine (virtual or actual) that enables a host machine to behave like another system. More specifically, it is any "method or system in which a specific computational configuration is imitating or approximating a different one" (Cardoso-Llach et al. 2021). Emulation allows one, for instance, to play the original Pac-Man game on their laptop rather than having to search for a preserved and functional arcade machine from the 1980s. It also allows a new machine, with a new operating system, to run outdated versions of computer software. For architectural historians, emulation offers a way of engaging directly with outdated software as well as other under-examined contexts of that software such as technical documentation, the software’s limitations, and example/tutorial files. Beyond solely enabling access to the infrastructure of digital instruments, these technologies shed light on the attendant issues that surrounded the production of digital architectural media in the 1980s and 1990s, for instance.[1]

There are both closed-source and open-source emulation programs. Because emulation is most often associated with gamer and hacker cultures, the more widely used programs are open-source. This means that any computer programmer can view a program’s code and suggest changes or developments. This is how MAME (formerly the Multiple Arcade Machine Emulator) and DOSbox, two of the most popular open-source emulation systems, were developed. These programs read ROM images or “ROMs,” which are files containing the data from a “read-only memory” chip—typically from a console cartridge or a CD-ROM, for example. These files allow the program to pretend the original media is in the system, enabling users to interact with it as originally intended. Despite their technical complexity, MAME and DOSbox are designed to be user-friendly and are optimized for users that want a simple way to run old software and games.

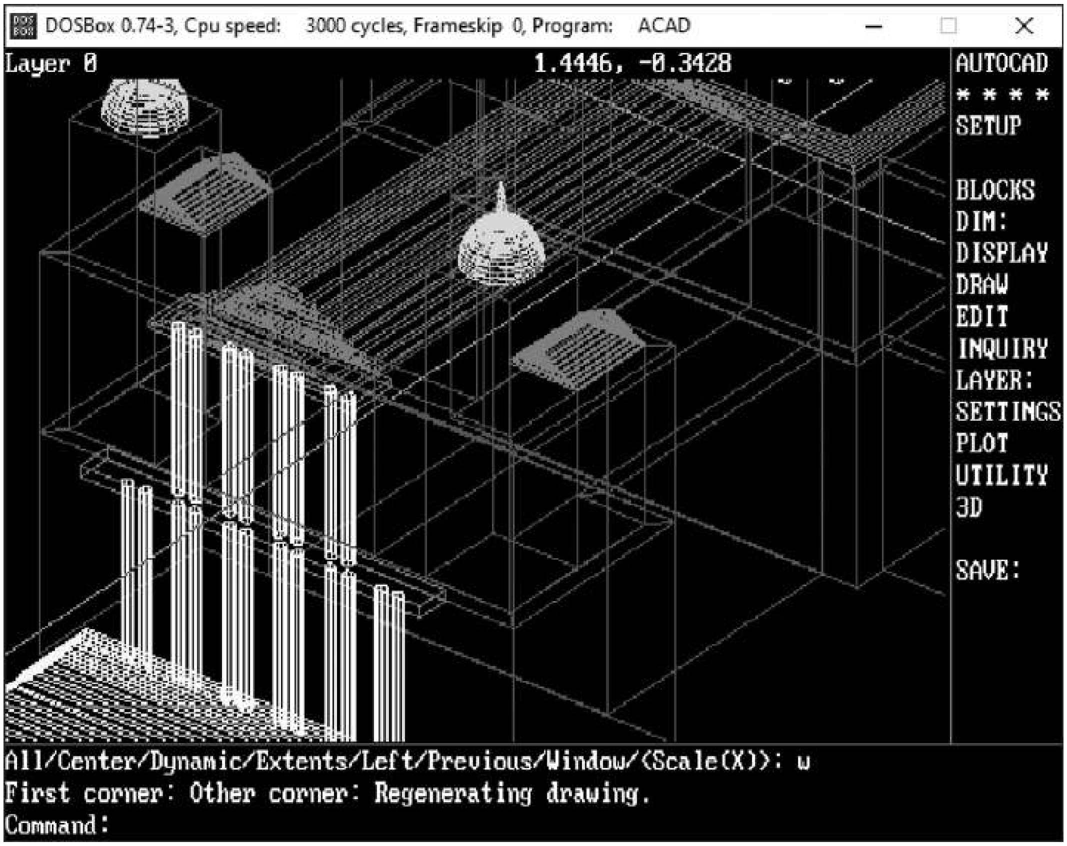

Figure 1.1.3 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

MAME was initially developed by Nicola Salmoria and is currently maintained by the MAME Team with support from developers around the world ("MAME"). Its stated mission is to

> be a reference to the inner workings of the emulated machines. This is done both for educational purposes and for preservation purposes, in order to prevent historical software from disappearing forever once the hardware it runs on stops working.
>
> ("About MAME")

Despite this generalized mission statement, however, MAME continues to be used primarily for retro-gaming—emulating old videogame consoles and cartridges.[2] In addition to emulating old arcade boards, it can also emulate gaming systems originally made by Nintendo, Atari, and Sega as well as some Apple, IBM, Hewlett-Packard, and Commodore computing systems. This flexibility makes it one of the most versatile general purpose emulators available.

DOSbox, by contrast, is solely a DOS (Disk Operating System) emulator. It is a standalone emulated computer that has an integrated DOS. Unlike MAME and other modes of general emulation, DOSbox does not require users to install the operating system and comes packaged with generic virtual hardware that simulates sound cards and video cards commonly found on systems like 1980s and 1990s IBM PCs. The project started in 2002 and was developed by Sjoerd van der Berg, Peter Veenstra, and Sebastian Strohhäcker. It was created as a direct result of the release of Microsoft Windows 2000, which had abandoned some support for DOS games and applications (Geeknet, Inc. 2009). DOSbox remains primarily a retro-gaming application and is directly targeted toward "people who want to play DOS games" (Geeknet, Inc. 2009). This is reinforced by their website description that states, "You can 're-live' the good old days with the help of DOSBox, it can run plenty of the old classics that don't run on your new computer!" ("Information").

MAME and DOSbox have become some of the de facto emulators for retro-gamers. From a media-archeological point of view, these programs embody technological nostalgia—a notion directly addressed in DOSbox's quote regarding re-living "the good old days" ("Information"). During DOSbox's beta phase in the early 2000s, the developers were surprised at how many people were interested in the project (Geeknet, Inc. 2009). The first open-source release of DOSbox was on July 22, 2002, and by July 2008, the application had been downloaded 10 million times. As of 2015, it boasted over 25 million downloads. The ability to emulate old gaming and arcade systems has contributed to the popular rise of retro-gaming as a subgenre of traditional gaming. Writing about DOSbox, videogame journalist Alec Meer claimed,

> It is impossible to overstate quite how much open source emulator DOSBox has done for PC gaming. Without the tireless efforts of its volunteer staff, vast tracts of PC gaming history would be all but lost to us and our fancy modern operating systems.
>
> (2009)

In the past 20 years, this subgenre has evolved past the emphasis on early arcade or 8-bit home game systems. A game from 2010, for instance, can be considered “retro” in 2023.

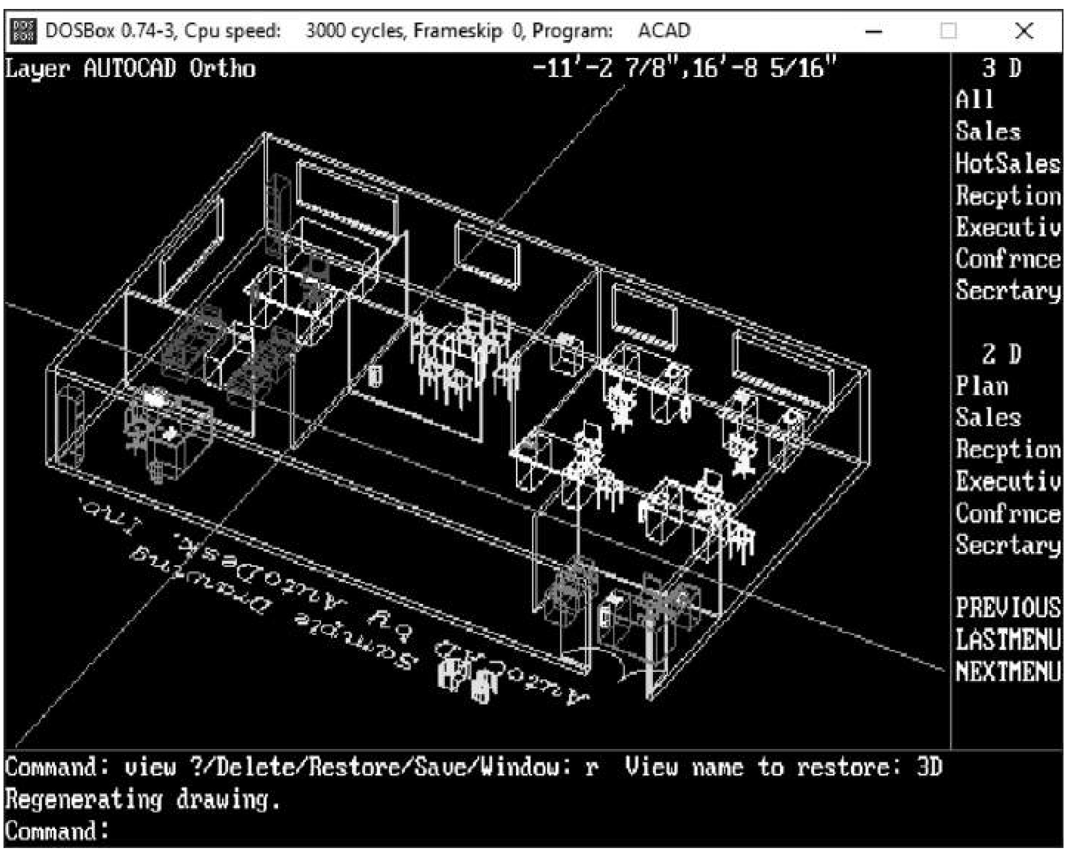

Figure 1.1.4 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

According to media historian Jaakko Suominen, retro-gaming culture effectively taps into both nostalgia and the complexity of contemporary life. Many retro-gamers seek out older games not only to recall their childhood, but also for their relative technological or narrative simplicity (Suominen 2008). “Retrogaming (action, practise) and gaming nostalgia (the mode of recollection and recollection discourse itself),” Suominen states,

> are a central part of a more general culture of technology and the cultural adaptation of technology. In many cases the making-nostalgic of a technological device, adaptation or form of action begins right after its introduction.
>
> (2008)

The culture of retro-gaming is an example of a continually evolving phenomenon that links together personal relationships to media and perceptions of technology. Engaging with games and software from our past can be comforting, but it also allows users to reflect on history as a process. Here, nostalgia functions as a gateway into historical analysis. While most retro-gamers engage these technologies for entertainment or comfort, they are also unwittingly forming critical positions on how these technologies have evolved over time. Suominen again:

> The experience of the history of culture is present, for example, when we play both familiar and new games: we take advantage of our earlier gaming experiences in new gaming situations, because we have learned to recognize the logic, rules, plots and actions associated with the games. Our earlier gaming experiences have taught us to act in a

> certain way when playing […] our earlier experiences have an influence on how we return to familiar games or how we choose new games to play. (2008)

The retro-gamer thus becomes an accidental historian, reconstructing the past in order to differently engage the present. Beyond simply preservation or entertainment devices, emulation systems like MAME and DOSbox can reveal how our broader socio-technical relationships evolve over time.

Learning from Retro-Gamers

Returning to Colenbrander's thesis on the contemporary alienation of the "classical architecture historical discipline," it's possible that the characterization of outsider versus insider with regard to architectural practice is today premised heavily on familiarity with digital tools (Colenbrander 2017). Historians with experience with software such as Autodesk AutoCAD or Autodesk Revit could be considered insiders, while those without any software knowledge are outsiders. To bridge this break in knowledge, familiarity, and expertise, the contemporary architecture historian's toolkit should not only expand to include the preceding techniques of media archaeology and emulation, but also reconsider its relationship to collaboration and academic boundaries in general. As the history of architectural media becomes an increasingly larger concern—evidenced by recent publications such as Zeynep Çelik Alexander and John May's *Design Technics: Archaeologies of Architectural Practice* and Andrew Witt's *Formulations: Architecture, Mathematics, Culture*[3]—the discipline may have much to learn from retro-gamers and hackers as well as media scholars.

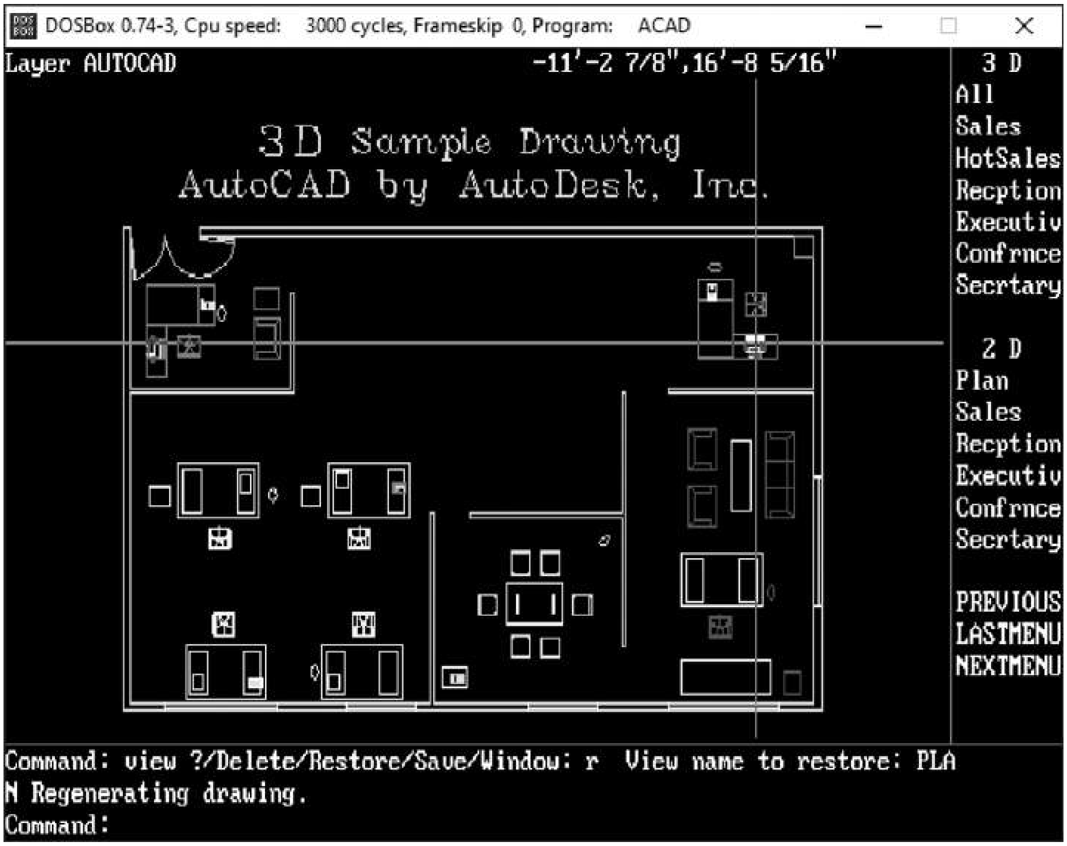

Figure 1.1.5 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

Digital preservationist David S. H. Rosenthal made a similar claim in a 2015 whitepaper titled “Emulation & Virtualization as Preservation Strategies” (Rosenthal 2015). In this report supported by the Andrew W. Mellon Foundation, Rosenthal cataloged a series of tools for accessing legacy media. Though primarily aimed at digital librarians and media scholars, the report highlighted the merits of nonacademic emulation programs built for videogame enthusiasts in addition to university-sanctioned emulation tools. According to Rosenthal, programs like MAME and DOSbox offer flexible and powerful emulation infrastructures that are accessible to a wide public. Without these open-source programs, scholars would have to rely on alternative emulation systems such as EaaS (Emulation as a Service) or EaaSI (Emaulation as a Service Infrastructure), cloud-based online emulators. These types of emulators are available at large research universities Carnegie Mellon, Yale University, and the University of Freiburg, but are not widespread due to their limited cloud instances and access permissions ("About the EaaSI Sandbox"). These limitations prevent many outsiders from using these services.

EaaS systems are university-sanctioned primarily because of their ability to limit illicit emulation or emulation that infringes on copyright. A tricky component of emulation is the legality of using a ROM image. Many manufacturers like Sony and Sega have gone through extensive litigation to prevent unsanctioned emulation of their intellectual property. On this, Rosenthal explains, "Most library and archive institutions […] are very reluctant to operate in ways whose legal foundations are less than crystal clear" (2015). This greatly limits the ability to emulate certain systems whose copyright holders either have not given clearance or are unidentifiable. To address this, many emulators like MAME maintain that they do not condone copyright infringement. However, much of the retro-gaming community plays games that have not been cleared for emulation. Rosenthal describes this situation as an "informal modus vivendi," a kind of agreement between gamers and companies that holds as long as there is little money to be made (2015).

Issues of copyright and intellectual property make emulation for architectural historical purposes a difficult endeavor, at times teetering on the verge of piracy. Autodesk, for example, prohibits the transferring of software licenses through unofficial resellers. Per Autodesk's current license agreement, a "Licensee may not […] Install or Access the Autodesk Materials with any product code, authorization code, serial number, or other copy-protection device not supplied by Autodesk directly or through a Reseller" ("LICENSE AND SERVICES AGREEMENT"). This means that anyone who purchases a copy of a previous version of AutoCAD from anywhere other than a licensed Autodesk reseller is legally unauthorized to use it per the EULA (End-User License Agreement)—that often-overlooked document presented at every software installation.

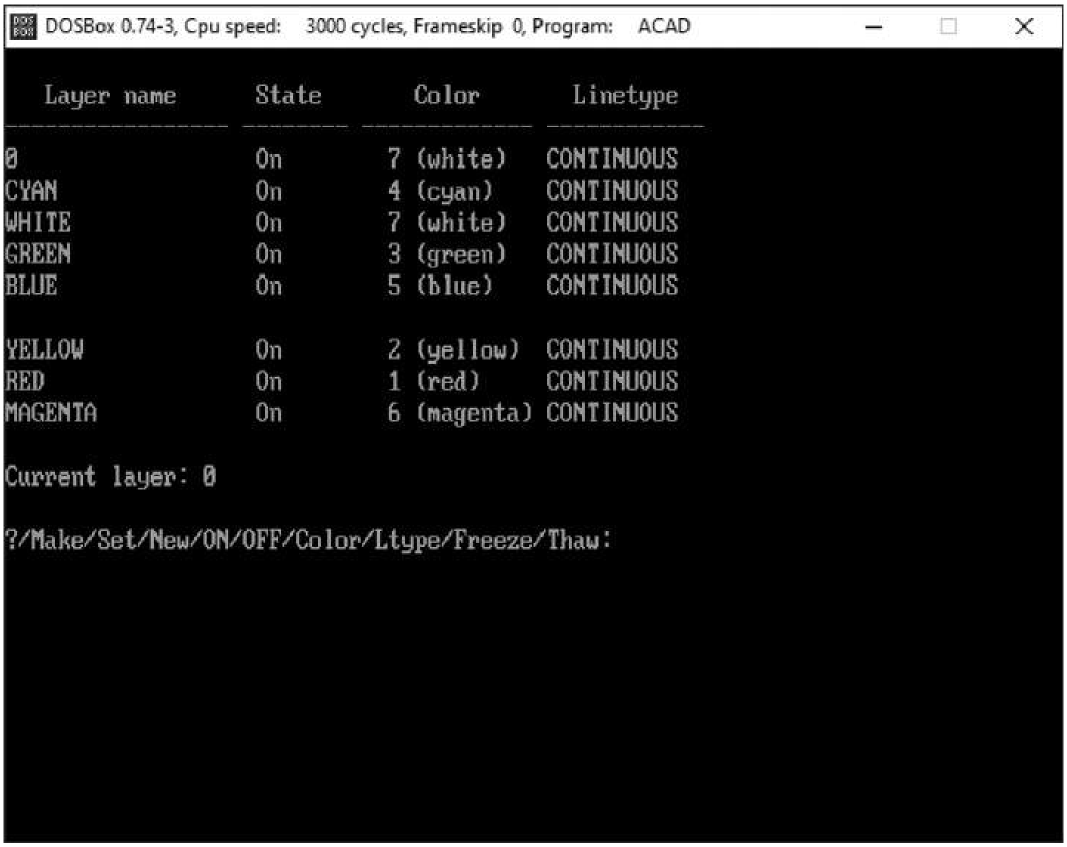

Figure 1.1.6 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

This conflict directly affects architectural design as it makes it difficult to legally access and archive documents in older file formats. For example, in a 2002 Autodesk forum post, user joespuppets2 (Joe Dunfee) lamented that the license agreement for AutoCAD 2002 clearly told users to destroy any previous version of the software after upgrading. Dunfee, concerned for his archived files, asked the community,

> If we upgrade to 2002 and then destroy prior versions, we will effectively be eliminating access to the older drawings [...] Aside from returning all our upgrade packages to the store and asking for a refund, is there any other way for us to maintain compatability [sic] with our older AutoCAD LT drawings?
>
> (2002)

Replies to Dunfee's post maintained that there was no legal workaround. Dunfee was caught in a difficult situation between adhering to the EULA or preserving access to their archived files. As of this writing, Autodesk offers no support for legacy products. But neither do most software manufacturers. This puts the historian of digital media in a similar situation to Dunfee: should they, like many retro-gamers, skirt the licensing agreement in the service of knowledge preservation, or should they limit their research to media whose access has been cleared? This is, of course, not to suggest that academics should engage in any form of software piracy. Rather, it is posed as a rhetorical reflection on the current difficulties of researching software-dependent media.

Historian as Retro-Gamer

A recent case study that offers insight into these methodologies was published by a group of Carnegie Mellon University researchers in 2021. In their project "An Archive of Interfaces: Exploring the Potential of Emulation for Software Research, Pedagogy, and Design," Cardoso Llach et al. describe their approach to using emulation as both a form of pedagogical research and an exploration of the media archaeology of CAD software. Performed as a hybrid course open to students from architecture, computer science, engineering, art, and design, the class experimented with emulation as a form of literary "close-reading" or critical interpretation of early modes of digital architectural production. "Through comparative reflection between different versions of the software," the authors state, "certain design observations and critiques become possible due to the emulated interaction that would likely not be derived from other historical sources" (Cardoso Llach et al. 2021). For the instructors, emulation provided a richer experience than any still images or video research materials could provide. It offered additional forms of context unavailable from other descriptions of historical software. Thanks to the emulation infrastructure, they could engage with the software in an interactive way and replicate its functional use as close to the original interactive experience as possible. Though the authors acknowledge the inability to exactly replicate the use environment of such technology, they do maintain that emulation offers "viable routes for staging the 'space of possible actions' afforded by historical software systems" (Cardoso Llach et al. 2021).

For the students in the course, the affordances revealed by their emulated interactions with software suggest ways to approach contemporary relationships between users and software. Like many retro-gamers, students in the course reflected on legacy software's simplicity and fidelity. Others reflected on the historical continuity of the interface's function and appearance over the past 20 years. At times, legacy software even felt familiar due to the unchanging nature of the visual cues such as toolbars and menu items. The authors concluded that emulation can not only "be part of a pedagogical and research toolkit for examining historical and sociotechnical aspects of software," it can also be used to inform future software and user-interface design (Cardoso Llach et al. 2021). The course concluded by having students produce speculative new software interfaces that addressed their previous emulation research observations. While some students were insiders to the field of architectural design (at least those that had experience with contemporary CAD software), those that were not were still able to critically engage in the course through their experiences in user-interface design or human-machine interaction, choosing to look closely at the interface as an artifact. The hybrid nature of the course participants and instructors offers an example of what can be accomplished when disciplinary boundaries are crossed and methodologies are strategically combined.

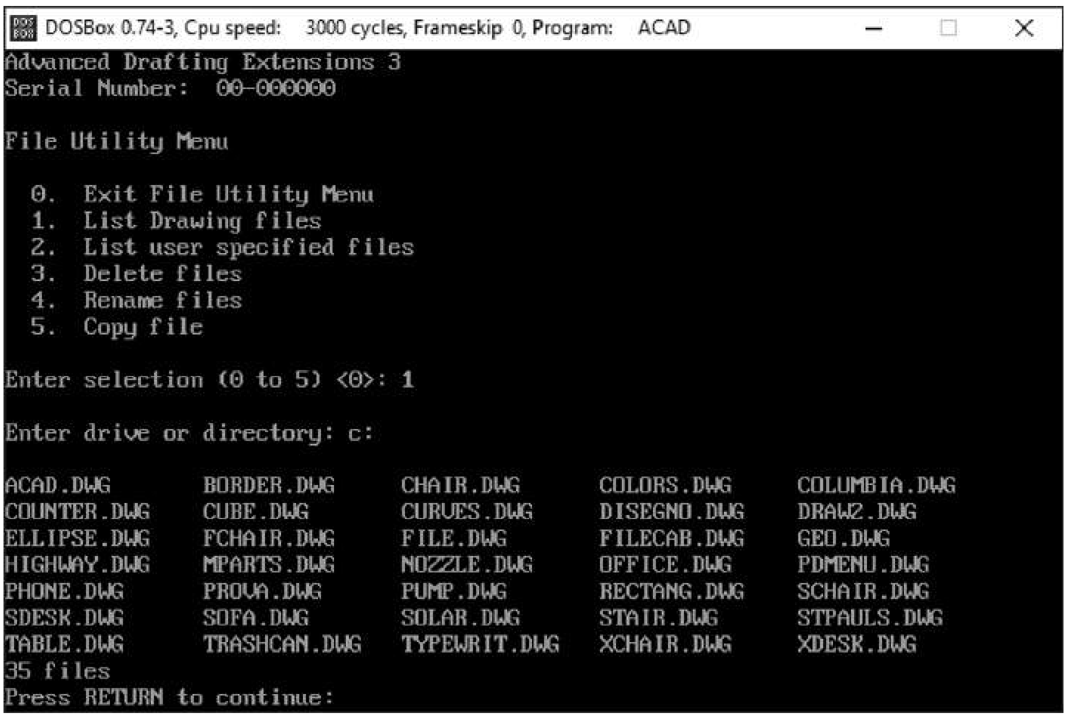

Figure 1.1.7 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

"An Archive of Interfaces" is a significant case study in the application of emulation for architectural historical purposes. It proposes a detailed outline for a methodology that combines media archaeological methods with other humanities-oriented techniques for "reading" software as historical artifacts. However, the project also fails to account for two key aspects of emulation discussed earlier: (1) the vast culture of gaming that informs much of its basis; and (2) the complex legal frameworks that undermine proprietary software usage. As Suominen makes clear, retro-gamer cultures reveal a lot about the various relationships to technology at play today. Many CAD users I have interviewed share a similar nostalgia to retro-gamers; they often lament the loss of an interface function or even have a preferred legacy version of a software application.[4] Any discussion on emulation that minimizes the impact of retro-gaming would be quite incomplete as it is often these marginalized hackers and programmers that contribute to the preservation of most digital media—legally or otherwise.

The legal dimension of software emulation must be discussed because preservation is often not a priority for many software developers. In retro-gaming and software development communities, the concept of abandonware refers to any software that has effectively been abandoned by its manufacturer. Though there are varying levels of software abandonment, the general question it raises is whether users who purchased a software/game maintain a perpetual right to use/play it even after the manufacturer shuts down its related infrastructure such as customer support or licensing servers. In 2015, the gaming community successfully lobbied the Library of Congress to publish guidelines stating that gamers could legally develop workarounds for playing games whose authentication servers have been offline for more than six months (Orland 2015). While these guidelines also mentioned strict limitations, it was a significant milestone for game preservationists. Most design and architectural software, however, offers no such guidelines.

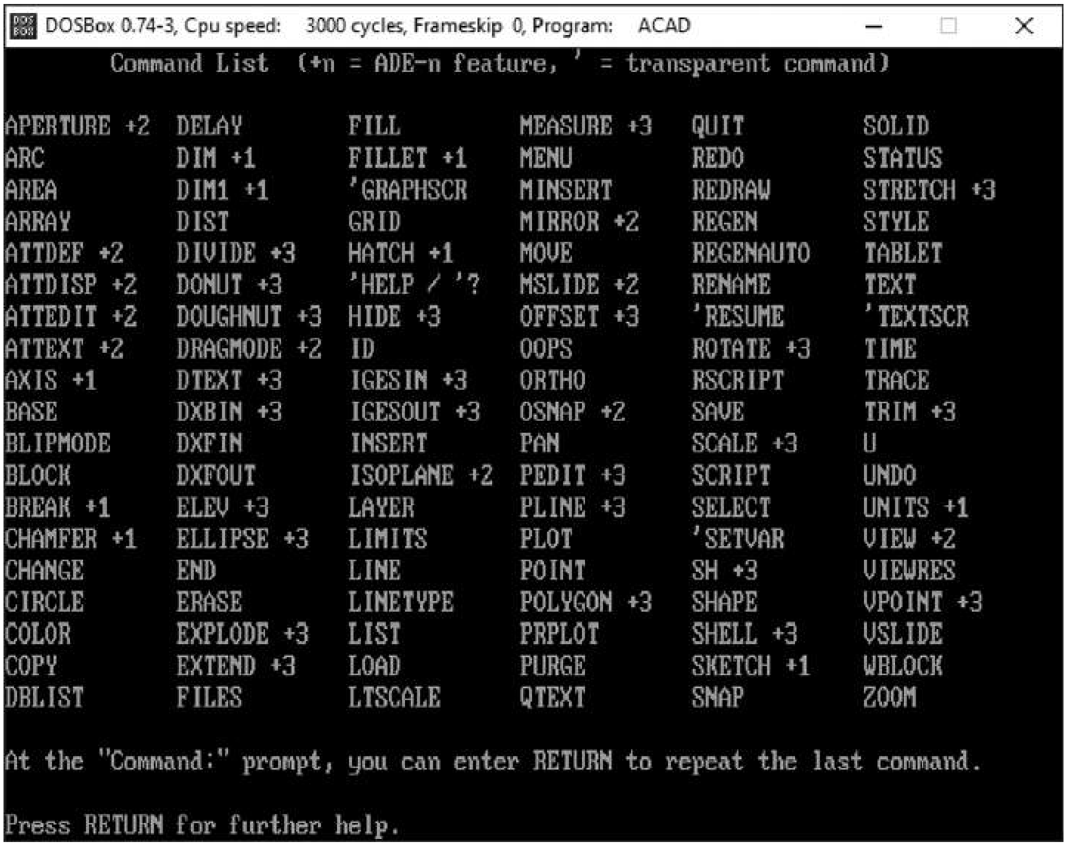

Figure 1.1.8 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

In this chapter, I have suggested that one of the biggest problems facing historians of the recent past is simply access to outdated media. Media depends on an interpreter, usually the program with which it was produced. But as we have also seen, even if it is possible to emulate the system on which that file was produced using MAME, DOSbox, or other systems, the legality of that access is questionable. The difficulty in reconciling both the physical act of accessing legacy media and the permission required to do so prevents many historians from researching in-depth the period of architectural production from the 1990s onwards. Projects that were produced digitally remain chronicled through their physical media, rarely their digital CAD files. Moreover, even projects that contributed to the narrative of innovative digital design processes are often reduced to a software screenshot or video (Lynn 2013). This greatly limits the stories that can be told about their production. As Cardoso Llach et al. have shown, software has a significant impact on the imagination of design through its affordances and limitations. A final drawing does not tell the story of the various layers that workers labored to produce or the different iterations a project went through; these are found in the digital marginalia of proprietary DWG files, 3D models, and other documents in various formats. Even a customized interface tells a story of a worker's relationship to their environment; a similar story that a drafting table used to tell.

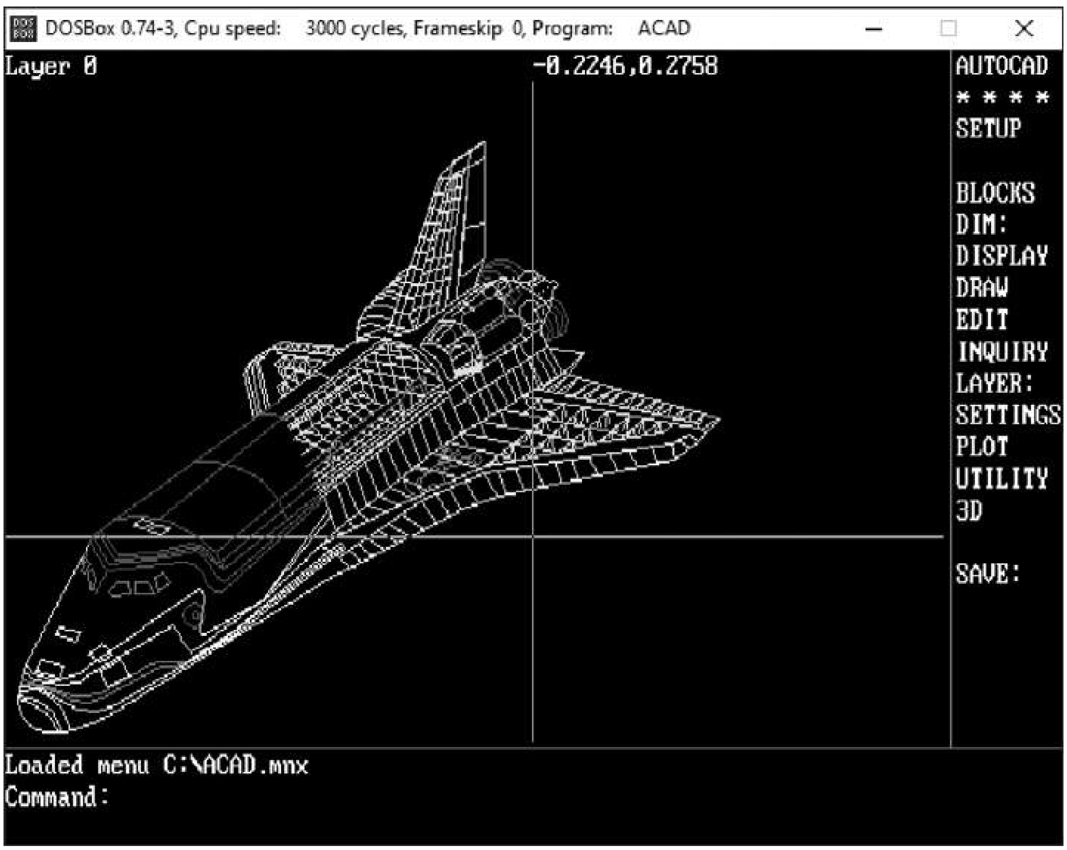

Figure 1.1.9 Screenshot of AutoCAD 2.5 running in DOSBox. Captured by the author.

By acknowledging that digital media warrants further historical scrutiny, the discipline of architectural history can not only update its methods, but also broaden its reach. But expanding the historian's toolkit and incorporating techniques from media archaeology and emulation do require more technical skills. This requirement could be addressed through collaboration. Because software-based historical research is so complex, new collaborations should emerge between historians, computer scientists, retro-gamers, software preservationists, abandonware resurrectionists, and other figures we have discussed in this chapter. New projects may also emerge that put pressure on copyright holders to release their restrictions on legacy software so it could be researched freely. Learning from retro-gamers means embodying a kind of open-source hacker mentality as well as an ethos of community learning. Whether allowed to or not, retro-gamers have shown us the various potentials of emulating the past. Architectural historians should take note.

Notes

1. Some of the under-examined issues surrounding early digital architecture include: the establishment of digital drafting rules and conventions, the reorganization of the office with regard to IT support, the exploration of different types of desktop software, and the emergence of the architectural technologist as a key figure in architectural practice.
2. It is important to note that ROM images and other media images remain copyrighted material. MAME makes it clear that the software is not intended as a tool for copyright infringement.
3. Çelik Alexander and May's anthology tackles specific histories of architectural instruments and how they have had both disciplinary and cultural ramifications. The authors focus on instruments like

architectural specifications and rendering techniques, contextualizing them within the histories of industrialization and modernism, for example. Witt's book discusses the relationship of mathematical instruments and the architectural imagination, focusing on how mathematical advancements trickled down to artists and architects in the 19th and 20th centuries. See *Design Technics: Archaeologies of Architectural Practice*.

4. See the author's in-progress PhD dissertation tentatively titled, "From Handbook to Help Desk: Software Knowledge and Architectural Practice" at the Eindhoven University of Technology.

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1.2

The Interplay of Architecture and Gameplay in Dark Fantasy

Urban Open-, and Post-Apocalyptic Videogames

Thoreau Bakker and Kristopher Alexander

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Introduction

How does virtual architecture influence gameplay? In what ways does it shape player movement, emotions, and interactions? What spatial parallels exist between level designers and real-world architects, and what knowledge might these separate but interconnected disciplines glean from each other? This chapter explores the topic through an interdisciplinary lens, engaging with academic and industry sources across architectural and game studies. Building on knowledge about the significance of architectural principles in game worlds (Jenkins 2004; Totten 2017), the chapter explores three archetypal game genres to illustrate and add nuance to existing theory. As game scholars/practitioners at a Canadian university, the authors are interested in the theoretical principles of architecture, the applications of these principles to making compelling games, and to the interdisciplinary opportunities for collaboration emerging at the nexus of the two.

Videogames are a billion-dollar economic force and a leader in the digital entertainment industry (global videogame industry). They are also much more than that. 3D games afford the exploration of architectural space and form in unique and engaging ways, and successful level designers rely on architectural knowledge to guide player navigation, to influence decision making, and to facilitate a sense of immersion in-game (Totten 2014). To illustrate exactly how this happens, examples from three archetypal game genres — dark fantasy, open-world, and post-apocalyptic — are presented in this chapter. From the medieval/gothic corridors of the *Dark Souls* series to the contemporary urban cities of *Grand Theft Auto* and dystopian ruins of *Fallout*, the triangulation of architectural theory, virtual architecture, and gameplay is the relationship of focus. Briefly introducing the rest of the chapter: the following interdisciplinary primer serves as common ground for those from architectural and game studies backgrounds. Following this are observations and discussions from each of the three game genres, observations finally synthesized in a section comparing and contrasting examples from each. The chapter concludes with interdisciplinary implications as well as potential areas for future research and collaboration.

Interdisciplinary Primer and Connections

For the reader with some familiarity with both disciplines but coming from either an architectural or game studies background, this section provides a quick orientation to each. As a point of departure, consider the following excerpt from the 2021 Oxford Dictionary of Architecture:

> Architecture might be described as the art and science of designing a building having qualities of beauty, geometry, emotional and spiritual power, intellectual content and complexity, soundness of construction, convenient planning, many virtues of different kinds, durable and pleasing materials, agreeable colouring and decorations, serenity and dynamism, good proportions and acceptable scale, and many mnemonic associations drawing on a great range of precedents.
>
> ("Architecture" 2021)

The breadth of this definition emphasizes a scope much broader than those outside the discipline may associate with it. More than simply "the art and science of designing a building" ("Architecture" 2021), architecture has been a profound expression of cultural values and societal functions for millennia (Ching 2023). Unlike architecture, videogames have only recently received academic focus and cultural adoption, called "one of the most remarkable and dynamic phenomena of modern technoculture" by Belyaev and Belyaeva (1). *Like architecture*, however, the scope of videogames *also* extends beyond simple tropes. The variety of experiences videogames cover make them hard to cleanly categorize, demonstrated by multiple papers on the difficulty of defining them (Karhulahti 2015; Arjoranta 2019).

At the intersection of the two fields we find innovative endeavors, from the industrial use of game engines in architecture, engineering, and construction (Kalay 2004; Day 2021) to theoretical explorations of the relationships between games, art, architecture, and design (Totten 2017; Aroni 2022). Interdisciplinary connections include environmental psychology and space syntax, focusing on how people interact with their environments and analyzing the layout of spaces and how they influence behavior, respectively. The narrative potential of spaces, as discussed by

Henry Jenkins (2004) in the context of Kevin Lynch’s *Image of the City* (1960) underscores the importance of storytelling in both urban design and game environments. In “Game Design as Narrative Architecture,” Jenkins draws on Lynch’s urban design principles to illustrate the narrative function of videogame spaces. Jenkins argues that videogame designers, like urban planners, use structural elements — paths, edges, districts, nodes, landmarks — to develop environments that enable players to navigate and create stories. This application of Lynch's work by Jenkins highlights the importance of spatial organization in shaping narratives in games, framing game designers as architects of narrative possibilities. See Nicholas Oueijan’s 2021GDC (Game Developers Conference) talk, “Stop Getting Lost: Make Cognitive Maps, Not Levels” for an applied discussion of Lynch and level design.

Other important orientations to game studies include the debate between ludology (focus on game mechanics) and narratology (emphasis on story), critiqued by Murray in 2005, pointing to the need for a balanced approach in game design that integrates both technical mechanics and narrative elements. This concept parallels architectural considerations, where combining technical functionality with narrative depth is also important. Another seminal work is the MDA framework (Hunicke et al. 2004), an often-cited tool used in game design and analysis, standing for mechanics, dynamics, and aesthetics. Transitioning from the broader architectural and narrative aspects of game design, the next sections will highlight concrete examples by exploring three videogame genres, demonstrating how these principles are embodied in actual gameplay.

Game Genre Selection Rationale

In selecting the game genres of dark fantasy, urban open-world, and post-apocalyptic for analyzing the relationship between architecture and gameplay, the chapter draws upon three critically acclaimed and popular series: the Souls-like series, *Fallout* series, and *Grand Theft Auto* (GTA) series, respectively. These present a varied multi-title set of industry examples, offering opportunities for comparative analysis across different aesthetic and architectural features.

The Souls-like series' use of gothic and medieval architectural elements enhances the atmospheric storytelling and plays an important role in shaping player navigation and encounter experiences. The GTA series showcases contemporary urban environments and provides a variety of options for above- and below-ground navigation while the *Fallout* series offers a dramatically different architectural landscape. Sharing the conceptual anchor of American architecture, the latter series' depiction of decayed and dystopian environments contrasts with more contemporary representations of cities in GTA.

The enduring popularity and critical acclaim of these franchises make them ideal subjects for study and their variety provides many opportunities for exploring how spatial design influences narrative and player interaction in virtual environments. The academic discourse surrounding these games, augmented by popular reviews and gameplay walkthroughs, provides a variety of experiences for analysis. This approach supports a broad understanding of the games' influences and legacies, offering insight into the interplay between architectural design and videogame mechanics.

Dark Fantasy

The Japanese game designer Hidetaka Miyazaki and the FromSoftware team he leads have significantly impacted the videogame landscape. Titles from the studio frequently top Best Dark Fantasy game lists, including *Dark Souls*, *Bloodborne*, and *Elden Ring*. Toniolo (2020), argues that the *Demon's Souls* and *Dark Souls* series have shaped the whole industry, pointing to the Souls-like category of games, as does Wood (2022). The studio has gained a reputation for creating brutally difficult games with dark and immersive worlds, challenging combat, and architectural elements often inspired by real-world structures. The fictional city of Anor Londo in Dark Souls, for example, is based on the Milan Cathedral in Italy, whereas the FromSoftware team visited Romania and Czech Republic gathering references for *Bloodborne* (Parkin 2015). In a 2012 interview on the design of *Dark Souls* (translated by 7Force), Miyazaki commented on the value of beginning with real-world architectural references and how he thought the team would have struggled to achieve the game without them. See Crowbcat's 2016 video *Dark Souls Locations in Real Life* for fascinating side-by-side visual comparisons.

Another connection between gameplay and architectural knowledge in *Dark Souls* is the role of wayfinding. In a 2018 video essay, *Game Maker's Toolkit* favorably compared the original to later sequels for a mechanic that was *missing*: fast travel. While later *Souls* games allow a player to teleport from fireplace to fireplace, the first *Dark Souls* forces players to explore interconnected levels, backtracking and requiring spatial memory to figure out optimal routes. The lack of fast travel early on makes journeys dangerous and isolating, while shortcuts, hidden paths, and secret areas reward exploration and curiosity.

> The experience of exploring also creates a pretty strong feeling of isolation and, I suppose you could say, homesickness, when you venture deep into certain areas. Going further and further into the Catacombs or Blighttown feels legitimately unnerving as you're moving further and further away from safety and familiarity — and if you want to return to the surface, you'll have to literally climb back out. You can't just warp.
>
> (Ibid., 7:56 – 8:19)

This lack of map and fast travel highlights the role of mechanics (M) and dynamics (D) from Hunicke et al.'s MDA framework (2004), as the dynamics emerge from the navigational mechanics afforded to the player.

▶ **Long Description for Figure 1.2.1**

Figure 1.2.1 Castle Asset Representative Stand-In for 'Dark Souls' Environment.

Another example of the mechanic-dynamic relationship comes from the interaction with the game's giant bosses, who through their massive size restrict player movement and field of view. Through a topic analysis of online review text, Yu et al. (2022) determined that the engaging boss fights and tactical combat are gameplay elements that *Dark Souls* players found highly satisfying, and architectural space is often used in games to signal the arrival of these dangers. Polygon's 2020 video *Videogame Architecture Is Full of Secrets* contextualizes the use of compression and expansion (or release) in games, an architectural idea often attributed to the work of Frank Lloyd Wright (Storrer 2017). Wright "employed the technique of compression and release, where a smaller room or foyer leads directly to a much larger room" (2017, fifth par.). Polygon argues the phenomena is "most noticeable in boss arenas — you know that feeling you get when you step into a suspiciously large room" (2:17–2:21), emphasizing the importance of changes in a space's volume for player anticipation.

Urban Open World

The critic/historian Reyner Banham wrote about Los Angeles in *The Architecture of the Four Ecologies* (1971). In it, Banham argued that to understand the city one must do so from a vehicle, to "abandon the classical canons of architectural history and drive a car along the highways and landscapes of the city, considering the cinematic speed of the car and a specific gaze through the windshield" (Gerber 145). Gerber builds on Banham by connecting Los Angeles to Los Santos (its GTA 5 doppelganger) and argues that *playing* the virtual city is a natural extension of Banham's driving.

Shifting from dark fantasy to a genre mirroring contemporary life, The *Grand Theft Auto* (GTA) series are the archetypal urban open-world games.

Emphasizing exploration and freedom, GTA's cities are integral to the game's narrative-driven immersive gameplay, and while the franchise has drawn controversy over violence and dark themes (Gabbiadini et al. 2017), these landscapes have also served as experimental environments for contemporary artists (Aldouby 2020). Ian Bogost argues that the "main innovation of GTA is its vast virtual urban space and freedom of action in that environment" (2006) and these open-world environments have grown with each successive title. Liberty city featured an 8.12 km^2 map, Los Santos 75.84 km^2 (Maddock 2023), and rumors suggest *GTA VI* is expected to be even bigger (Gwilliam 2023). Sheer scale alone does not always equal more compelling gameplay, however; many praise the character development and storytelling of *GTA IV* as more compelling than *GTA V*, despite its larger world (Bowen 2023), tying back to the ludology/narratology debate mentioned earlier.

▶ **Long Description for Figure 1.2.2**

Figure 1.2.2 City Sample Asset – Representative Stand-In for "GTA's Urban Landscapes"

While these open worlds may give an illusion of freedom, the gameplay is steered by the game mechanics on offer, as demonstrated by Kiri Miller's "accidental" in-game carjacking as she was trying to ride a BMX bicycle in the middle of the street (2008). Bogost (2006) discusses the ease of engaging in violence within the game, such as the simple carjacking mechanic activated by a single button press on a PlayStation controller. Along with narrative-driven criminal missions and readily available weapons, the mechanics shape the player's identity within the game. The impact of these mechanics might be juxtaposed with the findings of the infamous Stanford Prison Experiment conducted by Zimbardo (1971), where students assigned the roles of guards and prisoners in a simulated prison environment soon exhibited drastic behavioral changes. The experiment, terminated early due to its disturbing outcomes, underlines the power of roles and scenarios in altering behavior and identity. This raises questions about the influence of GTA's immersive environment, scripted events, and interactive prompts on player behavior, particularly in light of its aesthetic and narrative parallels to real-life cities.

Especially relevant are dramatic advances in rendering technology, with interactive simulations more realistic than ever before. While excessive focus on graphics can overshadow other aspects of game design, it is still commonly believed that the graphical quality of a game is a key indicator of its overall quality, as suggested by Ian Bogost and his quote "Visual fidelity implies authority" (Persuasive Games). Bogost wrote these words at a time when graphics paled in comparison to the photorealism exhibited in today's titles. Scheduled for release in 2025, anticipation is building for the release of *GTA VI* set in Vice City (based on Miami) and already systematic comparisons are being made between previous titles and the 1.5 minute trailer. At the time of this writing (Jan. 2024), the first *trailer* for *GTA VI* already has over 167 million views in its first month online (Grand Theft Auto VI Trailer 1), a testament to the compelling mixture of architecture, gameplay, and narrative.

Post-Apocalyptic

The post-apocalyptic game genre offers insight into the ludology-narratology discourse. Shifting focus from gameplay mechanics like navigation and combat, consider Jenkins'words in *Game Design as Narrative Architecture*, on how successful amusement park experiences reference "stories or genre traditions already well known to visitors, allowing them to enter physically into spaces they have visited many times before in their fantasies" (2004). Countering Jesper Juul's argument "against games as stories," Jenkins champions games as functioning within "a larger narrative system with story information communicated through books, film, television, comics, and other media" and their unique role in "creating an immersive environment we can wander through and interact with" (2004). This emphasis on environment emphasizes the importance of buildings and landscape on gameplay in general, and especially so in post-apocalyptic titles where the condition of said elements are tied to or illustrative of some important event. Iconic examples of the post-apocalyptic game genre include *The Last of Us* (2013) and the *Fallout* series (1997–2019), and almost a decade after Jenkins' prescient paper, the former features a 2023 TV remake, with a *Fallout* series scheduled for release in 2024.

Emma Fraser discusses how the ruins in videogames, particularly post-apocalyptic ones, are used as powerful symbols, representing the catastrophic end of civilization (2019). She paints *Fallout 3* as "a kind of curated space of exhibition amidst the turmoil" and points to the importance of environmental exploration and “encountering rubble-filled streets, collapsing architecture and wrecked landmarks” which are tied to the narrative (129). Much of this rubble is concrete and brutalist, an architectural style prominent in the mid-20th century that has profoundly influenced videogame level and environment design (Wilson 2018). Despite falling out of fashion by the 1980s, brutalism found new life in virtual worlds. Early first-person shooters like *Quake* (1996) and *GoldenEye* (1997) echoed the bunker architecture of the period, while games like the *Halo series* (2001–2001) and *Fallout 3* (2008) incorporated brutalism’s bare aesthetic to shape its dystopian scenes and moods. Wilson writes about a “hopeful construction boom,” with brutalist buildings tied to social infrastructure like schools and government buildings (par. 11). There is a cold irony here, when these buildings are desolate and broken in post-apocalyptic games like *Fallout*.

Figure 1.2.3 Destroyed Building Asset – “Representative Stand-In for Fallout’s Post-Apocalyptic Scenes”

Returning to the architectural-gameplay connection and the theme of studios referencing real-world architecture, the *Fallout* series provides especially strong and varied examples of the trend throughout its history. From damaged recreations of the iconic Washington Monument in *Fallout 3* to Fenway Park and the Statehouse in *Fallout 4*, these real-life landmarks provide a sense of realism and immersion, allowing players to explore familiar places transformed by the game's alternate history. These post-apocalyptic game environments reflect Jenkins' idea of narrative spaces and demonstrate the profound impact of architectural elements in creating rich, interactive game worlds.

Comparative Analysis/Synthesis

Having looked at some of the unique qualities of each of these genres, this section will explore overlap and divergences. First, in all three genres it is clear that game studios have taken inspiration and reference material from real-word architecture and cities. Miyazaki suggested the impossibility of success without these references (see prior), while it seems hard to imagine the GTA series without its urban anchors; even the fictional worlds of post-apocalyptic titles use specific landmarks and monuments to ground their narratives in alternate futures. These real-word references influence gameplay both structurally and conceptually, in that the relationships between form and space affect wayfinding and game mechanics while aesthetics and iconography enrich narrative immersion.

Presented as the archetype for urban open-world games, the GTA series stands out among the three for its provision of vehicles. Speed yields a different impression of cities — an idea applied virtually by Gerber to the ideas of Banham in the physical world earlier in this chapter — via faster interactions with the paths, edges, districts, nodes, and landmarks conceptualized by Lynch. Helicopter views of Liberty City in *GTA IV* afford players a bird's eye view as well as physical access to rooftops, while the functioning traffic lights below trigger police chase mechanics when transgressed. These extended views provide varied vantage points; of the people, the city, the structures, and the landscape.

Related to this is the perspective of the virtual camera, a distinct feature of virtual environments compared to the physical world. A first-person view (most closely mirroring our human vision) is often reported as more immersive, but is also anecdotally associated with nausea, aka simulator sickness, compared to third-person (behind and over the shoulder) perspectives (Monteiro et al. 2018). This duality produces uniquely virtual challenges for level designers, ranging from the appropriate resolution of textures to different perceptions of spaces as well as visual glitches like virtual cameras clipping through walls. Camera perspectives — an often-debated topic in gaming forums, and in addition to immersivity/nausea — have both strategic and aesthetic implications. Referencing *Demon's Souls*, Bycer writes how "the switch to third person also allowed players an easier time with situational awareness" (72) while fans of first-person shooters often begrudge how the third person provides sight around corners or from behind cover without being seen. Variations in the virtual camera perspective are thus especially important to the architectural-gameplay relationship and to how a player perceives the world.

The three game genres explored rely on relevant architectural knowledge and specific artifacts for compelling gameplay. Sharing some and disproportionately deploying others, the ways in which these games leverage these principles varies. The compression and expansion of space is especially relevant to labyrinthian castle hallways and more expansive boss encounters of dark fantasy games, while less so to the urban open-world genre. On the other hand, the form and aesthetics of buildings affect the narrative atmosphere of all three genres, be they dark medieval/gothic castles, bright contemporary cityscapes, or dystopian concrete rubble. While only scratching the surface of architectural and gameplay theories, these genres highlight the potent mix of environment, props, and mechanics for compelling gameplay.

Conclusion and Emerging Opportunities for Research

This chapter has engaged with a rich and growing field at the intersection of two spatial disciplines, exploring architectural principles, archetypal examples of game genres, and some of the studios that produce them. From practical and theoretical insights provided by both academic and popular sources, a holistic view of how these principles manifest in virtual experiences has been illustrated through examples. These similarities and differences provide a fuller picture of how narrative and mechanics work together and how they interact with the environment to produce engaging experiences.

The value of centuries of architectural knowledge to game developers is clear, but advances in game development hold utility for architects and urban designers as well. Despite an imbalance in the breadth and depth of knowledge between the two disciplines, Totten points out that while "architecture and level design may have different methods for achieving pleasure and delight … [they both] do so with spatial compositions" (2014). Taken for granted today, in 2008 Michael Nitsche described the "digital revolution in architecture," pointing to the utility of architectural visualization and the ability to experience a building before it was built. These digital tools and workflows are "more or less a necessity today for the modern architect" (Le Grice n.d.), and the bleeding edge of accessible real-time rendering technology is led by the makers of game development tools like Unity and The Unreal Engine.

An important topic not touched on in this chapter is the emergence of extended reality (XR), and the even more complex spatial dynamics that come with it. The immersion of VR is even greater than that of the first-person camera on a flat display, and Apple's Vision Pro will be the first consumer product to merge the physical and virtual through augmented reality (with head tracking). But while these new technical capabilities in real-time rendering and AR will open new creative opportunities, truly compelling spaces require artistic vision beyond photorealism. This artistic vision, coupled with contemporary tools and centuries of architectural knowledge, will produce hybrid experiences of tomorrow we can only imagine.

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1.3

Interview with Paolo Pedercini

On His Roles as Founder of Molleindustria and Experiential Game Design Instructor at Carnegie Mellon

Paolo Pedercini

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Could you talk about how you view architecture in games and touch on how you see digital space?

When you design buildings for a game, you are not creating living or working environments, you are looking at spaces in relation to specific game mechanics. An exploration-oriented game may have architecture with secrets and surprises, a first-person shooter may have nooks and crannies to provide cover and high points to snipe, a narrative game may have architectural elements that tell a story or contribute to the overall world-building. Disciplinary speaking, if there is any architecture at work, it's the niche architecture of playgrounds, theme parks, or stage design.

In games that rely on immersion and photorealism, you have a representational surface that references existing architecture. A proficient level designer is able to create an environment that looks like a real office even if it's functionally a spatial puzzle. In a game like *Counter Strike*, you may have a level that looks like a stereotypical Middle Eastern village to the eyes of a Western gamer, but that doesn't make any sense architecturally or urbanistically. Architecture is a theme not unlike that of a miniature golf or a themed restaurant.

In many game genres, level designers go through a phase called "greyboxing" or "blockout," in which all the volumes and features of the level are sketched out with featureless blocks according to things like the range of the weapons, or the height the avatar can jump. These sketches are then iterated and tweaked according to players' feedback and only at the end are made to look like "real" spaces by environment artists.

Beyond the mimetic aspect, virtual architecture doesn't have any limitations due to materials, budget, or gravity, so you can easily create spaces that are not possible in the real world. To me that's a much more interesting aspect: you can make environments that don't follow any rule of physics, that don't belong to any social context, but that are still meant to be traversed in first person, so they are still in a way in dialogue with architecture.

When I introduce my students to game engines, I prompt them to make "expressive" spaces: spaces that tell a story without words, or try to create a mental state like claustrophobia. We look at churches, monuments, pavilions, and art installations because their primary function is to convey ideas or provoke an emotional response.

What do you feel is the current relationship between architecture and videogames?

I think there are different ways games and architecture (and urbanism) intersect. Games have been used for a long time as tools to involve communities in urban planning, using systemic and immersive approaches. Some games may involve simulating neighborhood development plans, with community members roleplaying as different constituencies like business, low income families, landlords, etcetera. In other games players may be tasked with deciding where to house refugees on an interactive map of their city. These are things games can do well: unpacking the conflicting interests that shape our cities, and providing spatial visualizations of land and resources. More immersive approaches like Block by Block, a program run by the United Nation, involves community members in the design of public spaces through a modded version of *Minecraft*. The organization Games for Cities has a database with dozens of examples of such "serious games."

Another intersection is critical and discursive and may be best represented by the *Heterotopias* magazine, which looks at videogames through the lens of architecture. It can be a fruitful relationship. The politics and poetics of space can be more prominent in games compared to other narrative media since many games are about moving in a continuous 3D space. In many games the built environment is a central part of the play experience, and much more than a mere backdrop for a story. Even the tools game developers use are similar and related to those used by architects.

You can also try to look at architecture through the lens of videogames, but I haven't seen a lot of examples of that, probably because architectural theory is more developed and refined than videogame theory. I can think about the playful and subversive use of architecture by skateboarders and parkour athletes.

There is a new high school in Michigan that has been supposedly designed to reduce the impact of mass shootings. It has curved hallways to cut off shooters' sight lines, and bulletproof barriers to offer protection. These are common features in the design of first-person shooter levels, and many game designers pointed out that making a school look more like a violent game may not deter a shooter. Not to mention that these features can also obstacle law enforcement and help shooters, who are typically very familiar with the schools they target. So maybe novel ideas and insights may emerge from looking at architecture with a playful eye.

Finally, there can be a more critical relationship, I'm talking about using games to talk about architecture and urbanism. I'm personally interested in how games can encourage critical thinking around issues of urban development and envision better futures. For example, I made a little game about real estate speculation called *Nova Alea*, in which you see the urban environment from the point of view of financial capital. You basically make money by buying property and selling it before the next bubble bursts. It touches upon gentrification and displacement, and it procedurally shows the policies that can curtail these problems, such as public housing and rent control. Another game I made, *Lichenia*, tasks you with reclaiming a decayed city amidst climate chaos by looking at it as an ecosystem. Instead of the familiar actions of city building games (build a road here, place a power station there …) you have a more abstract kind of agency that blends the natural and the artificial. Both are quite minimalistic and are presented with a "magical realist" narration inspired by Italo Calvino's *Invisible*

Cities. I see them as antidotes to *SimCity* because they don't try to simulate an entire city, and they don't try to be "realistic" or "objective" in any way.

What do you mean by antidotes to *SimCity*?

SimCity was a turning point for the notion of realism in games because it was the first commercially successful "simulation" of a real-world system. Starting from the first edition, *SimCity* has been (mis)used in classrooms as an educational game, so countless sociologists, urban planners, and game critics have picked the game apart and analyzed its ideological biases and assumptions. At every new chapter of the series, they pointed at the erasure of racial dynamics that are central in the development of many settlements; at the games' bias toward modernist North American "desert cities"; at the relationship between crime and policing; at the commodification of nature; at the colonial idea of tabula rasa as the starting point of every game session; at the libertarian preference toward low taxes; at the supposedly socialist vision of a powerful planning authority; and so on.

On the other hand, generations of *SimCity* designers have insisted that they don't have anything specific to say about how cities work, or should work. They imagine it as a pure sandbox game, as a politically neutral simulation. That's not really possible, because they have to make all sorts of arbitrary decisions about how to represent complex socio-economic phenomena.In a way, *SimCity* was ground zero for all the discourses about ideology and videogames we are still having.

As a designer, I realized the main issue with *SimCity* wasn't a particular omission, an erasure, or a set of algorithmic biases, but the very idea of a single, totalizing simulation of a city. When we talk about cities we refer to a multitude of interconnected social and economical systems tied to a geographical place. If you want to make games that visualize and problematize these systems, an alternative is to have smaller games scoped on a narrow set of issues. Instead of a “capitalist realist” style that reproduces the existing cities as inevitability, you can employ a more fabulistic form of utopian storytelling. You can show how a city *could* work, you can use abstraction to isolate a specific aspect of urban development, or to visualize invisible dynamics and relationships within the urban environment.

How can videogames envision better urban futures?

I’m currently working on an open world game that is a bit like *Grand Theft Auto* (GTA), except instead of robbing people you have conversations with them. Also, instead of being set in the present, it’s set in a utopian near future, and more specifically in my own city, Pittsburgh, PA. It's a story-based game, but I like to reference the GTA series because they have an interesting way to take an existing city like Los Angeles or New York and shrink it down to a more manageable size. They have to “summarize” a city, retaining what’s familiar and memorable. I am doing a similar operation for Pittsburgh: I’m reducing it to an area of a few blocks while also transposing it 20 years to a future that is governed by ecosocialist principles. It’s a fun envisioning exercise. Also, it’s useful to use a real city as scaffolding because it gives me a distinct geography, an organic land use, and a rich history to extrapolate to the future. I wanted to avoid the kind of images that show up if you Google “utopia.” The typical vision of a utopian city is some kind of hyper modernist fantasy with buildings that all look like modern art museums and no historical stratification.

Since the game is only 20 years in the future and without any major catastrophe, I'm assuming most of the built environment will still be there. So the question is: what will be created from scratch, what will be demolished, and what will be repurposed in this new society?In this process of reduction, I'm also avoiding creating a mere collection of famous landmarks. I have a lot of ordinary vernacular architecture, typical midwestern houses, some unchanged, some with solarpunk retrofits.

For this particular project, I wanted to avoid having a space that is designed around the journey of the player. In most action-adventure games like the *Last of Us*, the environments are basically shaped entirely by the narrative and action bits. The game world exists only for your enjoyment, for your power fantasy, and ultimate triumph. To counter that in my game, I decided to create the city first, and then mapped all the plots, puzzles, and characters onto it. Since it's an anti-heroic game, I wanted the built environment to feel indifferent to your existence.

What do you anticipate will be the relationship between architecture and video games in the future?

I'm fascinated by how digital tools can shape the built environment as much as with material technologies and building codes. There are entire styles of architecture that, as a programmer and 3D modeler, I immediately associate to specific parametric tools or procedural generation techniques developed for CGI.

But I wonder if what architects can learn from games has less to do with technology and more to do with player-centered design. For example, can you design a building in first person, that is, from the point of view of the people that will inhabit it? Game engines can let you experience and iterate a space very easily. Instead of shiny renderings, models, and top-down plans, you can put together a rough “blockout” of an interior and let your clients navigate it in a game-like fashion. You can quickly iterate on their feedback or even let them tweak the space in real time. You can identify accessibility or wayfinding issues by moving through a building from the perspective of somebody who is in a wheelchair, or somebody who is looking for a specific room.

1.4
Foundational Pixels
How Architecture First Entered Videogames

Jon-Paul Dyson

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In 1596, the Jesuit missionary Matteo Ricci asked Lu Wangai, governor of the Chinese province of Jiangxi, to imagine himself wandering through a magnificent palace, entering through a spacious reception hall supported by pillars. The palace was purely fictional, but Ricci had created it — "constructed" it, in some sense — for two purposes. First, on an immediate level, he wanted to show how creating an imaginary building could be used as a memory aid, a mnemonic trick that Europeans had used since the times of ancient Greece, in which specific things to be memorized were linked with memorable features of the building constructed in the mind. Ricci himself apparently knew the entire New Testament by heart. At a deeper level, he created the memory palace as part of a campaign to demonstrate the wonders of early-modern European technology (from memory palaces to clocks) in a failed attempt to convert elite Chinese and thereby possibly the entirety of Ming-dynasty China (Spence 1983).

Ricci's use of an imagined building reminds us that for millennia people have used architecture in various fictive ways, from palaces that we invent in our minds, to ones we imagine based on written descriptions, to the buildings that artists have drawn in paintings, to the miniature dollhouses or playrooms that lovers of the lilliputian have fashioned of wood, fabric, and paper. Building out of toy blocks has likewise long been a favorite pastime of children, and there has been a profusion of mass-manufactured architectural toys over the last few centuries, from handmade wooden blocks to the LEGO bricks of today. Playing with pretend architecture is nothing new, so it's only natural — indeed inevitable — that the built environment has become central to videogames. It wasn't so at the beginning, however, for in the early years of videogames, architecture entered the picture haltingly, in ways dictated by the genres of the games and the limits of technology.[1]

While the roots of videogames stretch back to the earliest exercises in computers in the mid-twentieth century, they really entered the public consciousness in the 1960s and 1970s. This took place through four distinct but related types of videogames: arcade machines, computer software, handheld electronics, and television consoles. Each type of gaming had its strengths and weaknesses. Early computer games, for example, were often strong on calculation, algorithms, and the processing of written text but weak on graphics and were only accessible to a very small population of users. Arcade, television, and handheld games made the transition from analog to digital during this period, and in the process gained tremendous powers of computation, but they still were limited in their ability to generate visual images, thus prioritizing the sprites or other active elements of games (e.g., a bouncing ball) that were usually not architectural. Each platform afforded different possibilities but also came with certain limits to the potential integration of architecture into early videogames (Lowood 2009).

But even as each platform determined — and sometimes overdetermined — the possibilities of architecture in play, it is more helpful to structure an exploration of the emergence of architecture in videogames through a conceptual rather than a hardware perspective. In this conceptual model, there were three fundamental ways that videogames represented architecture: imaginatively, materially, and visually. These modes of building or ways of seeing often transcended any particular platform, but their various uses in the early years of videogames laid down the pattern for the decades of games to come.

Imaginary Buildings

Imagine you are a 12-year-old student at a school in Westchester County, just north of New York City, in 1964. You have been chosen to participate in a study investigating the possibilities of computers as educational instructors. Amidst the post–World War II baby boom, children are overflowing classrooms, and with the Cold War at its height, there was a felt need to improve education to make sure the United States was keeping up with the Soviet Union in training the next generation. It was in that context that IBM collaborated with the public school system BOCES of Northern Westchester County on a project to develop and test the efficacy of computer games for education. In the end, the collaboration produced several games, but the most successful and influential of them was the *Sumerian Game*.

On its surface, the *Sumerian Game* was a pioneering educational computer game (by some measures the first educational computer game) that seemed to make little use of architecture. In the game, players took on the role of the king of the ancient Mesopotamian city-state of Lagash, deciding what to do with the annual grain harvest: to plant, to feed the population, or to store. These were cold calculations, and depending on the choices the user made, the population of Lagash waxed or waned. Architecture did not play a role here, except in one way. On the original printouts housed in the collections of The Strong National Museum of Play, one can read where the grain is kept: "in the storehouse." Within the game itself, that is it. There was no further verbal description, no elaboration of details as to what the storehouse looked like, but with those simple words, architecture appeared in videogames, for the mind's eye automatically conjured up some image of a storehouse, a building to hold grain (though as we'll see ahead, the designers of the game worried this was insufficient so offered supplemental visual aids) (Wing 1965).

Text-based descriptions of architecture continued as games developed, especially for computers. David Ahl's 1973 book *101 Basic Computer Games* featured the game *Furs*, in which players had to choose between visiting three different forts in various sites around Lake Ontario, though there was no real description of the actual forts (1973). Similarly, in the early simulation game *Oregon Trail*, first written in 1971, players also stopped at forts, though again there was no real description in early versions of the game (Rawitsch 1978). *Colossal Cave Adventure* (^#^#^#^#), a highly influential game that challenged players to explore a series of caves (modeled after the real life Mammoth Cave), recapitulated human prehistory by setting architecture underground, but it began outside with the opening sentence: "You are standing at the end of a road before a small brick building." The building turned out to be a well house — like the storehouse in the *Sumerian Game* it had a very functional purpose, not only to provide water but also as the spot where key items such as a lamp and key could be found by the player. Interestingly, this well house was based on a real-life pump house that used to sit near one of the entrances of Mammoth Cave (Jerz 2007).

As text-based games developed, such as the Infocom game *Zork* (1977) or *Cutthroats* (1984), descriptions of architecture became more detailed, helping players visualize the architecture in their minds, but limits on computer storage often restrained developers' inclusion of much description. Scott Adams built Adventure International, the first commercial computer game company, on the basis of his adventure games, but despite featuring many architectural locales — from castles to fun houses — they often trimmed descriptions to the bare minimum of a few spare words to save space on the very limited storage media of the day.

And yet the newness of computers betrayed the organizers' confidence in their use of the written word to fully grip players' imaginations. They still felt the need not merely to describe architectural images but at times actually physically reproduce them. There was a hint of this in the early versions of the *Sumerian Game*, for the developers of that game not only programmed the simulation but also produced a series of pictures that could be projected using a computer-controlled slide projector that showed reproductions of ancient Mesopotamian architecture. When games became commercialized, cover art for the games became another site of architectural depiction. And in some cases, where in-game graphics were nonexistent or primitive, developers sought other means to convey the illusion of architecture.

Material Representations

As compelling as the written word was in summoning up mental visions of architectural structures, videogame designers often yearned to create more obvious physical and printed graphical representations of built spaces that could evoke atmosphere but also sometimes actually act as adjutants of the gameplay.

The first home videogame console, the *Magnavox Odyssey* (1972), gave a clear example of this with the game *Haunted House*. Because the Odyssey's capabilities were limited to moving a few dots on a screen, any realism needed to be literally superimposed on the game through the application of plastic appliques that stuck to the television screen by static electricity. These overlays might show hockey nets or a map of the United States for a geography game, but sometimes they took on the role of a built environment like a tennis court. The game *Haunted House* featured a nine-room spooky mansion with a mansard roof that served as the backdrop but also the stage for a game of clue finding and treasure seeking, as players moved their controls through the space guided by translucent and opaque spots like windows and cat eyes. There's little evidence that the game was much fun, but it did bring architecture visibly into play.

Figure 1.4.1 Screen overlay for Haunted House game for Magnavox Odyssey, 1972. Reproduced with permission from The Strong National Museum of Play.

Other electronics makers of the period used physical models to enhance the limited graphics of electronics. Mattel's high-tech handhelds, such as the company's football game, were groundbreaking consumer hits when they started coming out in the late 1970s, but their visual displays looked more like those found on calculators than anything like the high-quality videogame graphics that were to come after. Indeed, the calculator connection was more than just about appearances, for the basic engineering and design of the game was done by the calculator manufacturer Rockwell. In looking at the designs for the game in The Strong's collections, notably in a document entitled "PRELIMINARY GAME SPECIFICATIONS - H482" dated 7/26/76, it's clear that the original concept looked very much like a calculator. Mattel took responsibility for the plastic housing of the game, and it's here that one sees architecture molding (in the literal and metaphoric senses) the game experience.

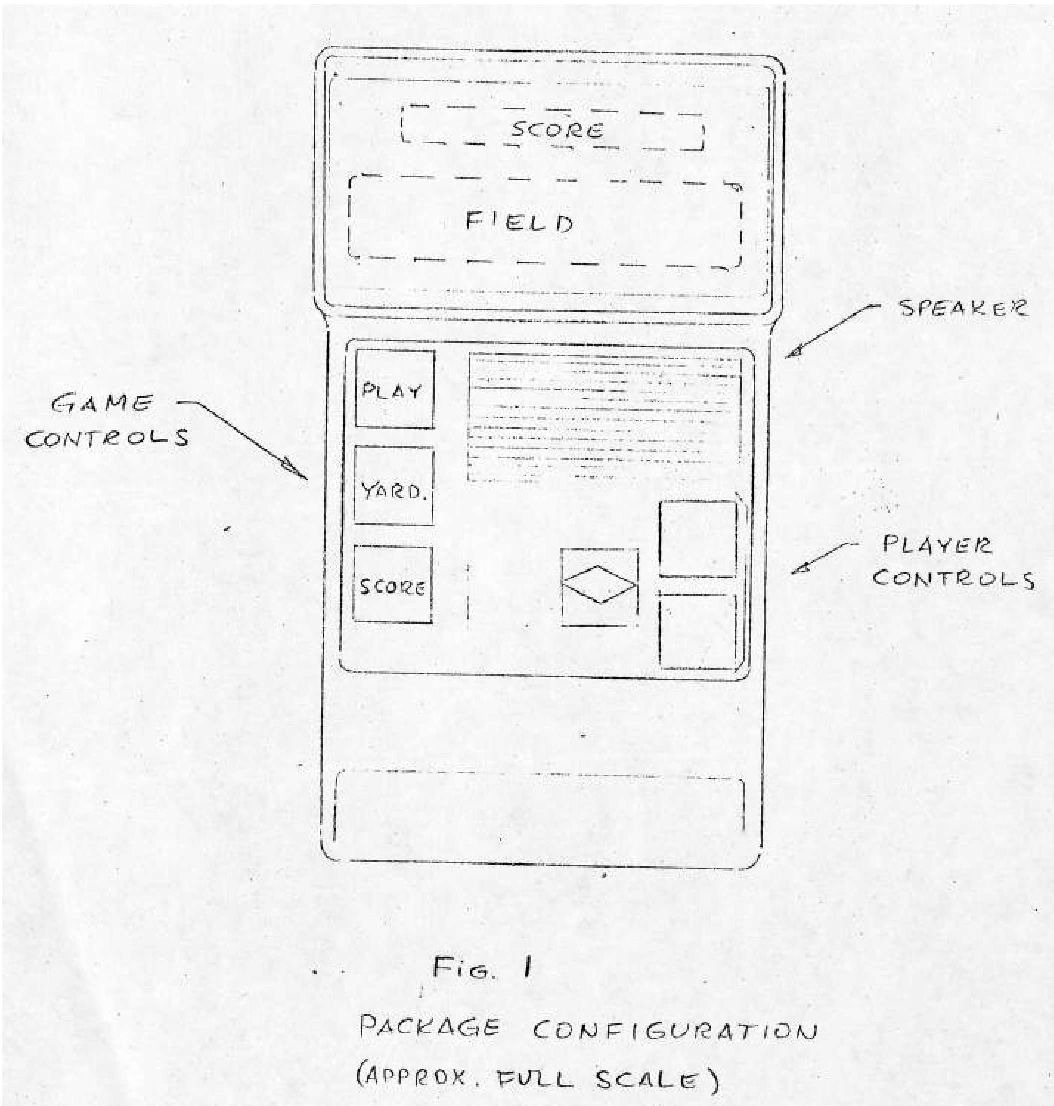

Figure 1.4.2 Early concept drawing for Mattel Football, 1976. Reproduced with permission from Mark B. Lesser Papers, 1973-1999, The Strong National Museum of Play.

At its grandest scale, a stadium is the architectural home for football. With roots going back to ancient Rome, stadiums were massive public structures that could seat tens of thousands of spectators — for gladiatorial combat in the ancient world and clashes on the gridiron in the modern world. Football grew in popularity in the late 19th and early 20th centuries precisely because of its violence; advocates such as Theodore Roosevelt believed it to be a redemptive form of play for the young, especially upper-class college students who were thought to be in danger of becoming weak or effeminate because of the degenerative forces of modern life (Dyson n.d.). Many of the largest stadiums such as the Yale Bowl or the Rose Bowl hosted major contests, and the Mattel game echoed the built environments of these stadiums. In the case of the game, the plastic stadium protruded from the face of the upper housing, surrounding the electronic playfield and setting the digital playfield within discrete architectural boundaries.

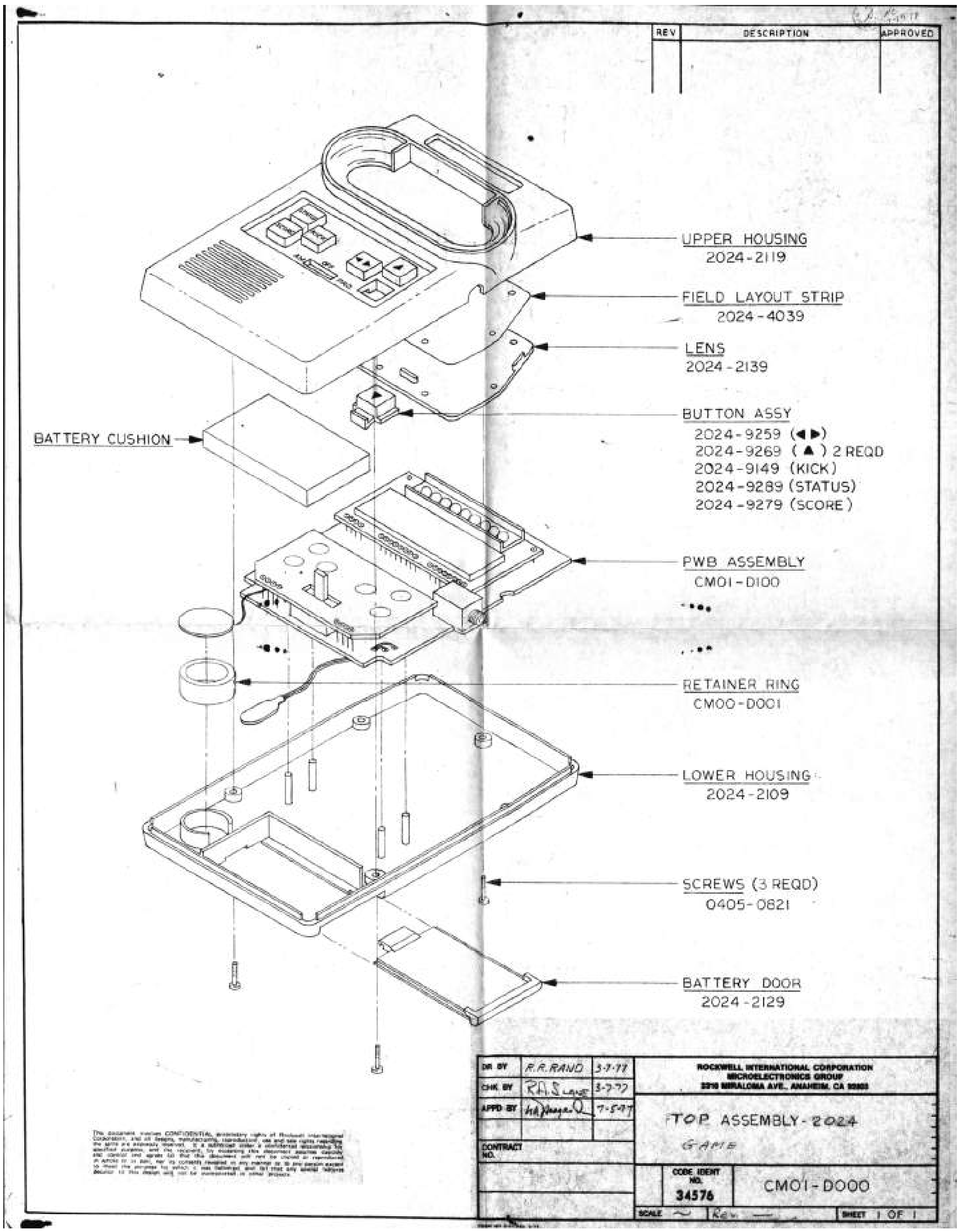

Figure 1.4.3 Assembly drawing for Mattel Football, 1977. Reproduced with permission from Mark B. Lesser Papers, 1973-1999, The Strong National Museum of Play.

This physical modeling of a stadium was doubly important because videogames were so new. How could the abstraction of five glowing lines moving around a tiny screen relate to a football game, especially when people were only just becoming familiar with the very concept of electronic games? People knew architecture much better than they knew videogames, so the building (or the representation of the building) had an important role in midwifing the play.

Art on the cabinet of an arcade game often did this as well, such as scenes of grandstands on the bezel that added to the surround around the screen in the Atari coin-operated game *Stunt Cycle* (1976). Similarly, for Atari 2600 games such as *Defender* (1982) and *Adventure* (1980), the artists provided concrete architectural artistic renderings on the game boxes that brought to life the abstract images on the screen.

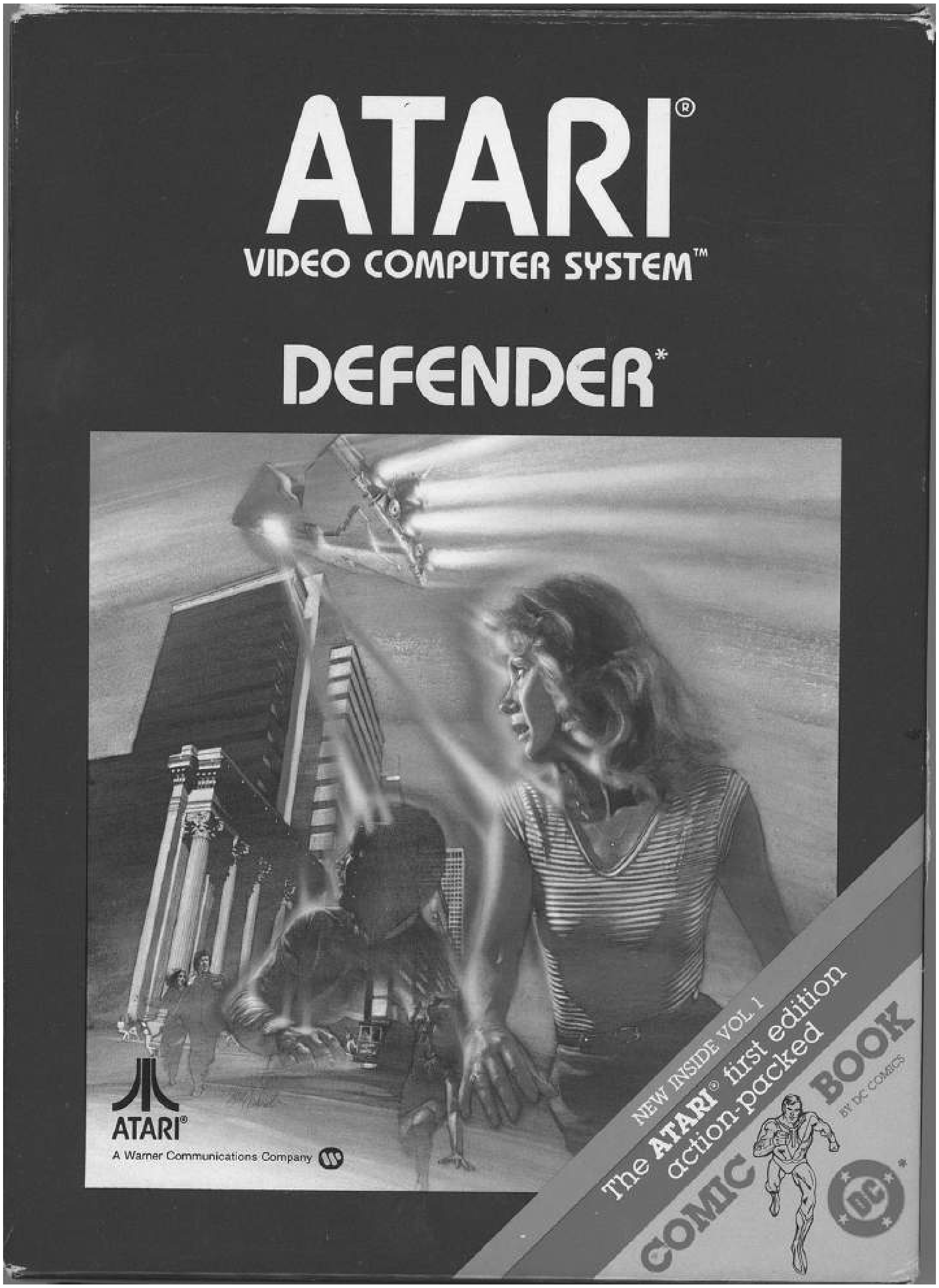

Figure 1.4.4 Defender, box cover for game for Atari Video Computer System, 1982. The Strong National Museum of Play.

Product packaging is never, however, just about facilitating gameplay. As Raiford Guins says of the coin-op cabinet as a piece of industrial design, “It was a medium of communication designed to facilitate user experience, gameplay context, company identity, product harmony, and location acceptance (2020).” Physical forms of games always serve many masters, but over time game designers sloughed off these external visual aids. Not content either with the power of words to generate the mental images necessary to grip players’ minds, they took advantage of advances in processing power to invest in computer-generated graphics that could represent architecture visually, on screen.

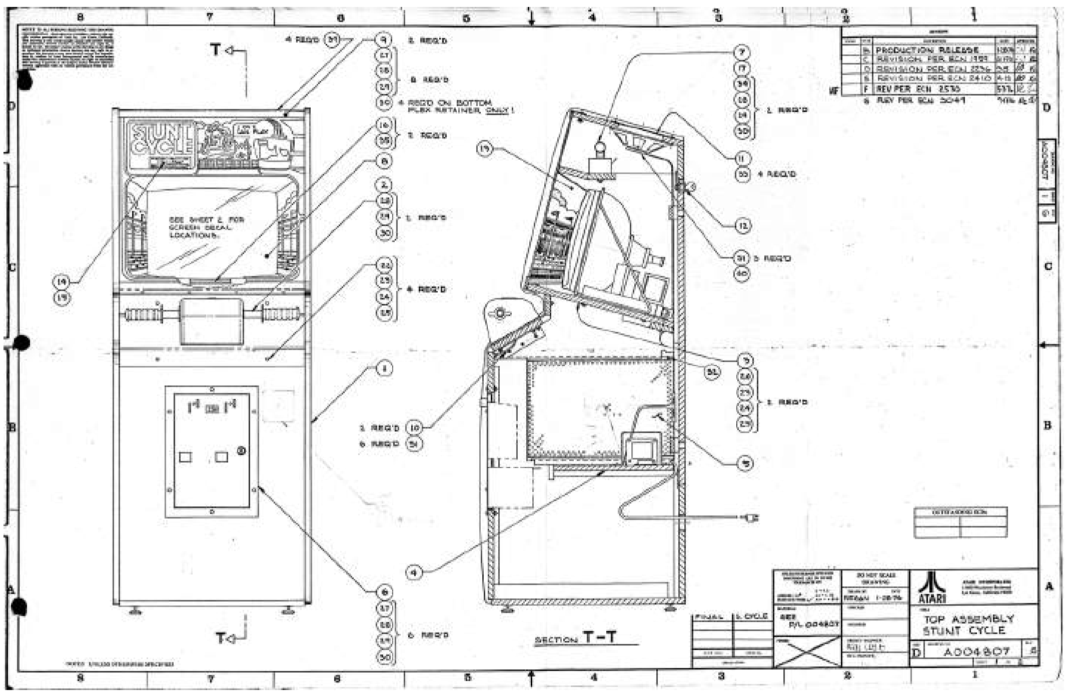

Figure 1.4.5 Assembly drawings for Stunt Cycle, 1976. Reproduced with permission from Atari Coin-Op Collections, The Strong National Museum of Play

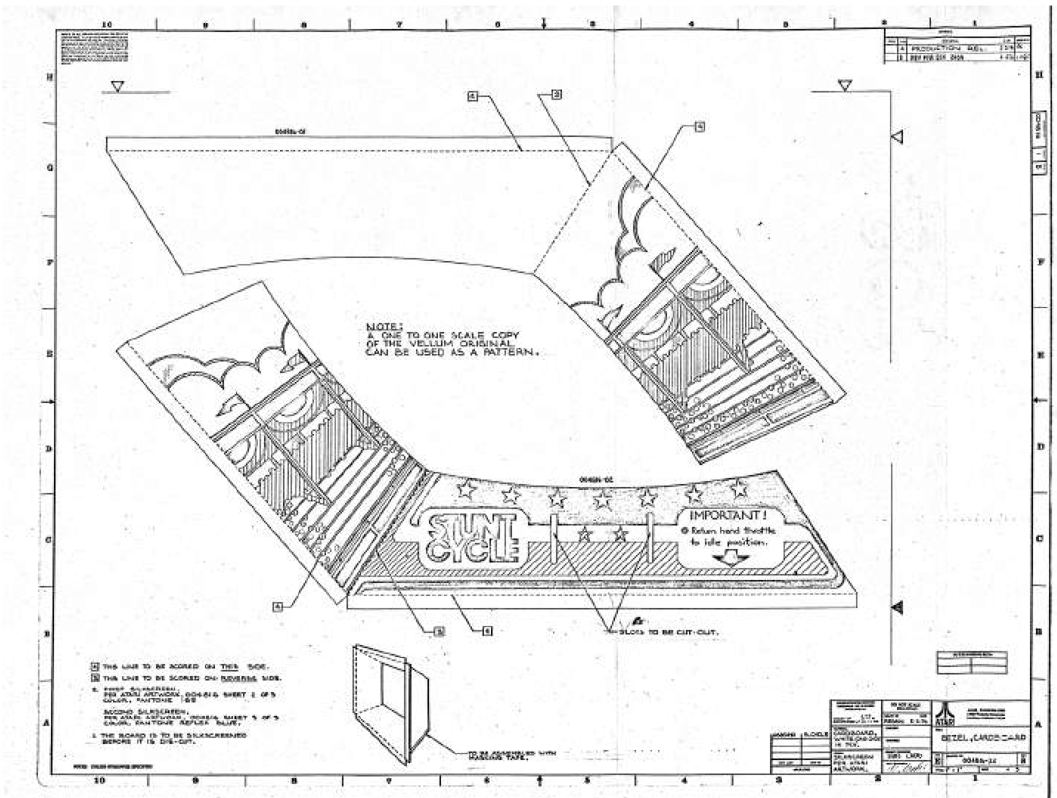

Figure 1.4.6 Assembly drawings for cardboard bezel of Stunt Cycle, 1976. Reproduced with permission from Atari Coin-Op Collections, The Strong National Museum of Play.

Visualized architecture

It is here, ultimately, that architecture earned its primary place in videogames, not through written descriptions or through physical add-ons but via pictures rendered in bits, not atoms. As technology improved in each of the major platforms for videogames — arcade games, consoles, and personal computers — more processing power allowed for better rendering of in-game architecture with a concomitant greater role for visual displays of built structures in the actual play of games.

Architecture first appeared in coin-operated videogames on a large scale primarily with arcade racing games. This was architecture in the form of racetracks and built landscapes. Atari’s *Gran Trak 10* (1974) offered up a bird's eye view of a racetrack. The dotted lines demarcating the track could have been merely markers with no actual architectural presence, but the game seemed to imply this was a more permanent course. Indeed, the flyer advertises "Colorful decals showing grandstands and checkpoints" that could be "applied to the front of the visual display," similarly (though more permanently) to the way that the haunted house overlay worked with the Magnavox Odyssey.

Atari's *Night Driver* (1976), which offered a first-person view of the racetrack, carried an implied architectural layout with side barriers along the track that defined the edges of the road. By the time of a game like *Pole Position* (1982), drivers were passing structures on the side of the road, though these were mere façades, passing features of the scenery. Although some of these games were Japanese, they displayed what the landscape historian John Brinckerhoff Jackson termed "Agrophilia — or the love of horizontal spaces," something he tied to Americans' love of speed. Billboards, for example, were easily rendered in a racing game and established a sense of rapid motion through space (Jackson 1984).

Early console games of the late 1970s and early 1980s, such as for the Atari 2600 system, also incorporated some architectural elements, primarily to demarcate physical spaces, often in ports from arcade hits. The game *Combat* (1977) — derived from Atari's *Tank* arcade games—used walls that tanks could hide behind and that shells could rebound off. In both the arcade and console versions of *Breakout*, players demolished the bricks in a wall at the top of the screen. As more console specific games developed, architecture became a more defining feature. In *Adventure*, players traversed dungeons and castles to find keys and fight dragons. In Activision's *River Raid* (1982), a bombing mission involved blowing up enemy installations.

It was really in computer games, however, that visually rendered architectural elements first became central. In 1980, after playing *Colossal Cave Adventure*, Roberta Williams was inspired to design an adventure game that used pictures, and with her husband Ken she created *Mystery House*. More than just being recognized as the first graphical adventure game for computers, Roberta and Ken's game made the architecture of the game central, not merely ornamental. As she described to Ken when she convinced him to make the game, "her game put you in an old Victorian house in which your friends were being killed off one by one" (Jackson 1984). Furthermore, not only was architecture central to the theming of the game, it was also at the heart of how she designed it. As Laine Nooney notes, Ken Williams remembered that "Roberta expressed her idea for the game as sketches. She organized her game as a series of rooms, each with a picture. Her design was a visual and spatial architecture long before it was ever a technical one (Nooney 2017). Unlike most computer programs of the time, Roberta Williams' design was relentlessly focused on static places, notably built places, not algorithms of systems or depiction of movement. Architecture was central to the game as she conceived it, and to do so she had to push Ken to stretch the technical limits of computer storage and graphics rendering on the primitive microcomputers of the day. The result was a program that fit on a single floppy disk, that not only featured architecture but made built environments central to the play experience.

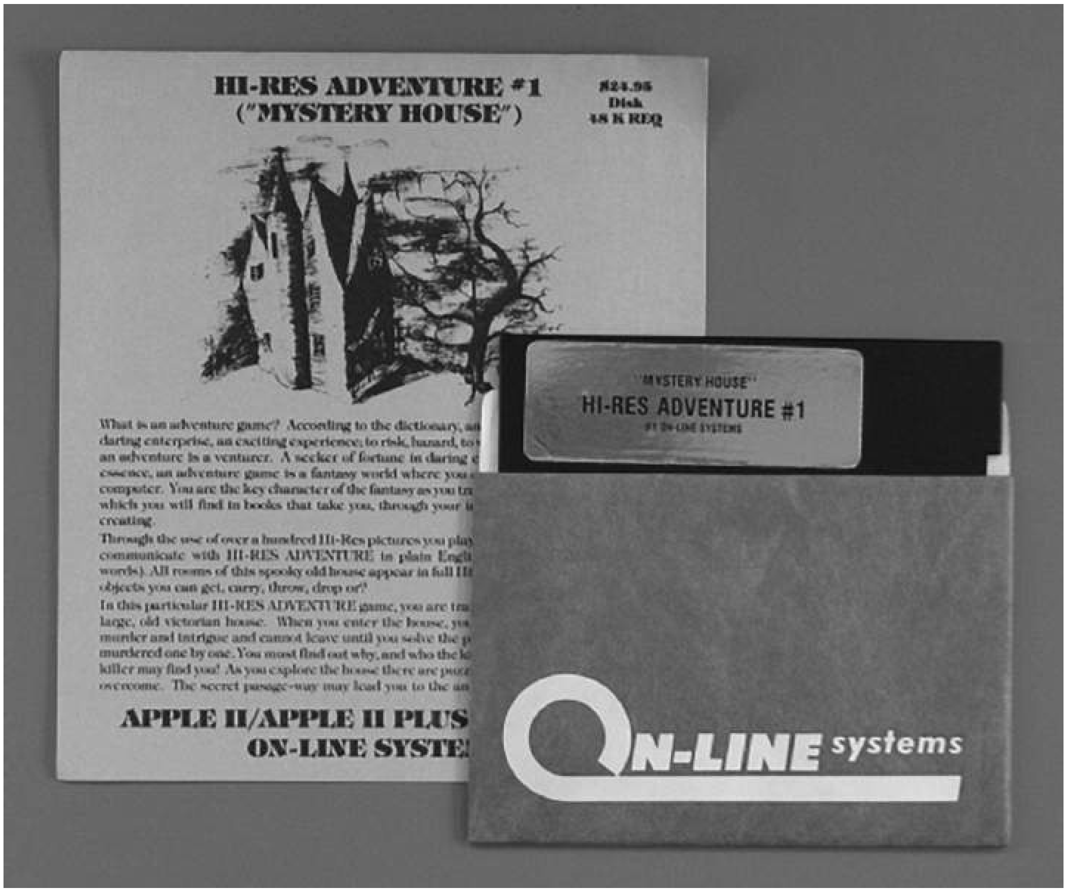

Figure 1.4.7 Game and packaging for Mystery House, 1980. Reproduced with permission from The Strong National Museum of Play

Architecture would only become more critical to videogames from that moment on. As in *Mystery House*, architecture was often the center of domestic dramas. *Little Computer People* (1985), for example, recreated the cutaway look of a doll house. A decade and a half later, Will Wright put domestic architecture at the center of his life simulator *The Sims* (2000). His earlier game, *SimCity* (1989), made urban planning — architecture writ large — the focus of the game. Haunted mansions became the basis of many horror and mystery games. Dungeons, castles, inns, and other pseudo medieval settings provided the built environments of thousands of roleplaying games modeled after the tabletop roleplaying game Dungeons

& Dragons. Adventure games like those in the *Assassin's Creed*, *Tomb Raider*, and *Uncharted* franchises not only made exoticized buildings central to the atmosphere of games, but also the actual playing of them as players traversed passages, explored rooms, and climbed walls. Shooting games, from *Doom* and *Quake* to *Team Fortress 2* and *Call of Duty*, even today rely on architecture to provide the physical barriers and layouts that make the game fun. *Grand Theft Auto* and *Cyberpunk 2077* offer cityscapes as playgrounds for missions and mayhem.

Sometimes these games are experienced from a first-person, ground-level perspective, sometimes from a bird's-eye view, but regardless of the angle of vision, architecture has become a central element of most games. Nothing becomes so ubiquitous with having some essential function, and architecture has assumed its starring role because, from the very beginning, it has achieved three fundamental purposes.

The Uses of Architecture

It is not surprising that architecture is in videogames. After all, our built environment is central to almost everything about our lives, and while play does not always replicate life, it certainly engages its main components regularly and deeply, though often with a twist. Play is not the same as life; as Johan Huizinga pointed out in his seminal text *Homo Ludens*, when we play it is as if we step in a magic circle (1950). In that circle, play often holds up a mirror, but a fun-house mirror, to life; we see life distorted, stretched, and shrunk. And sometimes in the process we are able to look at regular life anew.

The first key way that architecture engages videogames is through the creation of atmosphere. This is environmentalism in the broadest sense, but it's also about mood setting and establishing a tone for the game. *Donkey*

Kong (1981) uses girders and ladders to signal a construction site adventure. The Victorian mansions of both the haunted house overlay on the Magnavox Odyssey and Roberta and Ken Williams' *Mystery House* game speak to the ability of architecture to prepare the player for what they're going to encounter, just as *Castlevania* (1986) not only had "castle" in the name but crenelated battlements emblazoned on the cover of the game packaging. In gameplay, architecture plays a prominent role in setting players' expectations, with a closed door heightening worry and an open vista promising momentary relief. Architecture, because it's so familiar and freighted with long associations, can quickly and easily convey not only what the player can do but also what the player should do.

Figure 1.4.8 Giant Donkey Kong arcade game on display at The Strong National Museum of Play.

This last point also highlights the ways that architecture often acts as a facilitator of the play. At the most basic level, in early games like *Tank* or in early racing games like *Gran Trak 10*, architecture delimited the boundaries (the maze architecture of *Pac-Man* is more abstract but implied) and also provided internal obstacles to avoid or for projectiles to bounce off. Perhaps architecture's most important role in this way is how it disrupts lines of sight, promoting the play of hide-and-seek or chase. Most modern shooters are highly dependent on architecture to provide physical playgrounds that both afford certain actions (dodging, hiding, escaping) while also limiting others (chasing, firing, seeing). The presence of architecture enhances the play.

Finally, at times built environments are the focus of play. While common in games today like *Roblox*, *Minecraft*, and *Townscaper*, few early games gave players the opportunity to play architect. When they did, they generally fell into three categories: build, protect, and destroy. The arcade game *Rampart* (1990), for example, encompasses all three, as players must build their fortifications while protecting them from enemy assault by destroying the opposition ships that are firing cannons. Other early games focus more singularly on each of these elements. *Utopia* (1982) and *SimCity* emphasized constructing built elements, such as cities. Arcade games like *Missile Command* have as their primary purpose the defense of built structures, a secondary objective of the breakout hit *Space Invaders*, where the shields help ward off enemy shots. Lastly, games like Activision's *River Raid* (or the early game "Bomber" in Ahl's 101 BASIC Computer Games) are all about destroying architecture, in these cases while on bombing runs.

Architecture is common in videogames because it enhances the play, and therefore it is present to the extent it creates atmosphere, facilitates play, or provides a focus for the fun. Videogames, in the end, are not real life, and the richly rendered architecture on our screens today builds on what came before in the first games, whether that was the written description of a Sumerian storehouse, the plastic molding of a football stadium, or the simple line drawing of a Victorian mansion. These were the foundations of videogame architecture, the cornerstones of fun.

Notes

1. On traditional dollhouse play and links of that and other types of analog play to computer games, see Mary Flanagan, *Critical Play: Radical Game Design* (Cambridge, MA: The MIT Press, 2009), 17–62; Maaike Lauwaert, *The Place of Play: Toys and Digital Cultures* (Amsterdam: Amsterdam University Press, 2009), 71–106. On traditional building toys and play, see Tamar Zinguer, *Architecture in Play: Intimations of Modernism in Architectural Toys* (Charlottesville, VA: University of Virginia Press, 2015); Norman Brosterman, *Inventing Kindergarten* (New York: Harry N. Abrams, 1997); Amy F. Ogata, *Designing the Creative Child: Playthings and Places in Midcentury America* (Minneapolis, MN: University of Minnesota Press, 2013), 35–70. On digital games and architecture, Friederich von Borries, Steffen P. Walz, and Matthias Böttger, eds. *Space Time Play Computer Games, Architecture and Urbanism: The Next Level* (Basel, Switzerland: Birkhäuser Verlag AG, 2007).

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1.5

Architecture Manifesting Videogames Manifesting Architecture

A Cultural Artifact Loop

Vincent Hui

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Architecture as Icon

Architecture is an icon in videogames when it only serves as a veneer to contextualize players in a particular environment at a cursory visual level. The computational and graphic limitations of early videogame hardware relied upon iconic visuals to convey meaning and context as well as catalyze players' imaginations. From the Chinese architectural motifs in *Kung-Fu Master* to the cartoonishly oversized infrastructure in the original *Mario Bros*, these types of images only serve to establish a gameplay setting with minimal caricatures of their real-world counterparts. This process, especially in the early videogames of the 20th century, elucidates how architects' creations become iconic elements within the gaming realm, influencing aesthetics and narrative contexts of videogames with as few colors and pixels and as little computational power possible. Despite their challenges with technological limitations and general lack of architectural background, early videogame designers were charged with learning, if not developing, multiple tasks including play mechanics, interfaces, and game narrative.

Regardless of era, the most critical task for game designers is to make games accessible. This curation continues to rely upon a universality of architectural understanding from the conventional orthographic projection and iconography to the metaphysical challenges in conveying narrative sequence and expectation theory. That a player understands the sectional vantage point of a *Metroidvania* side-scroller without needing an explanation of peering beyond a building elevation or immediately understand the overhead view of traffic pitfalls in *Frogger* without a legend as to what a pixelated car looks like in plan is a testament to game designers' dexterity with a myriad of disciplines. The combination of architectural iconography of graphics and the oversimplification of simulation serve as a point of rendering game context and gameplay accessible. Ghost Town Games' *Overcooked* series is neither a cooking simulator nor a realistic simulation of the back of house conditions in a restaurant, yet the three-quarters view game uses iconic elements of architecture, avatars, and actions to transpose the hectic collaboration of food preparation through a range of conventional and fantastic contexts. The game appropriates architectural tropes to quickly convey context (Figure 1.5.1). Asian fonts, bamboo, and a yakiniku grill successfully and superficially contextualize players in a sushi restaurant whereas gothic windows and wrought iron gates transport them to an equally eerie and cliché world of ravenous vegetables.

Figure 1.5.1 The Overcooked Game series' adoption of cultural icons to contextualize gameplay.

As graphic fidelity within videogames increased, so did the architectural fidelity. Going beyond the generic architectural tropes of castles, skyscrapers, and pagodas for context, videogames designers have developed a greater appreciation for architecture in their virtual worlds. From Myers' portfolio of *Sims* games through to the saturation of Scarpa in 505 Game's *Control*, urban form and architectural design are respectively prevalent characteristics of these and a growing number of videogames (Figure 1.5.2).

Figure 1.5.2 Games such as Control adopts the aesthetics of Carlo Scarpa in order to not only present notions of 3D navigation of space but is instrumental in molding experiences (image courtesy of Darien Timur Mirzoev-Yakubov).

Architectural Fidelity

As the videogame industry matured, the role of architecture transcended iconography and became an increasingly engaged component of gameplay on account of the higher level of fidelity to the built environment. Architecture no longer served solely as a backdrop. Instead, it elicited players to interact with, if not explore, space as a component of gameplay.

Whereas videogames used generic icons and skylines for urban conditions, they have progressively used architectural elements as anchor points to contextualize players. The mere presence of Wright's Guggenheim or St. Patrick's Cathedral in the Spider-man game series automatically elicits immersion in New York. Similarly, the familiarity with more contemporary architectural works such as OMA's Seattle Library in the *Last of Us 2* not only acclimatizes the player in Seattle, but also reinforces the post-apocalyptic context given its condition in the game — overrun with plants and falling apart.

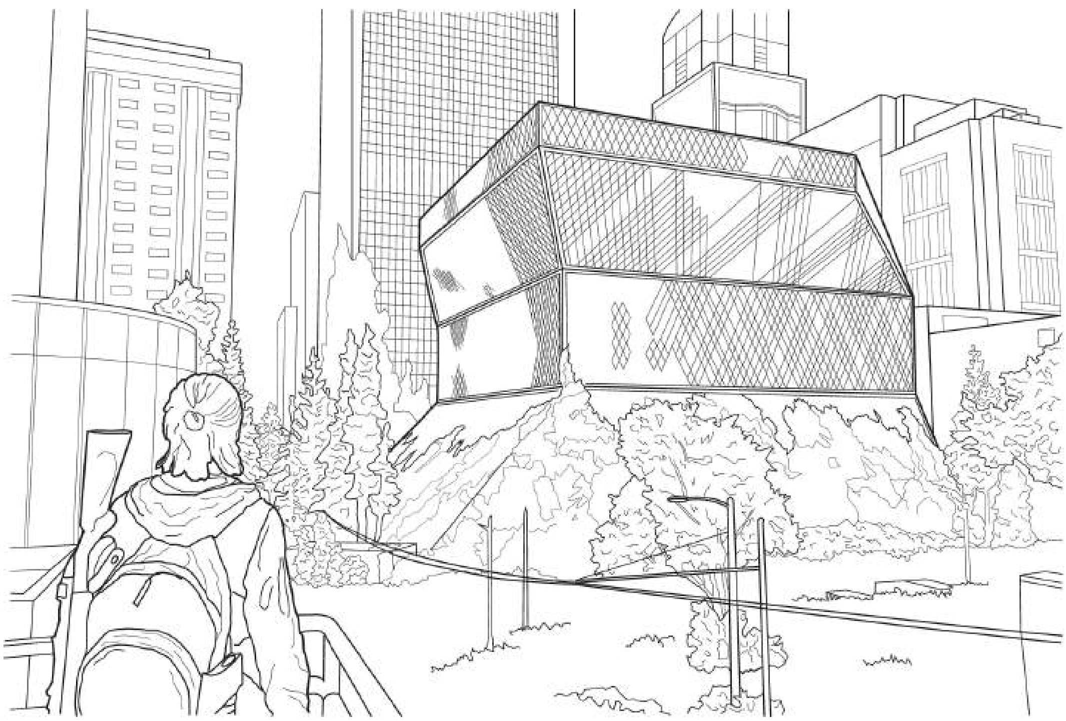

Figure 1.5.3 The library serves as an anchor point in the game (image courtesy of Justin Lieberman).

Figure 1.5.4 The Seattle Public Library serves as an icon that is reconstructed in the videogame (image courtesy of Remi Carreiro).

Game developers' aspirations for realistic and immersive environments mandated a high degree of fidelity by incorporating architectural elements. Architectural accuracy and attention to detail enhances gaming experience, fostering a deeper connection between the player and the virtual world.

The experience of navigating corridors in first-person shooters such as *MIDI Maze* (*Faceball 2000*) and *Doom* shifted the macrolevel awareness of corridors found in *Pac-Man* and *Lode Runner* to the experience of traversing with uncertainty in a virtual world. Though *MIDI Maze* may be a permutation of *Pac-Man*, its use of walls and perspective completely alter the game dynamics and experience. Increased technological capacity has paralleled the increase in architectural fidelity within videogames. The early iterations of Hideo Kojima's *Metal Gear* games on 8-bit consoles faced hardware limitations that precipitated a game prioritizing stealth and hiding over shooting enemies (Brusseaux, Courcier, and El Kanafi 2017). The game's protagonist, Snake, may be mobilized with various weapons but fundamentally relies upon walls, alcoves, and elevator shafts as architectural tools used to break enemies' line of sight. The use of the natural and built environment only becomes more pronounced in subsequent sequels. The ability to transpose real world architectural elements including HVAC, storage closets, and structure created both an increasingly immersive environment as well as a greater range of infiltrating and progressing in the game. This has served as a harbinger of the hyperrealism of architectural utility. Traversing the mechanical services along rooftops in *Mirror's Edge* or ducking behind concrete columns rationally organized in a structural grid in *Call of Duty* reflect this architectural fidelity as part of gameplay (Figure 1.5.5).

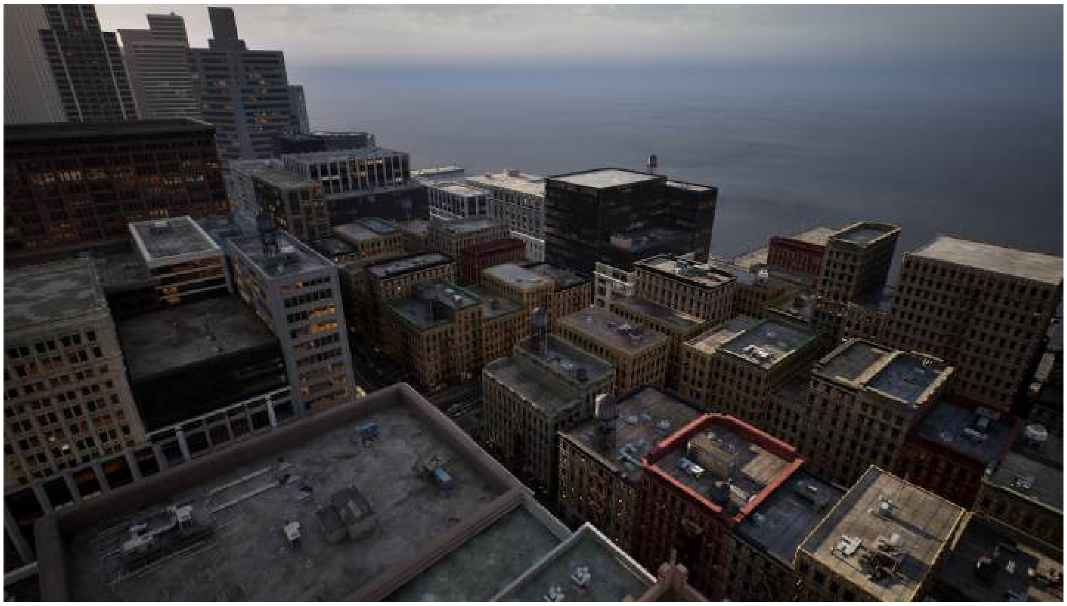

Figure 1.5.5 Increasingly detailed urban environments present an incredibly high level of detail on mundane elements ranging from HVAC units to radio antennae.

Whether conscious or not, these pioneering game designers used architectural tropes to reinforce gameplay and narratives. The fidelity of architectural sequence and narrative is constant regardless of photorealistic graphics. The navigation through different corridors or platforms ultimately culminating in a more expansive area for a "boss battle" draws upon the basic tenets of architectural compression and expansion of space. Traversing through the narrow corridors of *Boletaria* in the castles of *Demon's Souls* only to enter a larger volume elicits a tacit feeling of dread knowing that a key battle is imminent. When confronted between two paths, designers ensure that the primary path continues the narrative of the game whereas the secondary path would yield a reward or respite; dead end corridors tend not to happen as expectation theory mandates reward for invested effort.

The strides in architectural fidelity are not isolated to the virtually built environments of videogames. The simulation has extended to high fidelity immersion in a world and its characters. Though an entire subgenre of simulation games have arisen ranging from careers (*Farming* or *Surgeon Simulator*) and creatures (*Goat Simulator* and *Untitled Goose Game*) to more AEC–related (Architecture, Engineering, and Construction) occupations (*House Flipper* and *Cities: Skylines*), most successful games rely on a reductivism of tasks to highlight the unique excitement of the game environment while diminishing, if not outright removing, the mundane. Though players must constantly hunt and cook food in *Tears of the Kingdom* to maintain health or continuously craft weapons in *Cyberpunk 2077*, they are not confronted with the time constraints or skills required to eat or craft respectively. As fidelity to context and task are maintained, the reliance on iconography and simplification of actions maintain immersion free of banal minutia.

Videogames in Praxis

The principles and concepts of videogame design influence real-world architectural praxis. Architects draw inspiration from videogame aesthetics and spatial configurations, incorporating interactive and immersive elements into physical structures. This step establishes a bridge between the virtual and physical worlds, illustrating the impact of videogame design on architectural innovation. While at its foundations these are formal discourses, videogame design tools are instrumental in a myriad of implications on AEC praxis.

A key difference between architects and other designers is that their work must adhere to some dimension of feasibility in the physical world. Though the vast majority of architectural design is never built, inculcated in practitioners is the need to understand and communicate the nuances of its production. Failure to do so is conceptual illustration. Anything imagined can be modeled to an infinite degree of detail and rendered to an indistinguishable level of photorealism. The formal liberation afforded to architects with these tools has prompted a resurgence in visionary, speculative, paper architecture. The concept effectively is equivalent to the construct. Unfortunately, that which cannot be liberated from the screen is not constructible architecture. Mobilized with an incredible array of advanced modeling tools, parametric controls, and AI–powered iterative design engines, contemporary designers can manipulate form to emulate geometries of their favorite starchitect, generate relevant proforma content, automatically populate optimized structural and mechanical layouts, and even determine its localized economic, social, and environmental impacts. These same procedural tools are at the core of what has been adopted by the videogame industry for decades.

As digital simulation increases in complexity and realism, everything from daylighting simulation to predictive non-playable characters (NPCs) have become tacit components in both architectural and videogame disciplines. The digital tools and techniques behind establishing virtual architectural worlds in videogames are gaining traction in the design and manifestation of their real-world counterparts. Though modeling tools have become more robust and efficient, the AEC industry has witnessed an increasing demand for the adoption of heritage conservation practices including extensive preservation of existing building stock. Though 2D as-built documentation would have sufficed on AEC projects as late as the turn of the 21st century, the ubiquity of BIM and 3D scanning has resulted in higher fidelity models and more refined approaches to heritage architectural work. The 2019 fire of Notre Dame drew international attention to the high fidelity between *Assassin's Creed Unity's* painstaking documentation of its gameplay-focused digital twin and the memories of the iconic marvel.

LiDAR (Light Detection and Ranging), photogrammetric scanning, and advanced mesh tools have proven to be indispensable tools in contemporary AEC praxis for documenting high-fidelity existing conditions as base point for any architectural project.

In a similar vein, the visualization tools at architects' disposal have become more sophisticated on account of the advances in the videogame industry. The primitive, procedural infrastructure for simulating real-world physics including lighting, structure, heat and moisture movement, and even ambient air quality were limited, if not nonexistent, in the AEC industry prior to the research and development in the videogame industry. Both contemporary videogame and architecture disciplines relish in the advanced computational power behind real-time, ray-traced shading, ambient turbidity, and daylighting as well as tools to precisely simulate moisture movement and energy loss. In addition to the dynamic range of the simulation ambient environmental effects, contemporary architects are empowered with tools that can offer insights, options, and optimization strategies for structure. The same features in videogame engines used in architecture offices to streamline structure are increasingly inculcated in emergent architects while still in school (Figure 1.5.6).

Figure 1.5.6 Students are increasingly gaining mastery of digitla tools that enable them to succeed in the high demands of industry (image courtesy of Alvin Huang).

If the digital tools in creating videogames have become the foundations of simulating 3D qualities of an architectural design in its development, then the use of NPCs from videogame design into architectural praxis signals the integration of 4D occupation of a space over time. No longer the static background character, NPCs have increasingly become parametrically programmed. If NPCs in videogame series such as the *Grand Theft Auto* series have a multitude of responses based upon player interaction (from a drive-by shooting or an accidental bump) and environmental factors (NPCs behave differently based upon the time of day or ambient weather), then it would be possible to program NPCs in any architectural project to have both a series of parameters occupants would have to adhere to as well as conditional responses. As early as the end of the 20th century, software has been available to architects to simulate approximate behaviors of autonomous entities in a space, however once again, with the accessibility and robustness of videogame technologies, the advanced simulation possible with human behavior in a built project is astonishing, from Arup's use of *MassMotion* crowd and simulation software to determine successful egress of the public from an evacuation of transit hub to a proprietorship using NPC tools to convey density and use of a space to the general public. Combined with the onset of AI, the predictive precision of these digital ecosystems is quickly approaching the fidelity of layered complex networks in the real world.

Beyond computational capacities, videogame interface technologies have been gaining traction in architectural praxis. The AEC industry always evolves with technological shifts. The ubiquity of joysticks, controllers, and mouse and WASD keyboard interfaces has become a familiar means of both navigating architectural design presentations and developmental 3D modeling environments. The fidelity of architectural visualization accelerated from photorealism toward more interactive, engrossing interfaces including immersion facilities and mixed reality devices. Immersion facilities have mushroomed around the world's post-secondary institutions. Configured to extend the audience's perspective beyond a screen, these rooms utilize digital projections and controlled lighting and sound without the need for individuals to don head-mounted equipment (Figure 1.5.7). Though such a facility affords a high degree of accessibility and stakeholder engagement, the venue's success relies upon an alignment between design content and its physical configuration. For example, experiencing a design proposal for a large town square or cabin in a forest within a 6-meter diameter immersion lab would be far more successful in conveying spatial experience than a modest interior of a microhome.

Figure 1.5.7 A panorama view of students working on their design project in the immersion facility (image courtesy of Jake Levy).

More commonplace in both architecture and videogames is the adoption and use of mixed reality hardware. While the cost and size of these technologies have decreased steadily, the computational power and industry support has continued to increase. The same mixed reality tools that spurred the popularity of Niantic's *Pokémon GO* are now increasingly accessible to students and professionals in both visualization and fabrication workflows. The superimposition of design ideas in real-time at full scale serve to expand the frontiers of enhanced fidelity and accessibility in design development and communication. The combination of digital fidelity and real-time visualization with mixed reality tools are commonplace in architectural praxis. Even after the construction of an architectural work, there is a pervasive presence of videogame paradigms. While data-rich building information models with high-fidelity imagery may be instrumental for construction, sensors placed throughout the building to monitor energy loads, microclimate data, and activity among a myriad of variables effectively translate real-world data as updates to the digital model. More than a digital representation of the built world, this live digital twin serves as its avatar. From assisting in superimposing complex construction methods on an installation to receiving live data updates on a digital twin, digital tools are far more than high-fidelity representational devices, they are platforms critical to contemporary and future AEC production and operations.

Videogames to the Built World and Back Again

While it is clear that many advances in the gaming industry have raised the fidelity, efficiency, and quality of production in the AEC, the symbiotic relationship between the two industries yields a remarkable depth in how the built environment has begun to emulate the possibilities conjectured in videogame worlds. The convincing impossibilities of videogames have slowly crept into architectural practice. While theme parks (such as Super Nintendo World) are the most overt and profane examples, there are many more pervasive instances where the worlds of *Halo* and *Cyberpunk 2077* are seeping into the built world. The architects of the early 21st century were not only steeped in postmodernism, deconstructivism, and parametricism, but also immersed in the fanciful Mushroom Kingdom, the megalopolis of Night City, and the satire of *Vice City*. These are emergent based upon a combination of a) the tools of production, b) the designer's POV, c) the designer's conditioning with gaming tropes, and d) the direct influence of gaming precedents. Before elaborating on these points, it is important to note that progressive designers have been proposing, developing, and executing architectural works without videogame technologies. The contention here is that videogames as a medium and the technologies in their production and engagement have accelerated and opened up new directions in architectural design praxis.

Advancements in digital technology have revolutionized architectural practice, providing architects with powerful tools for design visualization and simulation. Software originally developed for the gaming industry, such as 3D modeling engines and mixed-reality platforms, has become indispensable in architectural production. Architects leverage these tools to explore complex geometries, simulate spatial experiences, and communicate design concepts effectively. The convergence of architectural and gaming technologies blurs the distinction between virtual and physical environments, enabling architects to experiment with novel design strategies inspired by the immersive nature of videogames. The blobitecture or parametricism behind many famous architects of the 21st century would not be possible were it not for the technologies in the gaming sphere for their production and simulation.

Architects' perspectives evolved alongside their exposure to videogames, leading to a more immersive and experiential approach to design. Snøhetta

+ Zeidler Partnership Architects' Student Learning Centre at Toronto Metropolitan University highlights this. The arrangement of the levels in the building is based upon the different learning modes and environments students engage in ranging from "The Sky" collaborative study space at the top level through to "The Valley" amphitheater at the bottom with levels named "The Bluff," "The Forest," and "The Beach" among the thematically designed levels in between. Taking the elevator amounts to passing a stage in a videogame where one literally enters a completely new level with each floor.

Architects began incorporating game tropes into their designs, embracing concepts like interactivity and narrative-driven experiences. The design of Jean Novel's National Museum of Qatar features a series of interconnected galleries that unfold like a narrative, immersing visitors in the history of Qatar. This approach draws parallels with the nonlinear storytelling prevalent in videogames such as *Skyrim* or *The Witcher*, where players explore diverse narratives and environments at their own pace (Figure 1.5.8).

Figure 1.5.8 Open world games provide users a myriad of choices to navigate space, side quests, and narrative sequences in a non-linear manner both in form and in choice (image courtesy of Thoreau Bakker based upon model work by Denis Rutkovsky).

Videogame aesthetics and environments directly influenced architectural projects, inspiring novel design solutions and spatial experiences. Some striking examples would be in the portfolio of architectural work emergent in Saudia Arabia, most notably The Line. Though the notions of a hyperdense urban nexus has been envisioned by the likes of Yona Friedman and Superstudio and projected in cinema such as *Blade Runner* and the *Fifth Element*, it is the degree of engagement and detail found in videogames that make for a plausible future. The urban conditions conjectured in games from *Megaman* to *Final Fantasy VII* present dimensions that have become so commonplace they are found, if not expected, in forward-thinking architecture. From the bold, iconic formalist approach to buildings to the pervasive use of artificial accent lighting, these real-world tropes in architecture reflect design aspirations found in games projected decades earlier (Figure 1.5.9).

Figure 1.5.9 The extensive use of accent lighting in “futuristic” architectural contexts has transcended videogame environments. It is now prevalent in many contemporary architectural projects (image courtesy of Thoreau Bakker based upon model work by Kyrylo Sibiriakov).

The final step of the cycle examines how the built environment, inspired by videogames, feeds back into the gaming sphere and back again. This is a territory that is only emergent now. If projects such as OMA’s proposal for the Dubai Death Star has vestiges of George Lucas’ vision of a city in a small moon, then its resonance transcends into other media including architecture. Whereas cinema tends to have an audience engagement of a couple of hours, videogames can have play times in the dozens of hours if not indefinite play for competitive games. The exposure to novel ideas on the built environment is not only more vivid in videogames, but on account of their audience’s interaction with and exploration of these new environments, emerging designers have developed a more robust perspective, expectation, awareness, and imagination on the future of the built world.

Design is a function of storytelling. The more robust the tools, the more comprehensive, complex, and most importantly, convincing an idea may be. Whether as a suite of tools to exaggerate the commonplace or to speculate upon extreme futures, the skills and tools shared between architects and videogame designers are critical in creating, remixing, and evolving cultural artifacts (Figures 1.5.10 and 1.5.11).

Figure 1.5.10 The use of videogame technologies can be effective at developing exaggerations in the current built environment (image courtesy of Ren Wang).

Figure 1.5.11 A minimual apartment layered with technology to sustain life in a single room (image courtesy of Ren Wang).

This chapter scrutinizes two cultural artifacts, architecture and videogames, that may be opposites yet share a commonality in their ability to draw from other media and synthesize them into navigable, interactive worlds. It presents instances where architectural innovations, originating from the physical world, find their way into videogames and how these videogames serve as a catalyst for innovations in architecture (Figures 1.5.12 and 1.5.13). This reciprocal relationship creates a continuous loop of inspiration, where the boundaries between the digital and physical realms blur, ultimately shaping the evolution of both architecture and videogame design. The architects of the 21st century navigated a landscape shaped by both architectural tradition and digital innovation, drawing inspiration from the fantastical realms of videogames. Through the convergence of tools, perspectives, tropes, and precedents, architects pushed the boundaries of design, creating spaces that blur the line between reality and imagination.

[Figure 1.5.12 A photo of the Getty Museum in Los Angeles (image courtesy of Ryan Scavnicky).]()

Figure 1.5.13 A translation of the iconic museum in a Grand Theft Auto game (image courtesy of Jake Levy).

Work Cited

Brusseaux, Denis, Nicolas Courcier, and Mehdi El Kanafi. 2017. *Metal Gear Solid: A cult work by Hideo Kojima*. Toulouse: 3rd ed.

1.6

Newest Basilica of Guadalupe

Andres Souto

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This project utilized the SketchUp warehouse as a site for finding the historical regional architecture as modeled by a variety of authors known only through their usernames. These modeled cultural artifacts of virtual information were then remixed and repurposed to form the Newest Basilica of Guadalupe, which carries themes discussed heavily throughout this volume. The project is made of virtual artifacts with grassroots cultural authorship and historical data all tied into highly contemporary digital experiences, including the media output of a YouTube video called *El Grand Tour*.

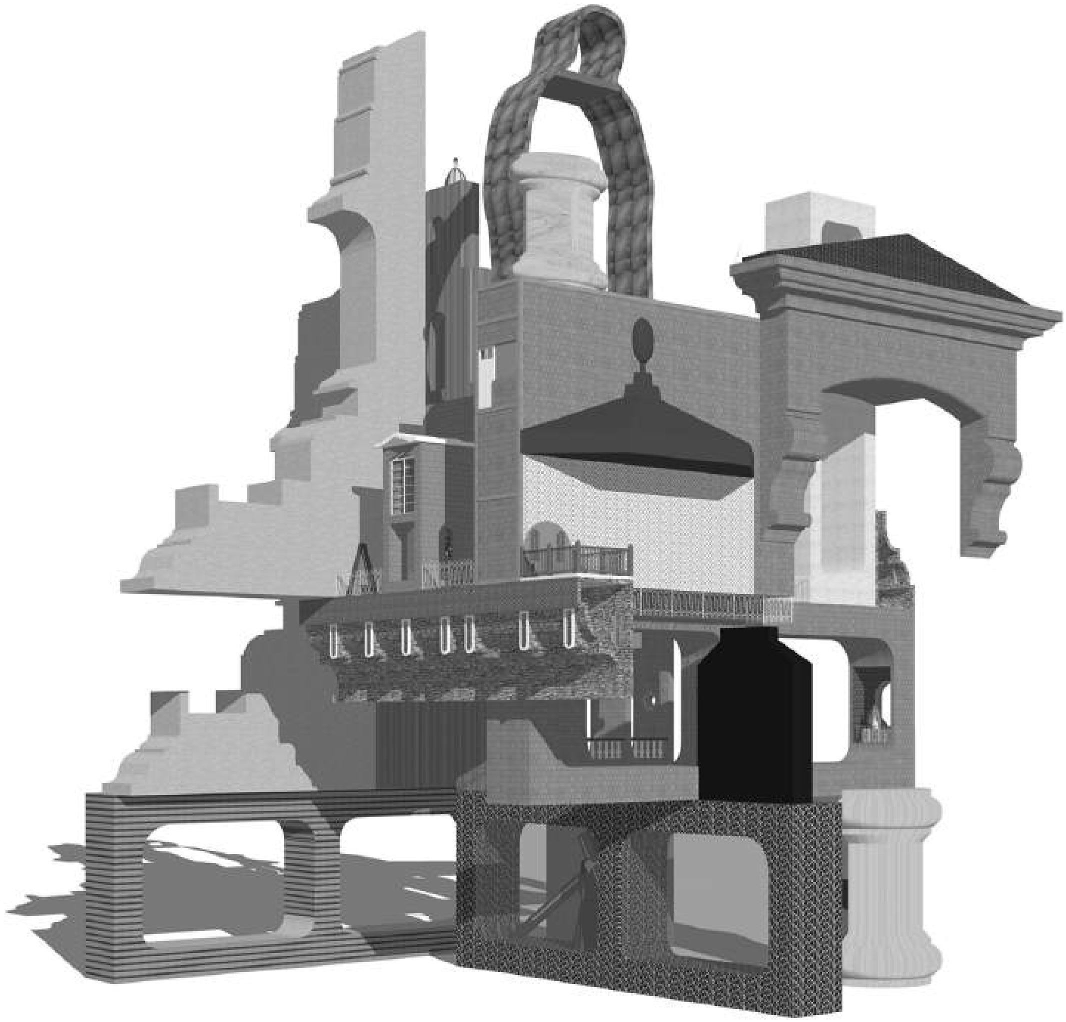

Figure 1.6.1 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

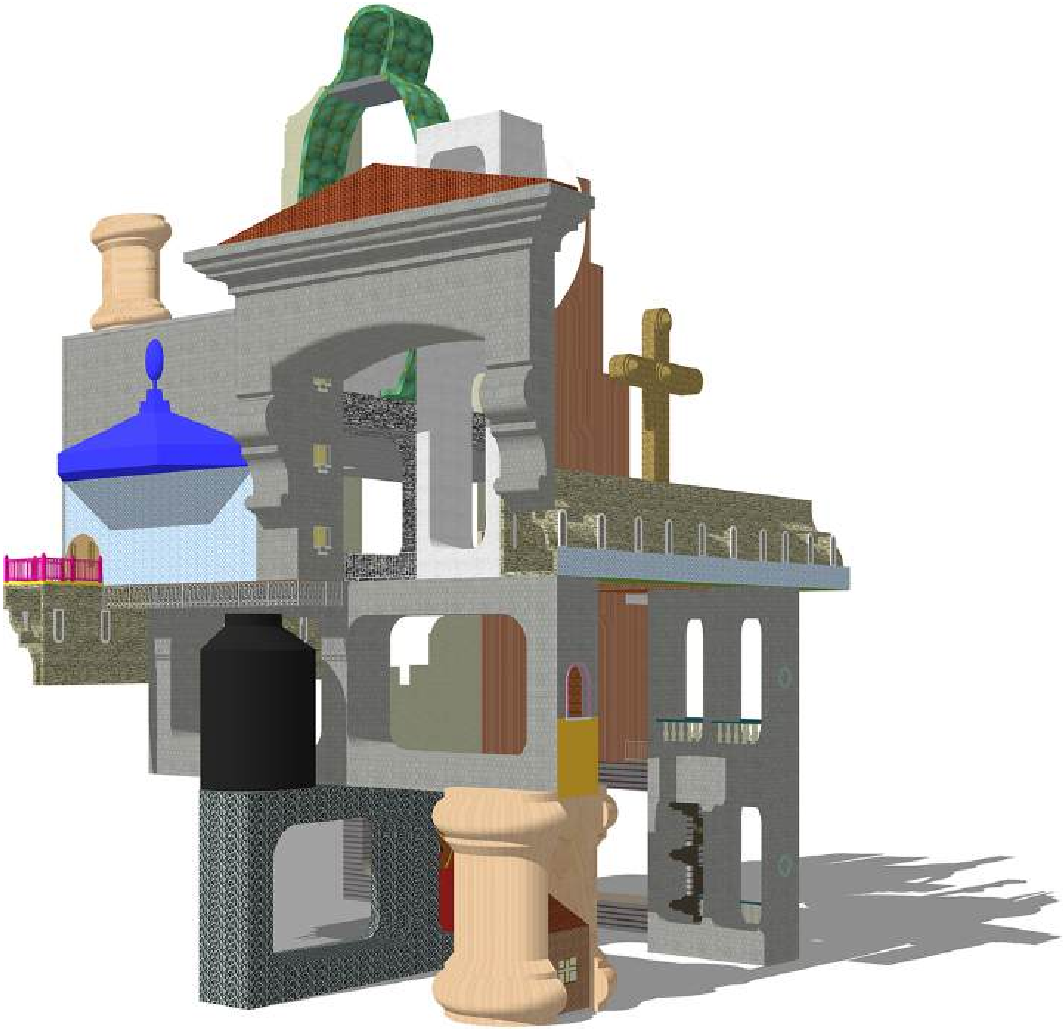

Figure 1.6.2 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

Figure 1.6.3 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

Figure 1.6.4 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

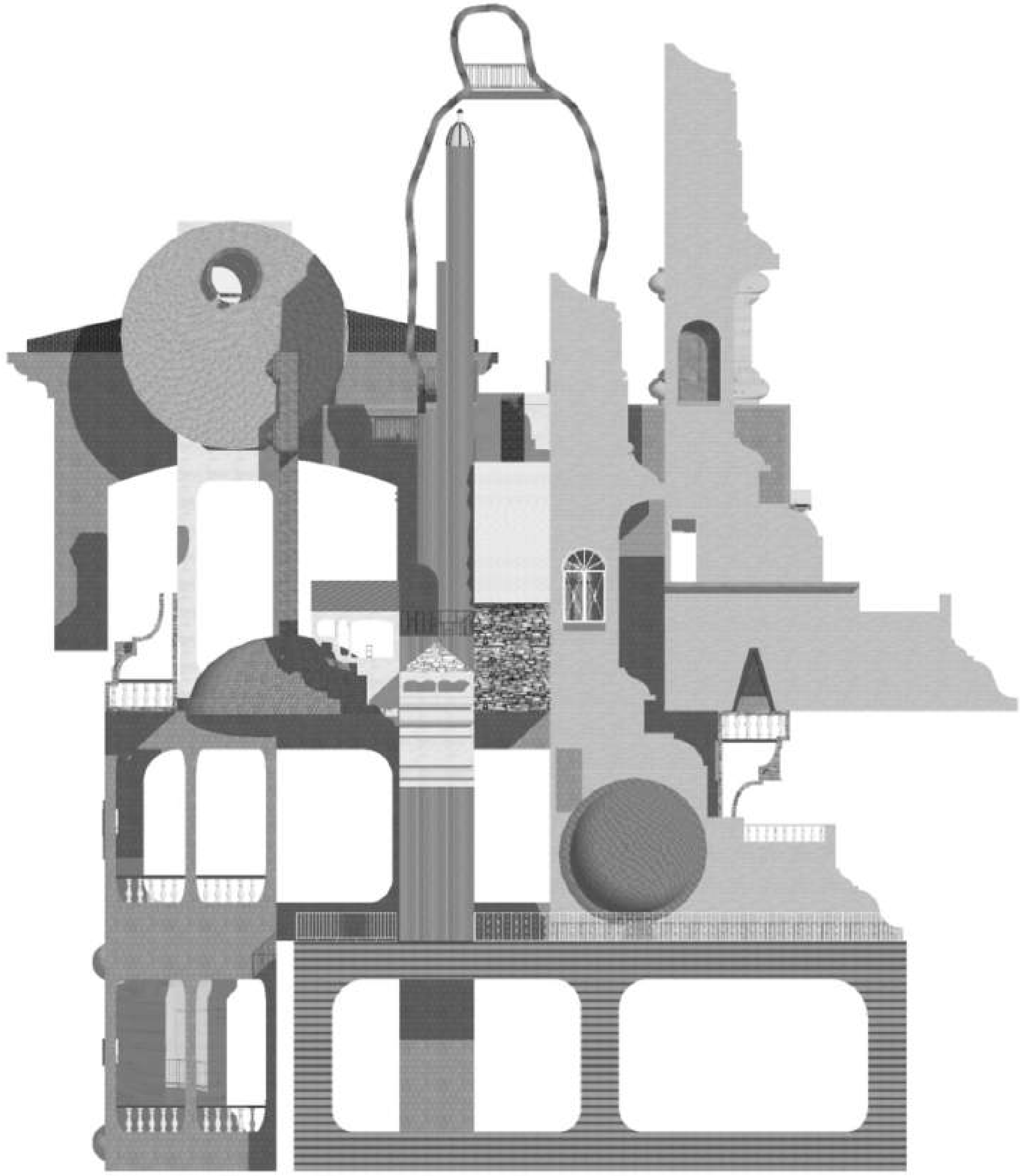

Figure 1.6.5 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

Figure 1.6.6 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

Chapter 2
Historic Reproduction

This chapter delves into the intricate process of reconstructing past environments in videogames, examining the challenges and interdisciplinary efforts involved in recreating historical settings for heritage, education, and entertainment purposes. Focusing on the reconstruction of a 16th-century Iroquoian longhouse, the chapter explores the quest for visual precision amid limited historical resources, drawing insights from scholarly research and excavation findings. Leveraging digital tools like point cloud scans and photogrammetry, the author navigates heritage architecture workflows to integrate these technologies for conservation and commemoration. This convergence with gaming technology highlights opportunities for participatory storytelling and digital preservation, facilitating a bridge between traditional cultural memorialization practices and contemporary technological advancements. Through this investigation, the chapter sheds light on the evolving landscape of heritage preservation, emphasizing the dynamic intersections between technology, storytelling, and remembrance in videogame reconstruction efforts.

2.1
Visualizing the Indigenous Architectural Past through Virtual Reality and Gaming

Kristian Howald, Michael Carter and Namir Ahmed

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Introduction

This research is made possible by the generous contribution and mentorship of the Huron-Wendat Nation. It is informed and guided by their principles, and we are grateful for their support and guidance. We would also like to thank e-Campus Ontario for their generous support.

Visualization in archaeology and cultural heritage has traditionally taken the form of flat conceptual renderings and written texts. The combination of digital media and conventional archaeological methods has ushered in a transformative era, allowing for unprecedented interaction with historical and archaeological records. Virtual reality (VR) and advanced gaming technologies have allowed communities to immerse themselves in their heritage, experience the scale and size of historically significant architecture, and potentially glimpse the past lives of their ancestor’s everyday activities.

The Huron-Wendat Nation of what is now called Southern Ontario and Quebec in Canada offers a unique window into the indigenous built heritage of pre-contact North America. Any close examination of Huron-Wendat longhouse architecture is primarily made from the perspective of function. How was a longhouse *used*, rather than how was it *built*?

Central to the Huron-Wendat Nation's cultural identity, the archaeological record of longhouses is evidence of their architectural ingenuity and deep-rooted connection to the land. Exploring these structures and the people within them requires more than just historical records; it calls for an innovative integration of technology, research, and collaborative descendent community expertise.

This chapter explores this by delving into the evolution of Longhouse 5.0, a virtual reality recreation of the pre-contact 14th-century Huron-Wendat city of Jean-Baptiste Lainé. Drawing on detailed archaeological findings, collaborative efforts with the Huron-Wendat Nation, and VR technology, *Longhouse 5.0* offers an immersive journey into the heart of the Huron-Wendat legacy.

History of Visualization in Archaeology

The intersection of digital technology and cultural heritage comes at a pivotal time for preserving, exploring, and disseminating historical narratives; where cultural heritage visualization has begun to explore in earnest 3D recreations and immersive virtual reality environments. Understanding the evolution of visualization from 2D to 3D provides the foundational context that has made projects like *Longhouse 5.0* possible.

The concept of "virtual archaeology" was introduced by archaeologist Paul Reilly, a researcher at IBM's UK Scientific Centre, in the early 1990s. Reilly's pioneering work laid the foundation for using 3D terrain models as invaluable tools. These models enabled rapid hypothesis testing, provided a platform for critical thinking, and were used to indicate missing data (Reilly 1991). Reilly also emphasized the importance of involving 3D artists in the reconstruction process, advocating for a multidisciplinary approach to archaeological visualization (Reilly 1989).

Despite Reilly's work, the archaeological community initially hesitated to embrace his ideas and processes. Reilly attributes this reluctance to a need for familiarity with digital tools and the perceived complexity and specialized knowledge required to operate them. The high costs of this further deterred their adoption (Reilly 2015b). The mid-1990s marked a turning point. Advances in software development and more affordable computing began democratizing access to equipment. Digital artists were now able to contribute their skills to a variety of fields, including archaeology. This marked a move from technical specialization to a more craftsman-like approach (Reilly 2015a).

Virtual archaeology and the visual interpretation of archaeological data continued to be academia-driven well into the 2000s. In 2009, global videogame maker Ubisoft released *Assassin's Creed II* and had an immediate influence on the public's perception of archaeology and history. By 2017, with *Assassin's Creed: Origins*, the franchise became known for its attention to historical detail, employing in-house historians and working with well-known archaeologists like Jean-Claude Golvin (Nielsen 2017). The widespread public appeal of this series not only made cultural heritage accessible to a new generation but has forced archaeologists to reexamine their own roles and methods of telling historical narratives.

Tracing the Origins of the Longhouse Project:

From Longhouse 1.0 to 4.0

The Longhouse Project (2017), initiated by Dr. William Michael Carter, represents a process of iterative learning and technological adoption. It aims to visualize archaeological data through modern 3D–based processes and meaningful descendant community engagement. Five iterations were produced, starting with an initial prototype in 2012 and ending with the latest complete version in 2022. Longhouse projects 1.0 to 4.0 laid the groundwork for understanding the architecture and structure of Huron-Wendat longhouses. These iterations employed a range of digital tools, refining our representation of longhouses over time and setting the stage for the more comprehensive *Longhouse 5.0*.

Pulling heavily from the CGI industry, *Longhouse1.0* experimented with various digitization techniques, including direct 3D scanning and reference-based 3D modeling using Autodesk Maya. Direct 3D–scanned objects were pulled wholesale into the 3D visualized environment, in this case, The Lawson Site in London, Ontario. Longhouse projects 1.0–3.0 were directly affiliated with Sustainable Archaeology (SA), a digitization and cultural heritage facility located on the ancestral lands of the Neutral Nation and housed within Western University and the Museum of Ontario Archaeology.

Using the Unreal game engine and the first Oculus DK1 virtual reality headset, *Longhouse 3.0* became an immersive virtual reality experience. Likely one of the first of its kind in North America, this initial experience demonstrated the value of virtual reality as an interpretive and communicative tool. During “playtest” sessions, Indigenous community leaders and archaeologists now had an environment to interpret and explore in tandem with the beginnings of a shared language, as the position of hearths was debated from the perspective of the historical record and Indigenous ways of knowing. With this initial positive outcome, the

Longhouse project focused on further explorations of the immersive experience and a more historically reflexive depiction of the longhouse and its surrounding environment.

Every aspect of the longhouse reconstruction underwent thorough scrutiny and experimentation within the context of 3D modeling. This included traditional indigenous pole-cutting techniques, the selection of cordage for lashings, and even the decision of whether bark was retained or removed from the framing poles. Indigenous and non-Indigenous cultural and historical specialists were consulted. Still, the endeavor remained anchored in the individual perception of the 3D artist and interpretation of the archaeological dataset.

Reconstructing a precise representation of a pre-contact 14th–century Iroquoian longhouse is fraught with challenges arising from the need for visual depictions and the uncertainties surrounding oral and written historical accounts. At key points throughout all five *Longhouse* projects, the team reflected on what balance they hoped to strike between accuracy and visualization. Does accuracy necessitate the inclusion of every aspect of an indigenous locale? Should digital representations of ancient peoples be included? What should and shouldn't be seen by non-Indigenous participants?

Ultimately, the act of archaeological visualization is purely interpretive. Gaps in the historical record are filled by subject experts who bring their own experiences and bodies of knowledge to bear, whether appropriate or not. In the case of *Longhouses* 1–4, the focus was solely on built heritage and the environment, leaving the issue of the digital representation of Indigenous communities aside until those stories could be told by the descendants themselves.

The Archaeological Foundations of a Digital Longhouse

A pragmatic eclecticism guided the selection of cultural and historical elements or perspectives, shaping the contours of the digital longhouse's mental visualization (see Preucel & Mrozowski 2010; Trigger 1991, 2006). Anthropological theorist Tim Ingold's conceptualization of "making" influenced this process, which emphasizes the construction of knowledge through the harmonious interplay of skill, tools, and context (Ingold 2011). This theoretical foundation has been instrumental in the intricate process of meaning-making within virtual environments.

Research encompassing 417-plus excavations within southwestern Ontario, Canada, over a 30-year excavation process, has yielded a comprehensive set of architectural attributes that defined the characteristics of Late Woodland Northern Iroquoian longhouses (see Dodd 1984). These features included average dimensions of approximately 18 m in length and 7.6 m in width, with a central corridor spanning 4.0 m across. Sleeping platforms varied in dimensions, with widths ranging from 1.1 to 1.8 m, lengths from 3.7 to 4 m, and heights between 1.8 and 2 m. These platforms were positioned 0.30 to 1.5 m above the ground and often feature an elevated secondary bunk, approximately 1.8 to 3 m above the ground, providing around 1.5 m of space between bunks for personal storage with interior support posts averaging between 8.6 and 12 cm in diameter, playing a crucial role in structural integrity (see Anderson 2009; Birch & Williamson 2013; Creese 2012a, 2012b, 2013; Cooper & Robertson 1993; Kapches 1990, 1993; Lennox 1981; Snow 1997; Varley & Cannon 1994; Williams-Shuker & Allen 1998; Williamson 1998, 2004; Wright 1974, 1995).

In contrast, exterior wall posts, predominantly under 10 cm in diameter, occurred at an average rate of 3.5 poles per meter along the length of the structure (see Dodd 1984; Williamson 2004). Archaeological evidence suggests that fire hearths were spaced at intervals of 2.9 to 3.6 m, with the common assumption that each hearth served two families positioned on opposing sides of the longhouse (see Fecteau, 1979; Varley & Cannon 1994). Four support posts defined the area around each hearth. The roofing material consisted of elm bark shingles measuring approximately 2 m in height and 1 m in width. Modern experimentation reveals an average smoke layer height of 1.2 m above the ground (see Fecteau 1979).

Yet, It remains crucial to acknowledge that the archaeological evidence itself does not provide explicit visual cues beyond the soil line. This compels us as archaeologists to construct visual significance both in the field and during the post-excavation analysis, a process that is inherently reflective and interpretive.

Longhouse 1.0 explored if it was possible to make a VR re-creation, given the limitations of the available tools. *Longhouse 2.0* and *3.0* sought to answer the question, can we create an *archaeologically sound* virtual recreation? This required a straightforward restart and the rebuilding of all digital assets. With each iteration, new visual, auditory, and sensory elements, informed by our Indigenous communities, were added. Elements such as a more accurate longhouse interior and environment complete with a tree canopy, vegetation, and a river feature enhanced the immersive experience in a more wholesome and grounded approach. Multiple longhouses were replaced by a single special-purpose structure located outside the palisade. This starkly contrasted the blank landscape of *Longhouse 3.0* and directly added to the immersion of the experience. The dramatic lighting effects the Unreal Engine was proficient at needed to be improved in the initial virtual reconstructions. The Unreal Engine's ability to display light scattering, soft shadows, and a bright overhead sun added significantly to a feeling of not just reality but warmth.

At the request of the town of Whitchurch-Stouffville, located just north of Toronto, Canada, and the Huron-Wendat Nation, the ancestral keepers of land in the eastern part of Ontario and Quebec, a new iteration of a virtual longhouse was developed. The team experimented with phenomenological immersion outside of a digital environment using recent archaeological data from the massive 200-longhouse Huron-Wendat Nation Jean-Baptiste Lainé pre-contact city.

A physically constructed scaled version of a longhouse vestibule opening cross-section with nontraditional materials enveloped the visitor. At the same time, they engaged with a 2D digital reconstruction of a longhouse representative of the Jean-Baptiste Lainé site. The core of *Longhouse 4.0*'s immersion was not a digital 360 environment but rather a phenomenological one based on the sight and feel of a tangible structure inside which the simulation was physically placed. As they explored, users would smell tobacco and sweetgrass and feel the longhouse roof above them and the walls beside them, moving the experience beyond sight and sound. A 2D flat-screen version of the Longhouse Experience was placed inside, where visitors explored the virtual environment using standard game controllers, providing a digital and physical experience. Additionally, *Longhouse 4.0* introduced global illumination to the interior of the virtual structure. This was achieved with prebaked texture maps that included bounced light information, creating a more realistic experience.

Figure 2.1.1 This image starkly illustrates the advancement in lighting between Longhouse 3.0 and 4.0. Incorporating global illumination (GI) created realistic bounce lighting and occluded shadows, producing a greater sense of volume and believability.

Despite the positive feedback *Longhouse 4.0* received and our best efforts, patron feedback was clear: the simulation lacked something vital. It felt static, empty, and abandoned. Architecture, digital or analog, Indigenous or otherwise, is meaningless without inhabitants.

So where were the people?

Bridging Indigenous Architecture and Virtual Reality

Longhouse 5.0 represented a significant leap forward. Game engines, like Unreal, were becoming increasingly capable, allowing artists to create expansive environments. This allowed us to create an entire village and the surrounding agricultural landscape. Paramount to this iteration was the inclusion of people. The longhouses were the social nucleus of the village (see Creese 2012a; Hayden 1977; Heidenreich 1972; Kapches 1993, 1990; O'Gorman 2010; Snow 1997; Steckley 1987; Trigger 1977; Warrick 1984, 1996; Watts 2009; Williamson 2004; Wright 1995), often oriented east to west to maximize sunlight and minimize wind exposure. Spaced at 2.9 to 3.6-metre intervals, fire hearths were more than functional necessities; they were communal spaces where stories were told, meals were shared, and traditions were passed down. The viewer could now experience this connection between the people and their surroundings.

Consultation with subject experts and archaeologists revealed the lack of literature around the entire lifecycle of a longhouse specifically post occupation. As part of *Longhouse 5.0* we had the opportunity to work with structural experts to imagine and visualize a longhouse in degradation. This was included as an explorable location within the simulation.

Figure 2.1.2 Longhouse model simulating post resettlement conditions (image courtesy of Vivian Kinuthia).

The VR component of *Longhouse 5.0* increased user interactivity and immersion. Participants could walk through and inspect the internal features of the longhouses, such as fire hearths, sleeping platforms, and storage bunks. Users could experience the average smoke layer height of 4 feet above the ground, a detail derived from modern experimentation, made safe through digital recreation (see Fecteau 1979). Returning to a VR experience allowed the viewer to explore the longhouses in their historically accurate dimensions, materials, and orientations in recent archaeological excavations.

Collaborative Research and Indigenous Stakeholder Consultation

Longhouse 5.0's genesis was marked by a collaborative development process that brought together artists, researchers, students, and indigenous stakeholders. This inclusive approach grounded in a meaningful partnership facilitated a comprehensive understanding of the Huron-Wendat culture and lifestyle. The guidance and insights from the Huron-Wendat nation were pivotal in ensuring the project's fidelity. Archival sources, oral traditions, archaeological data, and ethnographic records were collected and extensively used during this phase, forging a bridge between the project's technical team and our Indigenous partners built on inclusivity and respect. The team wrestled with the notion of authenticity and what might have been the personal preferences of Indigenous builders. The team felt uncomfortable experimenting with variations on the *Longhouse* that needed to be explicitly described in the source material. This should be left to the Indigenous CG artists themselves.

Though longhouse construction is described and depicted in several sources, including *The Jesuit Relations* (Thwaites 1896-1901) and the Oral Traditions of the Indigenous community, significant gaps exist. We have little information about planning and construction processes — longhouses were viewed through the cultural filter of colonial explorers with inherent bias — and not as evidence of complex Indigenous technology. Within the context of the School of Architecture, Toronto Metropolitan University's studio class, the *Longhouse* simulation sought to push back against this implied belief by providing the tools for analysis through an architectural lens. Additionally, partnerships with Sheridan College's computer animation program, considered one of the best in the world, helped further enhance the technical and artistic capability of the next iteration of the virtual *Longhouse* series.

Longhouse 5.0's development leveraged CG industry-standard 3D software to model built heritage at Jean-Baptiste Lainé. Given this site's large number of longhouse variations, creating a new model for each was potentially overwhelming. SideFx Software's Houdini, a powerful node-based application used in cinema and videogames, was used to generate and randomize the longhouse procedurally. Tools developed explicitly for this project allowed the team to adjust longhouse dimensions utilizing a range of initial settings corresponding to actual longhouse sizes. This procedural approach allowed us to create as many unique longhouses as needed. From this approach, five hero longhouses of varying sizes were created.

However, the process had its challenges. Incorporating rounded vestibules into the design proved to be a considerable challenge. The task of fitting rectangular shapes onto curved forms resembled the difficulty cartographers face when projecting the Earth's surface onto a flat map. The Sheridan College team developed an innovative approach by dividing each quadrant into sections of parallel "ribs." This method offered a practical way to organize the exterior bark sheets that make up the woven outer walls of the longhouse. Procedural modeling workflows can more easily arrange multiple instances of a 3D object if a regular pattern is followed or a completely random one. Bark shingles on the exterior of a longhouse are a complicated combination of both. Initial renderings were, at times, too patterned or too chaotic. Based on data from oral histories and experiments in physical longhouse construction, bark shingles were replaced frequently and though initially systematically applied, the constant maintenance process would have made each longhouse unique. This proved challenging to reproduce digitally. Finally, an acceptable balance was achieved through a long process of trial and error.

The elaborateness of the longhouses extended to their internal structures. Similar procedural techniques played a pivotal role in defining the layout of these structures, allowing for customization in terms of height, sections, and overall arrangement. The arrangement of upright poles to create the framework unveiled an economy of construction evident in Indigenous engineering. Ultimately, the development team created five hero Longhouses that closely matched the majority of dwellings at Jean-Baptiste Lainé. Sizes within the Unreal Engine adjusted slightly to correspond to the archaeological excavation map.

Figure 2.1.3 A view of the center of the village. Also seen in the middle of this image is an interactive stone. A viewer can click on this element to discover additional contextual information about the setting.

Virtual Reality Hardware

The Oculus Quest 2, rebranded recently as the Meta Quest 2, was initially chosen for *Longhouse 5.0*. Its wireless design and user-friendly operation were ideal for classroom settings, allowing for quick setup and ease of use by students and educators. Another consideration for this device was its affordability, as it could fit within the budget constraints of educational institutions, facilitating the integration of VR technology into learning environments. We initially thought the Quest 2's capabilities would be sufficient for what we had planned to achieve. There were some inherent constraints when using VR. A framerate of 90fps, 45 frames per second per eye, should be achieved to immerse the viewer fully. Dipping below this value increases latency, which can contribute to VR sickness. To accomplish this, Quest 2 requires the poly count, the number of polygonal faces loaded at any given time, to be kept below 300,000 polygons per scene. A 3D reconstructed village, surrounded by forests and agricultural lands and inhabited by people, pushed the limits of this poly-count.

The constraints of the Oculus Quest 2 prompted a creative departure from textural photorealism in favor of a non-photorealistic style reminiscent of Studio Ghibli's impressionism. This pivot leveraged the strengths of Quest 2, focusing on accentuating shapes, colors, and stylized forms and allowed significantly reduced texture sizes, reducing the overall memory used by the simulation. Despite these artistic adaptations, the complexity of *Longhouse 5.0*'s design, with its detailed structures, agricultural fields and surrounding environment, ultimately necessitated a level of graphic fidelity that exceeded the standalone headset's capabilities. This led to the critical decision to transition to a tethered VR system, harnessing external computational power to surmount the hardware constraints and fulfil the project's user experience requirements. Though this decision allowed us 'breathing room' in terms of our geometry limit, significantly increasing it from 300,000 to close to 1 million, we were still forced to design for efficiency, given the number of objects in the overall scene, including grass, corn stalks, and leaved trees — which in total numbered in the thousands. In retrospect, we likely should have separated the experience into multiple levels, allowing each to load separately when accessed by the user. Currently, the only example of this is the interior longhouse scene.

The caveat is the always-increasing processing power of desktop machines and VR headsets. Future versions of the Meta Quest, including the current Quest Pro and Quest 3, will be able to run the *Longhouse 5.0* simulation untethered and at a much higher processing rate. Ultimately, we decided to accept current processing limitations and to design for systems 1– 2 years ahead.

Texturing

Texturing is adding surface attributes to 3D models as two-dimensional overlaid maps. This describes various information, including color, roughness, metalness, occluded shadows, and normal mapping, all of which are fundamental to the final user experience. For *Longhouse 5.0*, we created high-resolution models for most objects using Maxon Zbrush and Autodesk Maya, each in millions of polygons. These models were re-topologized, reducing the number of polygons that a model might have to a VR–friendly size ranging from 50 to 1000. The high-resolution detail was then baked into these lower-resolution models, giving them the appearance of having more fidelity than they possessed. The impressionistic art style employed gave us latitude in the accuracy of object textures, making the use of procedural workflows possible within Adobe Substance Painter. This allowed us to texture large numbers of models within a compressed period of time. The final stage of this process involved connecting the textures to 3D models within the Unreal environment.

Environment

Efforts were made to accurately represent Jean-Baptiste Lainé and its surrounding land, which is now located in the Whitchurch-Stoufille area. We initially considered a 5 km × 9 km area, but this scale was too expansive and would be an impractically large area for viewers to explore. We focused on detailing a more manageable 2 km × 2 km area. Obtaining historically correct elevations was the next challenge. We acquired temperature-based height maps that provided the approximate sea-level elevation. These maps were converted to grayscale for height information in the world-building software Gaea. This software by Quadspinner can procedurally add in natural forming erosion leading to the defined waterways. The footprint of Jean-Baptiste Lainé was overlayed to ensure the final scale and details were correct.

The final 2 km × 2 km map was imported into Maya to create a village template, which was then transferred to Unreal Engine. To help maximize performance, we used distance-based level of detail adjustments. The 1 px = 1-meter scale facilitated alignment in Unreal, with final adjustments bringing the scale to 99.5 in X and Y directions and a height value of 16. Substance Alchemist was utilized to generate a set of tile-able textures, which were then stylized in Substance Painter for a painterly look. These textures were painted onto the environment's surface by hand in Unreal to ensure they integrated appropriately within the scene.

Everyday Life and Material Culture in *Longhouse 5.0*

The virtual environment of *Longhouse 5.0* includes a detailed representation of the "Three Sisters"—maize, beans, and squash. These crops are modeled based on historical and ethnographic data and are essential to Huron-Wendat agriculture. The team used Unreal Engine's foliage tool to place 13,500 models of these crops, generating multiple levels of detail in real-time to manage a large number of models. The fields are expansive, designed to support the large population of Jean Baptiste Lainé, and include travel paths for user exploration. While users cannot currently interact with these crops, their inclusion serves educational purposes, offering insights into traditional Huron-Wendat farming techniques such as mound planting and companion planting.

The virtual landscape in *Longhouse 5.0* is populated with region-specific vegetation, including birch, cedar, ash, and elm trees. These trees were created using SpeedTree software, TreeIt Tree Generator, and Unreal Engine. The birch trees, for instance, were designed with a focus on the graphic nature of the bark, created in Photoshop and made tile-able using Substance Alchemist. The team also experimented with low-res cards and basic geometry to create 3D trees that fit the project's stylized nature. The virtual vegetation serves multiple purposes: enhancing the composition of the rendered environment, providing an educational component that elucidates the cultural significance of these trees to the Huron-Wendat people, and establishing non-intrusive spatial boundaries within the map.

Longhouse 5.0 also showcases the material culture of the Huron-Wendat people, from pottery to clothing. Each object was accurately modeled and ranged from stone axes with a cutting edge of approximately 8 cm and bone needles around 10 cm in length to clay pots with a capacity of up to 2 liters. Crafting areas where these objects are made are represented. For example, the pottery crafting station is depicted with a range of clay pots in various stages of completion. Although these objects are not interactive, their presence provides valuable context about their specific uses and significance in food preparation, crafting, and building tasks. Also, the simulation includes a highlight and select system, allowing users to access additional textual information for each object. Unreal Engine's foliage tool allowed us to populate the city grounds with various vessels in randomized clusters.

NPC Creation

A pivotal new element within the immersive realm of *Longhouse 5.0* is the creation of non-playable characters (NPCs), a first for the *Longhouse* project and one requested by Indigenous partners over previous iterations. Given the sensitive nature of cultural representations, our production team didn't have a responsible avenue to design and create Indigenous digital avatars. We were presented with a solution. The community chose an animation, gaming, and VFX company, Awastoki, in Wendake, Quebec, the center of the Huron-Wendat Nation, to lead this critical endeavour. Awastoki designed seven inhabitants of Jean-Baptiste Lainé, carefully guided by community historians, representing differing genders and roles, including two warrior variations and one female elder.

The process of NPC creation was a careful and collaborative effort supported by the Bureau of Nionwentsio of the Huron-Wendat nation. Huron-Wendat historians provided detailed guidance for Awastoki's depiction of Jean-Baptiste Lainé's inhabitants.

Awastoki's character creation pipeline was designed to harmonize historical interpretation with the project's technological framework and limitation of 10,000 polygons per avatar, which included hair and clothing. The process began with Character Creator 3 to generate mid-resolution base characters, emphasizing historical accuracy in facial features and hairstyles in collaboration with the research team. For clothing, Marvelous Designer was used to craft historically accurate attire, followed by Zbrush for general refinements. A single outfit type for each gender maintained a streamlined approach.

Wrap 4D alongside Topogun was used to re-topologize the models. This process allowed the character meshes to be optimized to 7,000 triangles and effectively allowed a common mesh to be used across all characters. As a result, shared UVs and the potential for a single rig further streamlined the process. Projections with Marmoset Toolbag 4 facilitated the generation of PBR–ready textures from the Character Creator 3 models, offering a solid base for texture detailing in Substance Painter and Photoshop. This optimized pipeline delivered seven unique characters, each within a 10,000-triangle limit. These Awastoki-created NPCs are placed naturally around Jean-Baptiste Laine, depicted in the midst of everyday activities — harvesting, socializing, looking at the tree line for threats to the city, and longhouse repair. The effect is a visualization that feels more “alive” than any of the *Longhouse* project’s previous iterations.

Figure 2.1.4 A key aspect of this version of the longhouse project is being able to depict inhabitants in social settings, such as in this interior scene. Awastoki’s avatars were instrumental in removing the haunted feeling created in earlier iterations due to the lack of people.

Conclusions

Real-world testing in Wendake at the *Cabane d'automne*, an annual community gathering of members of the Huron-Wendat Nation, was a pivotal moment for the *Longhouse 5.0* project, offering us a unique opportunity to gather direct feedback on user interaction within the VR environment. Participants were generally impressed with the immersive quality of the virtual world, commenting positively on the visual and auditory elements that brought Jean-Baptiste Lainé to life. This was a unique experience for most participants, and most had never had the opportunity to try virtual reality, let alone a VR simulation centered on their personal heritage. Team members monitored the seated participants for safety, observing that many were reluctant to stand and actively explore the available space, preferring to "lean and look" instead. From a project perspective, the final public presentation confirmed several assumptions. First, a VR experience would captivate audiences, fostering community involvement and remembrance. Second, despite being tethered, an experience with restricted motion can be equally practical as one offering complete freedom of movement, reinforcing the idea that total immersion is achievable for the participant. Third, genuine collaboration with the Indigenous community is essential for projects involving historical or archaeological data sacred to them. The project's success depended entirely on this partnership.

User feedback at all stages has been invaluable for our team, providing specific directions for future development. We are now exploring additional options for incorporating more interactive game-like elements, such as clickable information points, interactive storytelling, or simple task-based simulations that could offer users a more hands-on understanding of Huran-Wendat culture and history. The Wendake experience has shown us that while we have succeeded in creating an immersive environment, the next step is to make it a more interactive and educational space.

Our vision extends to potentially incorporating more powerful VR platforms, such as the anticipated Apple Vision Pro or Meta Quest 3. With the increased computational capabilities of these devices, we aspire to return to a more photorealistic aesthetic, further enhancing the immersive quality of our simulations.

Beyond advancements in VR, the project's next phase is considering using pre-rendered experiences projected within immersion studios, such as those made by Igloo, an immersive VR projection environment. This approach eliminates the need for shared VR headsets, providing a more communal experience.

The *Longhouse* project is only one of many currently produced in cultural heritage globally. Beginning in 2012, as an exploration of what might be possible with immersive technology and limited in scope, we now see the wide adoption of 3D visualization as standard practice. We hope this project can serve as a model for true collaboration among multiple participants: researchers, technicians, artists, and the communities whose stories we help tell.

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2.2

Interview with Maxime Durand

On His Role as World-Design Director at Ubisoft

Maxime Durand

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Could you talk a little bit about your current role?

I started as a resident historic consultant, which was different from anything Ubisoft and other videogame companies had done before. I was hired to be there permanently, working with the team to help them navigate historical sources and information, and to inspire them with history so that they could create awesome content within the *Assassin's Creed (AC)* franchise.

This led me to an idea that started with the notion that we thought *AC* could be used in classrooms and museums, but it had to be adapted because there were many restrictions to using a AAA mature-rated game. For many years, I worked on designing this new format called the Discovery Tour. I've ultimately directed this project, working with museums and cultural partners to create three Discovery Tour experiences that we have released, collaborating with academia to make the most out of this experience in different countries worldwide.

During your initial project involvement, what specific expertise do you provide, considering the various aspects of history, archaeology, and gameplay? Were there any notable moments of friction or game changes resulting from your contributions?

The first game that I was hired for, which has become *AC: 3*, is set during the American War of Independence, or the American Revolution. The job offer mentioned the need for a historian with skills to assist the teams in working with Native American history, colonial history, and to be inspiring. The job description was well done, and I had expectations, possibly different from theirs.

I came from a research background with the personal idea that history can be inspiring. So did I inspire people? Yes, on many topics and I don't always know how. The reality is, the teams that are working on these projects are huge. At first, I concentrated a lot on directors, thinking let's influence those at the top of the hierarchy: the artistic director, the design director, and so on. With time, I realized the historian's position is better if information goes through the entire team and is much more accessible. Yet we have to filter our input because people have spent precious time working on these games, and there's a lot of pressure to make a good game out of it.

The toughest part of being a historian is not to tell the team what to do but to find the information and restrict ourselves from giving them too much. The core of the work of the historian is to narrow down, give bullet points, and provide easily understandable images so that if developers want to learn more, they can ask for it. They need an appetizer before the full meal.

It is a matter of making people understand that the past is different from today. The question is about how much the team will be inspired and how much information they'll find so that they can incorporate it into the game. Maybe the most important element is that *AC*, for instance, is not a documentary. It's a fruitful reconstitution, and as much as the historian would like it to be closer to reality, the whole purpose of the game is to be entertaining.

Did you notice any instances where your input on architecture altered gameplay, or where you identified and rectified mistakes, such as the inclusion of magical elements for gameplay purposes, like enabling character climbing on specific cathedrals?

With *AC 3*, the team was facing a challenge: colonial architecture is not exactly comparable to Italian Renaissance. So quickly, they came up with the idea to focus on the wilderness with trees. I came up with some ideas, for instance, the fact that Boston was almost an island at that time, with tides, which is very different from today, and that the Tremont Ward was three mountain tops they could use for heights. So here the architecture I showed them changed their perspective and helped them to create the design of the game. Historic architectural information can lead the team to inspiring moments and details.

Another example is *AC: Black Flag*. I remember when we had a discussion about the cathedral in Havana. Ultimately, the team chose to include the cathedral that was built more than 100 years after the game's portrayed era because they lacked a sense of grandeur and architecture, which they really wanted. Today, it's a real staple in the city.

For *AC: Valhalla*, there were absolutely no castles or any kind of forts from the ninth century. So the motte-and-bailey would be the kind of architecture that would be seen thoroughly. The team quickly realized that it was very small and not up to what they were expecting. Ultimately, the game shows a mix of Roman architecture, which makes a lot of sense. But then there's a mix of Norse architecture, and even up to the 18th or 19th century Victorian reconstitution era of castles because that would give a better sense of grandiosity, height, and volume to the game, making it a better and more diverse playground for players. It was a very honest discussion that we had with the artistic direction, they decided that there's no way we're going to include the motte-and-bailey in this game everywhere.

I remember being fascinated by the Library of Alexandria in *AC: Origins*. There's limited documentation about its appearance, so when exploring it in the game, it was intriguing to see details like scrolls instead of books, which made sense

in hindsight. Did you contribute to the reconstruction or have thoughts about it?

Many ideas originated from different sources, including historical references like the library in Ephesus, possibly influenced by the library of Alexandria, which had a distinct visual appeal. While Judith McKenzie's book served as the most important resource for Alexandria's design, the team also found inspiration in the movie *Agora*. We relied on Jean-Claude Golvin's reconstitutions, some of which he did exclusively for us. Game developers often rely on accessible knowledge, resulting in creative liberties and conjectures. The game's mechanics determine heights and measurements to prioritize gameplay, occasionally leading to illogical elements like a colossal statue within a library. Despite historical inaccuracies, visual shortcuts such as inscriptions and classroom scenes effectively convey context to players.

As somebody who's coming from a historical background, how do you feel about the inaccuracies that come about in games and how do you think those impact the public's understanding of history?

I'm a real party pooper when it comes to this. I really want the game to be the best it can be, but I feel a personal pressure that I inflict on myself to convince developers to stay as close to history as possible. Of course I've been frustrated many times by subjective decisions that were based on other people's personal opinions. But this is how these games are made where fun is prioritized ultimately.

I'm aware that some people perceive historical videogames as documentaries, and I'm saddened by that perception. But at the same time, everyone who likes history or archaeology becomes interested at some point because they've seen something that has intrigued them, whether it's visiting a museum, reading a book, or watching a movie, and it sparks their interest in studying history. Perhaps they eventually realize that entertainment's representations of history are not exactly how it happened, but if it's part of something bigger, that's what I find very strong and powerful.

Perhaps through playing games like *AC*, people can learn something new. They might gain insights into historical figures like Alfred the Great and understand that Vikings were more than just brutal warriors. If people are going to play, they might as well learn something from them.

Do you think the relationship between architecture and videogames, particularly in terms of historical reconstruction and the spaces depicted in these games, is currently strong?

From my perspective, there are tremendous ties between architecture and videogames. Both are designed with a sense of purpose and an understanding of how users will interact with them. Once built, they're out of the designer's hands.

Functionality is at the heart of both architecture and videogame design, not just aesthetics. In videogames, functionality may even be more important than aesthetics. Everything in a game, like *AC: Unity*, is carefully placed to help players navigate and orient themselves. Monuments, landmarks, trees, and even roads are strategically positioned so players can understand their surroundings and find their way. Nothing is accidental; it's all designed to enhance the player experience.

One key difference between real-life architecture and videogames is perception. In videogames, the camera lens and perspective are different from real life. For example, in *AC*, the third-person view means heights and widths are exaggerated compared to reality. Everything needs to be larger than life so players can easily identify important landmarks and navigate the game world. This is especially evident in games like *AC: Origin*s, where temples and structures are scaled up to ensure they stand out and are easily recognizable from a distance.

Figure 2.2.1 Image from the Assasin's Creed Origins.

And then there are technical limitations, or what's called memory space. The more memory on the console, the more things we can see on the screen and can load. Whereas the further back in time you go in console and computer power, the more the game has to cut the line of sight from the player, so that it doesn't break the illusion. That has evolved a lot through time.

Do you think specific architectural concepts or influences have shaped videogame design, particularly in terms of how players interact with historical buildings within games, or how virtual spaces are constructed?

With every game, we consult architecture books for the look and feel, it's always a matter of purpose in the game. With every title that we've worked on, there are inspirations from the right historical time periods and the real architecture behind them. The more historical information available regarding this architecture, the higher the chances that it goes into the game.

Do you think players tend to act less reverently in digital spaces compared to physical ones?

There was this very big and famous international museum where we were presenting many years ago for one of our upcoming games, with the intention to convince them to be a partner of the adventure. I remember that they had this room full of curators of a specific time period and we were going around in a tomb just to show them the level of detail. Then in the example game level we started breaking jars and half of our audience became horrified. I understand that for curators, it could be frightening. But

I also think players have better engagement if they interact with their surroundings, such as a monument. If there's a story line in the historic space, there's something that engages them emotionally and ties them to it. There are many more chances that people will remember and understand the space.

Do you feel there needs to be a greater fidelity between gaming environments in the real world?

I would like to, but I don't think there's an end goal. It's never going to be possible to do a full reenactment. If we're trying to portray the day of yesterday, it would be difficult because of the perspectives and information available, and so on. Then there's all this unwritten history that I wish we can continue to tap into. Then we can move away from only a European perspective on history or a Western history perspective. We can go further than just historical records. Archeology, I think, is amazing for that, and architecture, because it can help us understand what has not been written but existed in the past, like the role of women or underprivileged people. I think videogames can play that part. There have been historical videogames for as long as there have been videogames. What people expect out of historical videogames has grown stronger, and they expect more details and fidelity. So I feel like that trend is going to continue, and we're going to see more games about different time periods and places that we have not seen in other mediums before, hopefully more of Southern America, or Africa, Asia, and so on.

Do you believe that the layers of history, represented by ruins and reused materials in Roman-colonized countries, create a more captivating environment compared to being in the original state of a city?

As a historian, I appreciate that these elements are mixed, so we can bring back what it could have looked like in some time period. But it's always going to be very limited in our architecture and archaeology because of the state of the sites.

We can try to decipher the past and find these answers to have a better understanding. For *AC: Mirage*, because there's this huge disconnection between what is considered Western origins or Western heritage, and what is Eastern or foreign. Games like *Mirage* can bring a lot more attention and understanding on what we may have considered Mediterranean or Westernized. We can have a better understanding as modern-day citizens that we live in a world that is not divided only by Western and Eastern, and hopefully change our perspective as modern-day citizens.

How did you approach the research on indigenous architecture and communities for your work on *AC*? How did you manage potential concerns about representation and ensure a positive

working relationship with the communities?

To me, it’s a great pride that we were not part of the 99% of videogames that misrepresented Native Americans. So, we work with historical sources, mostly European-centric sources and the communities that we want to portray, understanding that people from the past don’t exist anymore. Even if our historical records show something, they might have a different opinion based on oral tradition or modern-day sensitivities. It’s very important for game developers to be aware of that and work in collaboration with the communities.

AC: Valhalla wanted to show the same locations in Colonial America as we did with *AC 3*. So we tried to show some of these villages a few centuries before. When we talked and discussed with the Native American Consultant regarding the language, they had different names for places and regions than what is told historically. We didn’t use the historical names; we used modern-day names from the community because we felt that was right and while it might be less accurate, it’s more meaningful. When we deal with other religions that are still existing and meaningful to a lot of people, it can lead to tensions. With *AC: Valhalla*, there are pagan gods that are tied to the right-wing extremists. The game didn’t want to be associated with non-historical ideologies. We had to be mindful and navigate around this kind of information because ultimately, the game is to be entertaining, not to be a political message.

Figure 2.2.2 Boston Map with Reference points.

2.3

Restorative Heritage

Videogames as Participatory Storytelling

Michael Otchie

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Hi-fi preservation and playing with digital artifacts

Nestled between the expanse of Lake Huron to the north, the embrace of Lake Erie to the south, and the stretch of the US border to the west, Southwestern Ontario unfolds as an expansive realm of agricultural production, playing a vital role in nurturing Canada's economy.

Glimpsed from an aerial vantage, the landscape takes shape as a canvas of manufactured terrains on an industrial scale. Amidst this intricate mosaic, there are few remnant historic structures indicating how the place has spatially and culturally evolved over time. Viewed from one of the region's high-speed 400-series highways, cultural landmarks appear as rare and scattered. However, beneath what at first appears as a vast region of nondescript farmland are embedded stories of communities that resonate with the historical ebb and flow of migratory tides across Canada's storied past, including several black communities whose origins stretch back as far as the 18th century.

It is however within this modern rural context that a promising example of how local histories can be told through videogames can be found. The 1934 Chatham Coloured All-Stars featured within Major League Baseball's videogame, *MLB The Show '22*, stands as a compelling testament. These All-Stars, the pioneering team of Black baseball players, etched their legacy by clinching an Ontario Baseball Association championship amidst protest and racial discrimination. Their narrative encapsulates resilience while confronting the discomfiting facets of Canadian history. This integration within the gaming realm materialized through an inventive, although unlikely, partnership. The Chatham-Kent Black Historical Society, dedicated to amplifying black history narratives, joined forces with Southwestern Ontario and The Ontario Lottery and Gaming Corporation, united by their commitment to Ontario communities.

The game is built upon the premise of offering players a three-dimensional visual experience that closely mirrors real-time interaction with televised footage. The meticulous digital recreation of team members and the 1934 playing grounds was informed by careful reference to photographs and artifacts showcased at the Black Mecca Museum, a tribute managed by the Chatham-Kent Black Historical Society. This careful recreation of historical artifacts mirrors a growing trend of digital resources that commemorate people, places, and events; and the architectural restoration process, endeavouring to reinstate heritage building fabric to a specific point in time. The insertion of these digital assets demonstrates the malleability of videogame platforms and their ability to be adapted or augmented to reflect the interests that challenge a dominant narrative, harking back to the influence of the hacking processes that inform the way in which games are coded. The advanced digital tools employed in videogame creation, surpassing those used in film and architecture in many respects, can be viewed as presenting novel modes of heritage visualization. These not only depict the past but also challenge the conventional notion of experiencing narratives through the lens of a single author.

A parallel emerges between the creation of digital assets featured in the videogame and the growing trend of digitization in recent years within the sphere of heritage preservation. Tools such as point cloud scans and photogrammetry have revolutionized how architects capture high-fidelity site and building data. The resulting digital assets defy the ravages of time and weathering, becoming accessible from any corner of the world, thus negating the need for a singular physical repository. Moreover, these digital artifacts transcend static existence and within the field of heritage architecture these tools are commonly used for the replication of a building's heritage attributes that may have been lost or eroded over time, such as ornate stone carvings or elaborate ironwork. Likewise, the accuracy of digital scanning technologies has become an essential part of workflows for developing solutions to create the complex construction documents required to adapt existing buildings and integrate the old with the new to continue their lifespan.

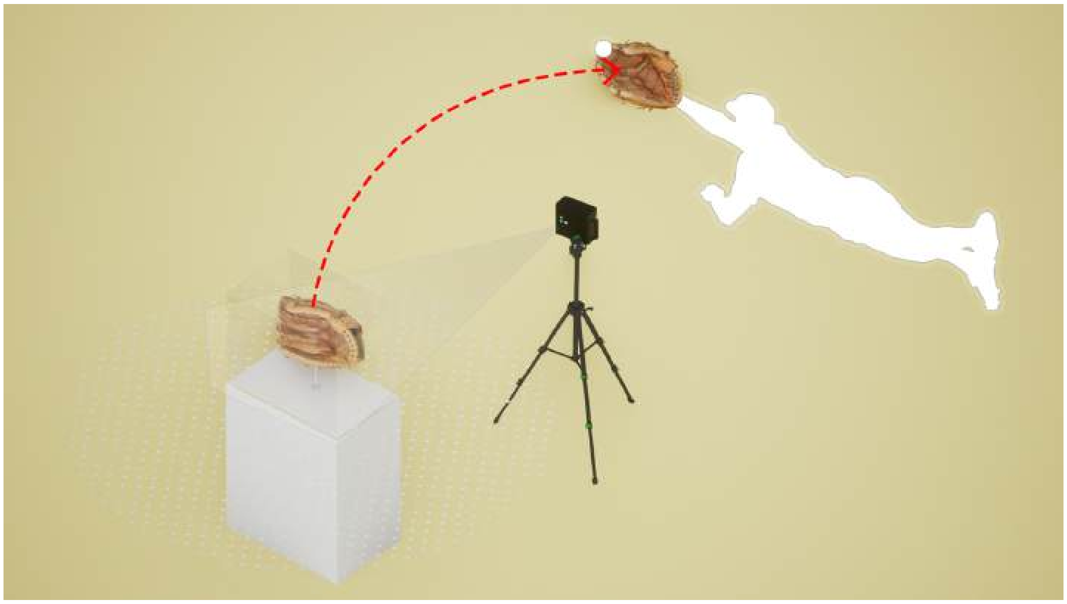

Figure 2.3.1 A videogame arcade machine proposed as a physical destination for experiencing thematic aspects of a city’s past.

Similarly, in the case of the MLB game, digitized items like cherished baseball gloves or jerseys can be wielded and adorned without the fear of irreparable harm, therefore taking on dynamic qualities within the virtual realm not afforded in their physical incarnation. Although these virtual objects are intended to be experienced anywhere in the world, the attention that they bring to specific locations has the potential to help encourage tourism and investment in places that would be otherwise overlooked. Attracting interest in places via videogames has the potential for economic benefits and therefore the creation of digital cultural artifacts evokes questions of ownership, particularly concerning cultural assets that are strongly associated with local communities.

The digitization of heritage raises not only questions about its potential benefits but also sparks debates concerning the selection and curation of stories. Take, for instance, the MLB example — it can be viewed as a component of local history, but it also serves as a vital chapter within the broader narrative of race within sporting histories and the overarching discussions concerning the African Diaspora, transcending national boundaries. In this light, the baseball league in which the Chatham All-Stars embarked upon their historic tour can be seen as a metaphor for the migration and transfer of skills and labor across North America. It provides an alternative perspective, shedding light on the complex interplay between tangible and intangible traditions woven into the fabric of cultural heritage.

In the realm of conserving historical content through videogames, discussions extend beyond the selection of appropriate content to the very nature of interaction that should be facilitated. While many videogames offer expansive open-world platforms, granting players the freedom to traverse digital landscapes and engage with a global community in real time, this openness also leaves room for potential misuse and abuse. In contrast, the structured format of sports games, exemplified by the MLB game, provides a more restrained yet respectful arena for engagement with historical narratives. It offers players an opportunity to interact with people, places, and events while maintaining a level of sensitivity, particularly when dealing with themes as integral and sensitive as race. However, this restraint might potentially limit the depth of meaningful interactions that players can experience.

While not explicitly conveyed in its digital counterpart, the narrative of occupying the baseball diamond where the Chatham All-Stars once played resonates with histories of freedom experienced by various groups in Ontario. It delves into the perceptions of safety and the emotions associated with these spaces, offering a multifaceted understanding of their significance. Furthermore, the story of the baseball team intertwines with the transformative processes and value extraction that have shaped the now highly technologized farming landscape. It can be regarded as a proxy for honoring this intricate history — a testament to the enduring connections between people, land, and cultural heritage. In essence, the digitization of such narratives opens doors to multifarious interpretations and discussions that extend far beyond their immediate contexts.

The MLB videogame, with its primary focus on spotlighting individuals and historical events, inadvertently opens up novel avenues for reimagining architectural histories. It presents a unique opportunity to overlay themes often considered transient onto the canvas of built landscapes, typically perceived as fixed and permanent. While this connection may seem unexpected at first, videogame technology is gradually becoming an integral tool within the toolkit of heritage architects. This is primarily due to its remarkable capacity for real-time spatial visualization, offering a realistic portrayal of physical spaces.

In light of these considerations, heritage professionals can play a vital role in defining the boundaries within which digital cultural assets exist. They can help establish guidelines and frameworks that ensure these assets are placed in environments where their historical and cultural value is not just preserved but also respected. This entails striking a delicate balance between open exploration and respectful engagement, creating spaces within videogames where players can learn, reflect, and appreciate the nuances of history without compromising sensitivity and respect for the subject matter.

Moreover, videogames, as a ubiquitous medium, provide an inherently familiar mode of navigating and experiencing spatial environments. Diverging markedly from traditional visual mediums, videogames empower players with an unparalleled level of engagement and agency. This dynamism serves as a catalyst for the seamless integration and reimagining of historical narratives within virtual landscapes. The intrinsic ability of videogames to sample and remix these narratives acts as a potent bridge, connecting history with contemporary relevance, thereby fostering a profound and comprehensive understanding of cultural heritage identities.

As players immerse themselves in these crafted narratives, they not only absorb historical knowledge but actively participate in a broader cultural dialogue, forging meaningful connections between eras long past and our contemporary world. Within the realm of videogame genres, sports games stand out as a quintessential reflection of the zeitgeist. They meticulously capture the essence of the current year's team rosters while building upon the foundations laid in the previous year's iteration. Leveraging cutting-edge technology, these games strive to create a convincing and immersive simulation of the ongoing sports season. In contrast to watching sporting events from the past, these games also position gamers in the competitive moments of play where the outcome is unknown.

However, it is imperative to underscore that the digital preservation of the Chatham All-Stars transcends mere aesthetic representation. It ushers in hyper-realistic outcomes, enabling these historical figures to coexist with modern athletes in a shared virtual realm. This blurring of temporal boundaries holds immense potential, offering players not only an educational experience but also a transformative journey through time and space. The MLB videogame thus emerges as a powerful agent in bridging historical divides and fostering a deeper appreciation of our cultural heritage.

The digitization process went beyond simple preservation; it became a bridge across generations. It actively involved family members, creating a deeply personal and collaborative journey in digital preservation. Even though these contributors were initially unfamiliar with videogames, seeing the animated characters come to life on screen was a profoundly emotional experience as they had the opportunity to connect with sporting events that occurred before television broadcasts and when the filmic documentation of competitions wasn't commonplace. Consequently, for the first time, elders within Chatham's black community saw visual representations of a parent engrossed in the game and demonstrating skill and prowess that they were so renowned for. These interactive experiences harkened back to the rich traditions of oral histories as a form of record-keeping within black communities and the broader African diaspora. It not only preserves a legacy but also revitalizes the connections that bind generations together through the inaction of organic events.

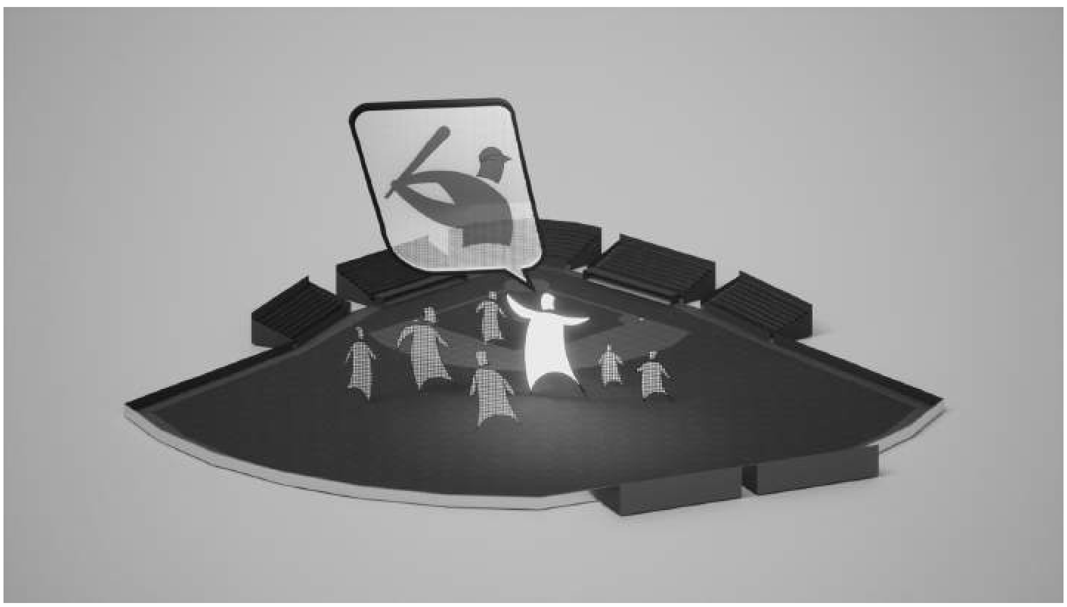

Figure 2.3.2 A virtual baseball diamond imagined as a place of gathering and story telling for disparate communities that echoes traditions of oral histories as a means to connect generations.

The interactive and often nonlinear essence of videogames positions players as active participants in the narrative creation process. This interactivity resonates with the echoes of oral traditions, where storytellers forged frameworks and listeners enriched narratives through inquiries. The analogy between these time-honoured practices and the participatory gameplay of videogames underscores the potential of the latter in preserving cultural traditions. Furthermore, oral histories transcend their role as vessels for perpetuating accounts of individuals and events. Like the Chatham example, they signify active participation in the perpetuation of place identities across generations, continually evolving to remain relevant to their audience. In an era where historical heritage ties often erode, videogames stand poised to serve as conduits for collective remembrance, enabling players to resurrect forgotten facets of historical places typically overlooked by singular narratives. This approach to commemoration aligns with the translation of other contemporary forms of artistic expression.

The MLB game stands as a compelling demonstration of preserving local narratives with dignity, juxtaposed against narratives that may have faded or been marginalized over time. By involving communities in the preservation process, it demonstrates the potential for videogames to assume the role of platforms to confront historical losses and engage in cultural restoration. This approach could reinforce connections between heritage professionals and the public, fostering a mutual commitment to safeguarding cultural heritage. This example of commemoration also highlights the significance and potential of using games, in both their digital and physical format as a means to perpetuate traditions, the scholarly value of which has likely been undervalued due the lack of association with academic conventions.

Lo-fi interpretation and the curation of digital archives

The relationship between videogames and traditional conservation methods, which often involves sensitively restoring building fabric and the commemorative plaques honouring people, patterns of use or former buildings, should be viewed as complementary rather than opposing. Just as diverse approaches are present within conventional heritage practices, various instances illustrate the preservation of specific places through videogames. While the aforementioned MLB game accurately captures objects, individuals, and spaces with high fidelity, the videogame adaptation of *Scott Pilgrim vs The World*, based on the graphic novel by Bryan Lee O'Malley and feature film directed by Edgar Wright, provides an alternative lens. Published by Ubisoft in 2022, the game follows the fictional and larger-than-life exploits of Scott Pilgrim, a 23-year-old bassist who must battle his new girlfriend Ramona's evil exes and preserves the nuanced elements of Toronto's cityscape as referenced in the books and film. The game's visuals closely adhere to the anime-inspired illustrations from the original series of black and white graphic novels. Published by Portland-based independent comic book publisher Oni Press between August 2004 and July 2010, the original static interpretation of the story provides a snapshot of the city at a specific moment rather than a caricature representation. In contrast to the realism of the MLB example, this game embraces the low fidelity orthographic and pixelated aesthetic characteristic of late 1990s and early 2000s videogames.

Figure 2.3.3 The aesthetic of videogames envisioned as a form of memorializing lost features of the urban fabric.

Spaces and buildings are visibly not intended to be a true depiction of reality. Consequently, the limitations of earlier technology serve as an interpretive medium to convey the essence of city life and its transitory qualities and intentionally celebrates a visual representation of Toronto that might otherwise appear anachronistic. Moreover, the game's aesthetics could be interpreted as a tribute to the iconic stand-up arcade machines that once graced cities worldwide. These arcade cabinets played a pivotal role as urban spectacles, contributing significantly to the videogame industry's meteoric rise into the multibillion-dollar enterprise it is today. These entertainment units, scattered across cityscapes, served as spontaneous portals to escapism, offering a respite from the mundane aspects of urban life. However, their relevance has waned considerably with the advent of home entertainment consoles and mobile gaming, readily available on the ubiquitous smartphone.

Scenes within the game pay tribute to both the graphic novel series and the film, both of which lean heavily into Toronto's thriving indie-rock scene of the time and the enthusiasts that surrounded it. The music venues, restaurants, stores, and streetcars that feature in the game's background as indicators of the recent past in which the story is set are juxtaposed with the iconic permanent landmarks such as the CN Tower and Casa Loma, which the city is more commonly associated with. By alluding to the sights, sounds, and tastes associated with Toronto's independent music scene, the gaming environment has a unique relationship with the city's residents, showcasing how gaming platforms can commemorate intangible aspects of urban culture that surpass the physical fabric of the built environment. Nuanced references to specific places in time demonstrates the importance of stories embedded within popular culture to provide an archive of the momentary experiences that the built landscape can offer.

The multimedia dimension of the *Scott Pilgrim* narrative resonates deeply with the intricate network of specialized retail spaces that have played a vital role in entertainment consumption. These spaces encompass videogame shops, movie rental outlets, comic book stores, and record shops. However, they now confront an existential threat driven by various factors, including the ascendancy of streaming services and digital distribution platforms. In contrast these new technologies rely on remote and impersonal data centers and distribution facilities that facilitate the city's consumption and in so doing remain spatially and architecturally disconnected from its vibrant urban landscape. The multifaceted *Scott Pilgrim* narrative thus encapsulates an almost nostalgic form of urban exploration. It entails navigating the city to patronize venues that proudly maintain their independence, even in the face of homogenizing urban forces that threaten their existence.

The game utilizes this thematically connected ensemble of spaces, a concept mirrored in how Toronto is portrayed through an abstracted map that tracks progress through its levels. The game's ability to capture Toronto's essence connects to a broader discussion about the city's portrayal on screen, often used as a stand-in for other North American cities despite its prominence as a filming location. *Scott Pilgrim vs The World*, both the film and the videogame, presents an almost unique instance where the city plays itself as a character. In doing so, certain locations from the various interpretations of the story, such as the beloved Honest Ed's department store, no longer exist, emphasizing precarity of culturally significant real-life environments in the face of gentrification pressures. This underscores the potential for videogames to serve as valuable heritage archives enabling future generations not only to visually comprehend previously existing environments but also how those spaces were encountered, albeit in an exaggerated way, and provide a source of creative inspiration.

The creation of digital cultural assets through videogames aligns with the expansion of the definition of heritage within urban contexts. In Toronto, previously overlooked locales like Little Jamaica and thematic elements such as neon signage have recently gained recognition as vital aspects of the built environment and sources of civic pride that warrant careful consideration and preservation. By expanding what constitutes conservation, videogames provide insight into innovative avenues for digitally commemorating elements of the city's cultural fabric. For instance, the use of digital tools by heritage professionals that are complementary to videogame development could potentially be used to create virtual third places that are analogous to record stores or music venues, allowing for serendipitous encounters with intangible heritage and the creation of like-minded community based on a shared appreciation of cultural expression.

By recognising gaming enthusiasts, or gamers, as a potential niche audience for memorialization to be targeted toward, heritage professionals could potentially help to develop engaging contemporary content that represents the medium of the day akin to the emergence of documentary film making and audio recordings of more recent decades.

Figure 2.3.4 A Videogame arcade machine proposed as a physical destination for experiencing thematic aspects of a City’s past.

Conclusion

In the present day, we often take it as a given that heritage buildings are safeguarded not merely for their intrinsic value but for the collective benefit of the general public and for future generations. These structures have grown to become integral to our cultural identity and play a pivotal role in shaping a profound sense of place, whether at the local, regional, or national level. However, it’s imperative to recognize that our understanding of what constitutes heritage value and how we go about preserving it has undergone significant evolution.

This evolving recognition of heritage now extends to a more serious consideration of the preservation of the diverse intangible heritage that informs city life. This encompasses a myriad of activities such as the use of language, the preparation of food, dance, and music, moving beyond the conventional criteria that often center on the visible character of neighborhoods defined by factors like architectural style, form, and material palettes of the buildings that comprise them.

A pertinent example of this evolving landscape in cultural conservation can be found in the case of Little Jamaica in Toronto. Although the area has long been informally known for its immigrant communities, it's only recently that the city has acted to formally recognize and conserve the qualities associated with them. This conservation initiative was largely prompted by the unintended consequences of a new transit line. This development led to the closure of several businesses connected with the community and contributed to rising property prices, linked to the enhanced transit accessibility. The Little Jamaica case illustrates an exploration of innovative preservation methods and questions about what it truly takes to preserve the identity of a place. This approach considers not only the cultural and historical aspects but also functional and economic factors that influence community displacement and disrupt recognized patterns of migration. In many respects, what is intended to be preserved are qualities not dissimilar to those captured in both the MLB and *Scott Pilgrim vs The World* games. Thus, the games could potentially serve as precedents as part of wider multimedia narratives, documenting places at risk and their associations with diverse cultural expressions.

Parallel to discussions about preserving tangible and intangible aspects of culture are considerations of accessibility, encompassing both physical and nonphysical barriers. In contemporary construction, accessibility often adheres to the principles of Universal Design, a term coined by American Architect Ronald Mace, which aims to address the needs of individuals of all ages and abilities. However, these principles were not originally designed to retrofit existing structures, including heritage sites. Consequently, heritage properties can often symbolize the misalignment between sites' contemporary, inclusive identity and the unresolved shortcomings of past environments. These deficiencies underscore the importance of alternative forms of commemoration to engage a significant sector of society that may not be able to connect with heritage in conventional ways.

Recognizing the unique capabilities of videogames, which can offer heritage experiences independent of physical environments, highlights their potential for providing equitable engagement with places that shape our shared history. Furthermore, as a relatively new medium for storytelling, videogames provide fertile ground for the creation of compelling characters that reflect the qualities of places, allowing cities like Toronto to play themselves in narratives that resonate with a contemporary audience. This dynamic intersection of technology and culture is redefining how we perceive, preserve, and engage with our heritage.

The inherent accessibility and affordability of videogames position them as a prominent form of contemporary entertainment, transcending geographic, temporal, and cultural boundaries. This characteristic also opens avenues for collaboration between heritage professionals and videogame developers for creating the artifacts and archives of the future. The fusion of architectural elements with popular culture in videogames empowers communities to engage with heritage in novel ways. In the realm of preservation, where conventional efforts often emphasize physical restoration, videogames offer a unique dimension by providing immersive experiences that transcend material constraints. Recognizing videogames as tools for commemorating historical spaces can enrich our comprehension of architecture, fostering community engagement and scholarly discussion. Videogames, defined by their interactivity, introduce an uncharted pathway for reclaiming lost narratives, redefining local historical identities, and involving the public in meaningful interaction. Moreover, as demonstrated in the aforementioned examples, videogames offer an appropriate platform for heritage professionals to share research with diverse audiences around the world on subject matter that relates to play, leisure, and creative expression.

2.4

Interview with Erik Champion

On His Roles as Professor and Research Fellow

Erik Champion

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What are your thoughts on using heritage sites or historical buildings as level design? How do you feel that changes people's perspective of the historical buildings and affects how historical or heritage spaces are understood?

In these popular games you avoid, or you aim and fight, so they combine two of what Roger Colloy talked about in the four modes of games. He was an anthropologist in the 50s looking at competitive chicken sports. He said games have a sense of vertigo, competition, chance, and mimicry, but we do not have computer games which have much in the way of imitation. This is because our interface is limited and the way in which we interact is usually seek and destroy. When we look at architecture and videogames, when you shoot or destroy something, it is really just another texture applied on the wall. There are only a few games which understand the use of architectural elements and how they are put together just so they can be used to be destroyed.

There is this theory in 19th-century Germany about how people understand the beauty of a building by looking at its proportions and by imagining it as a face or a body and climbing it in your mind. I am hoping to think of a way in which you could virtually climb a building and understand its relative elements, proportions, and symmetry. We do not get that in *Assassin's Creed (AC)* buildings because they are just obstacles and hiding spaces, the way in which they change over time and reflect their users is not evident in *AC*. If you go to *AC: Odyssey* with the Spartans and Athenians you have this potential to show how their cultures were expressed through their physical and architectural design, but it is not used.

Many of the mainstream games are fairly destructive so architecture is demolished, and some of the really subtle things are not explored. Game designers could talk to architects about how architectural space is experienced and whether there could be more varieties of the architectural experience in a game. With first person shooters, buildings are often action spaces but contemplation spaces as well. You get to rest the player in order to then prepare them for something else that is really exciting, because if you continually push their adrenaline, they might get tired and bored more quickly. If you go into a Gothic cathedral, they first have a small space in order to make the entry into the large space even more dramatic, which is an architectural theory. Game theorists could reach out to architectural theorists to explore a bit more subtlety.

For example, there is a famous paper by Henry Jenkins called "Games: A Narrative of Architecture," and it upsets me because architecture can be narrative as well. Yes, there are narrative aspects to architecture, symbolism, and ornament which I think game designers could use a little bit better. On the other hand, when you ask architects to design a game, very few of them really create interactive situations using the built environment. I have found teaching students that they leave the mechanics to the very last moment or they copy. They say they have these wonderful ideas for the game, but it usually is how the game looks and not how the game is played and experienced in terms of mechanics. I agree that architects might approach games a little bit differently, but I would say both sides have a little bit more to learn.

There is a book called "Space, Time, Play," which is interesting in the way it reveals how architects think games are just a boring subset of 3D models. That is a mistake, but I also think few games explore architecture well. When I said I love *AC*, I really love the detail in the settings they use, but I have issues with it. They could use place and cultural presence more effectively, a sense that other types of people experience a space differently to you.

The first *AC* was to me one of the most successful in this way because you actually interact according to the way in which people saw their religious states. You have a leap of faith which allows you to fall down from buildings and the way in which that showed how the assassination mode was actually related to the religious, and shall I say mysterious, sect that actually existed in Syria on which the word comes from, there was so much potential there. I think wonderful things about the series, but I think it could be more. When you ask me about the game designers and the architects, it would be interesting to go to a panel of both where they talk about what they think of the other person's impression of what they do. Architects experience architecture differently to the general public.

There is an interesting thing about *AC* with the way in which diverse types of social roles group together. *Skyrim* got closer to it because out of scrolls, the NPCs have a life independently of you. They play with that because they start asking you to join an assassination creed and kill these horrible people, but the people get nicer and nicer. Therefore, the way in which you can create personhood through the NPCs and the architecture could be explored a bit better in both. They could reveal more about the architecture, for example you talk to Vitruvius from *AC: Odyssey*, but he is an engineer, and you do not learn anything about the books and his way of thinking. Why can't we make you go to his books and try and reconstruct something?

How do digital gaming interfaces immerse users beyond visual fidelity?

One of the problems is that computer vision built the foundations of augmented virtual reality, meaning that we are focused on the visual. When you're in an architectural space you feel the air, you feel the reverberation from the walls, you feel so many things which are not visual. I've noticed that as soon as you add audio that reacts to your interaction in a visual space, it's much more powerful. I have seen a wonderful smell-based augmented reality project for example, we can use more sensors and things like wind.

If you go to the palace of Knossos in Crete, there is actually a miniature labyrinth underneath the palace which was dug up by an archaeologist. He also put concrete layers of what he thought the labyrinth was like. What he did on top of the actual remains is now also considered heritage. They are not sure if that was the origin of the minotaur, but the labyrinth which means a double-headed axe does seem like a symbolic telling of the story.

What we decided to do was get photographs from the British archaeological survey and we looked at developing them as panoramas inside Unreal Engine. We had this head-mounted display and used it as an opportunity to make the minotaur story. You're in the tunnel of the labyrinth and when you turn around the headset will turn around really slowly, but that will just add to the horror and the anticipation. We built simple biofeedback so as you get closer to the minotaur, you hear the heartbeats of the previous players getting louder and maybe yours mixed in. In terms of architecture, when you get to the end of a tunnel or a maze, you can feel the wind coming from the direction of the tunnel at right angles. In World War II, the people who survived the Battle of Crete and escaped from the Germans said that they can remember the scent of the wild flowers and trees, so I said to the students "let's put scent on these electric fans and we'll turn them on in relationship to your direction, so if you go to the end of the tunnel and you turn right, the fan will start blowing wind on you with the herbs on the routers so you actually smell and feel the scent of the air."

In Europe, there are people who have set up a way of using heritage sites after hours. When the heritage site is closed to the regular visitors, it is then rented out to groups who do a live-action role-playing game. In Poland, they rent out the castles to people who do Harry Potter–like adventures all dressed in druid and wizard outfits. I like that it uses the heritage site when tourists are no longer there. There are all these opportunities to use heritage sites in new ways.

What augmented reality could do is show how things change over time. For example, in Mayan archaeology, new kings built new layers on top of their palaces. When they created these layers, each layer was more powerful and if you invade a palace to destroy the power of the empire, you destroy the power of the architecture. The people who painted the ornaments which symbolize history used their fingernails. Their fingernails were crucial to them when painting buildings, thus crucial to the power of the king, so when people invaded the city, they ripped the fingernails off the painters. That is one example of how architecture is seen as growing and organic which is not showcased in games often. There's so much symbolic overtones to the Mayan worlds that are also architectural. For my PhD I was collaborating with an archaeologist, and I asked: "this environment's too big, the computer can't handle it, can we have portals?" and he said, "brilliant, that's in Mayan religion!" There are all these aspects that automatically apply to games.

Someone once said "mythology is science with a few extra steps," so you can build a virtual environment where people go through the scientific explanation, but then if they do things in a certain way, they are allowed to then explore the fantastical, local cultural beliefs.

When I studied people and said, "this virtual environment is an archaeological simulation" and they proceeded to treat everything with respect, did not know what to do, and were confused with navigation. When I told them it was a game, they actually knew what to do and it was much easier for them to navigate, but they destroyed everything. I have authored a paper on this called "Indiana Jones and the Joystick of Doom," saying that games are really wonderful, but you are not trying to learn about the culture. I am developing games where it is really creative and interesting, but you are learning about history in an interesting and nondestructive way. On the other hand, there are actually historical and cultural sites which are totally based around war and destruction. That to me is one of the dangers of games — we tend to go towards the destruction mode. That is why I am interested in mechanics, it is what separates games from other environments. To me, mechanics are the way in which a game changes its game state from one level to another or how it progresses, but most interesting is that mechanics are as the player perceives it or the designer intended it. Architectural simulations do not have mechanics. They might have limited interactivity, like a walking simulation, but they do not allow you to see how things change over time, which one of the great advantages of games and virtual environments is to show processes.

Do you think virtual space does not feel as valuable, so people explore it in a more aggressive way? Or is it the instinct of our videogames?

People just want to outperform other people in terms of what they think the game can offer. We are drawn towards destruction because every game has this ability to aim at something and give you points, so it is a really valuable feedback system. Games are explorative, but if we only explore by destroying, we are limiting our creative palette at the same time. Games offer up a magic circle where you can do anything and are not punished, physically hurt, or judged. The thing about a computer game that differs from a social game like a sport is that we are definitely judged in a real-world sport. We could do the same in a virtual game, but I cannot think of any recent heritage project where you were judged by the way you perform a ritual. Yet rituals and role-playing are crucial to cultural heritage. If we look at the so-called role-playing games, we do not really role-play. We try to get as many points as we can and level up depending on a different shade of character. I am not sure that's character role-playing because we are not trying to learn the role, and we are not being judged on how well that we perform it.

In the *Elder Scrolls* series, they could actually do more. There is this guy who played Oblivion as an NPC, and he just stayed online for days just trying to experience what it would be like to be a character in the game. There could be opportunities for people to actually pretend to be an inhabitant rather than a game player, which would add variety and mystery but would also mean those players would have to try and imitate the locals and understand them in order to avoid being exposed as a foreigner. That is one way they could be brought together. I have called this a cultural Turing test. Normally in a game the AI is really reduced because it takes too much processing, or it makes it much harder to work out the game balance. There might be a way in which we go in and we have to copy the locals while they are trying to find out if we are human or not, thus a reverse Turing test. There's opportunities to collaborate with ethnographers and anthropologists to see how people create identity for space and architecture. There are some missing disciplines that we could work with between game designers and architects as well.

Do you feel like architecture has influenced current or future videogame design? Do you feel like architecture had any significant role in the past or do you feel like games developed separately and architecture came in later?

The first videogames were mechanical balls jumping up and down in museums. The guy who is considered to be the grandfather of VR, Ivan Sutherland, he was not an architect, but he created augmented reality, virtual reality, and CAD for his PhD at MIT. People know him for being one of the inventors of VR or augmented reality or mixed reality, but he actually invented computer CAD as well so there was this crossover.

There is a considerable influence, but it is more indirect because architects influenced film, and film influenced games. The original *Blade Runner* movie featured a Frank Lloyd Wright house. Frank Lloyd Wright went to Italy, and he hated Renaissance architecture, but he decided, I can copy Mayan architecture because it is in the Americas. The first three directors of the Bauhaus were architects, but the Bauhaus did not teach architecture for years until Mies van der Rohe and Gropius went to America, so I think they would have been influenced to design. Architects do influence commercial games and they indirectly influence the setting and the set design.

In a game we could explain the Vitruvian theory which is about utility, beauty, and robustness, and you could see it from the Vitruvian perspective, so it is not just explaining how people in those days lived, seeing it their way. I was asked to be in a research group where they wanted to build world pavilions in VR, and I said “when you have these world pavilions, people go there because it’s like the dawn of a new world. How would you convey the sense of completely new fatality and freshness and being a vision of the future considering that this is 70 to 100 years old for us now?” and they did not get it. I think it would be important for VR and games to do that.

Do you feel like videogames have been influencing either architectural praxis or

pedagogy?

Architects have said to me: “you can’t build construction drawings from games,” and actually, I think you could. Games only design architecture as shells, but they could add mass. Architects either do not see the advantages of games as an experience for the end user or they do not want to give control to the end user because architects are in love with the fly through, which is not experienced by people, it is a way to control the audience. When you are an architect, you do not want to give your client full-send democratic input because the more chances they have to change their mind, which costs more. There must be a balance between effective workflow and design strategies to manage the client and create an interactive experience.

Apart from modeling things out of clay, architects do not really design products in the design process as changing over time. They tend to design it with a specific outcome. The new parabolic notion that things can be changed dynamically is not so fundamentally.

A Spanish architect once told me that the person in charge of the Alhambra does not want it in a game because games “do not have enough pixels.” When people play professional games, they do not necessarily have the highest settings on and the best resolution possible. There is something called experiential realism. It is not how realistic and photorealistic each pixel is, it is after you walked away. Did it feel like it could have been real? It is the life after memory of it. Games do not have to be photorealistic, they do not have to be exact copies of models, but what they should do is convey process and meaning. They are a good architectural tool that we could use better.

2.5 Historic Reproduction

Kristian Howald, Michael Carter and Namir Ahmed

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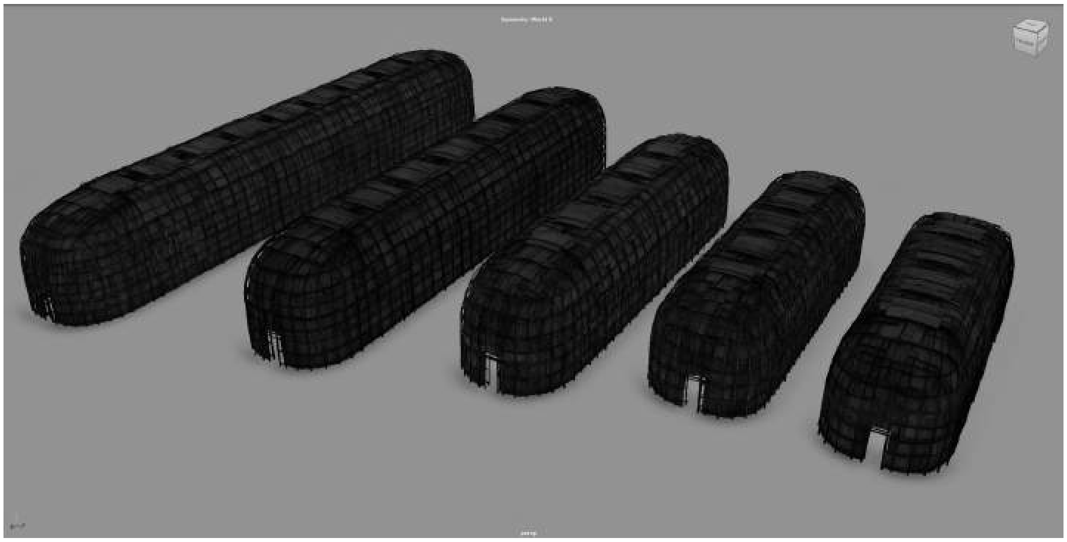
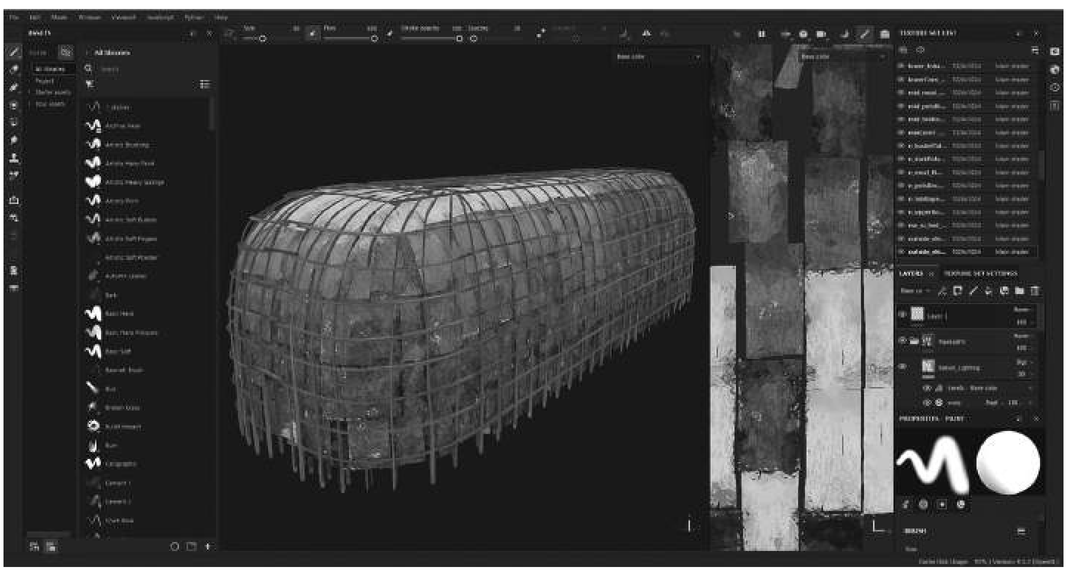
The convergence of archaeological knowledge, architectural insights, and videogame production technologies has catalyzed groundbreaking advancements in the reconstruction of indigenous settlements. Drawing from meticulous archaeological findings, scholars piece together the layout, materials, and cultural nuances of these ancient communities. Architectural insights lend depth, helping recreate structures with precision, while considering environmental factors and social dynamics. Videogame production technologies then breathe life into these reconstructions, offering immersive experiences that transport users into the heart of these settlements. Through collaborative efforts, these disciplines intertwine, fostering a profound understanding and appreciation of indigenous cultures, their way of life, and their enduring legacy in history.



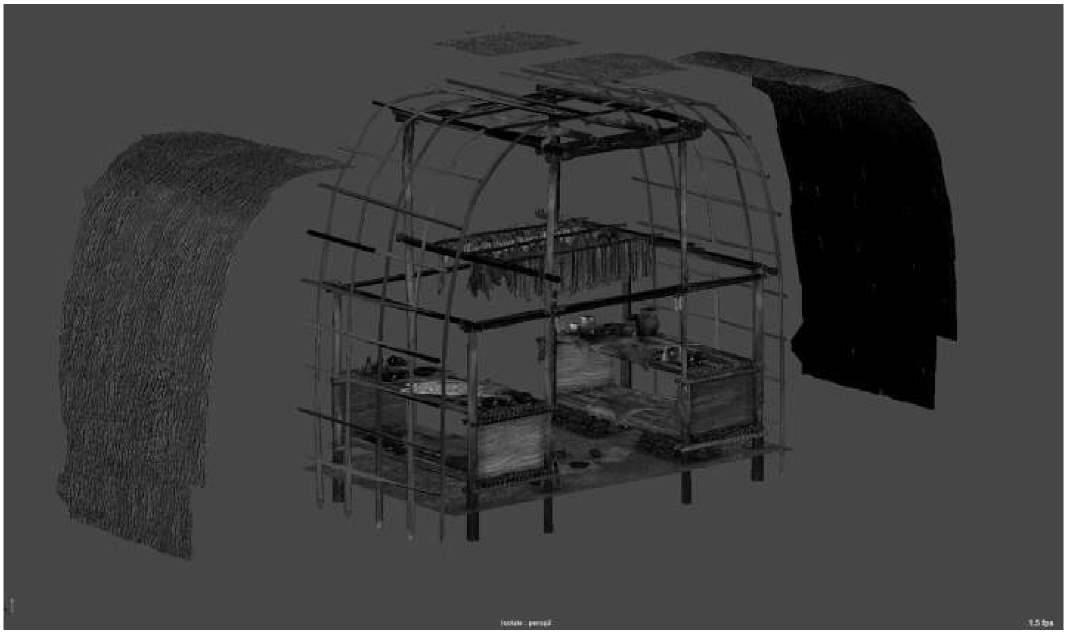
▶ **Long Description for Figure 2.5.1**

Figure 2.5.1 Procedurally Generated Longhouses Ready for Unreal.



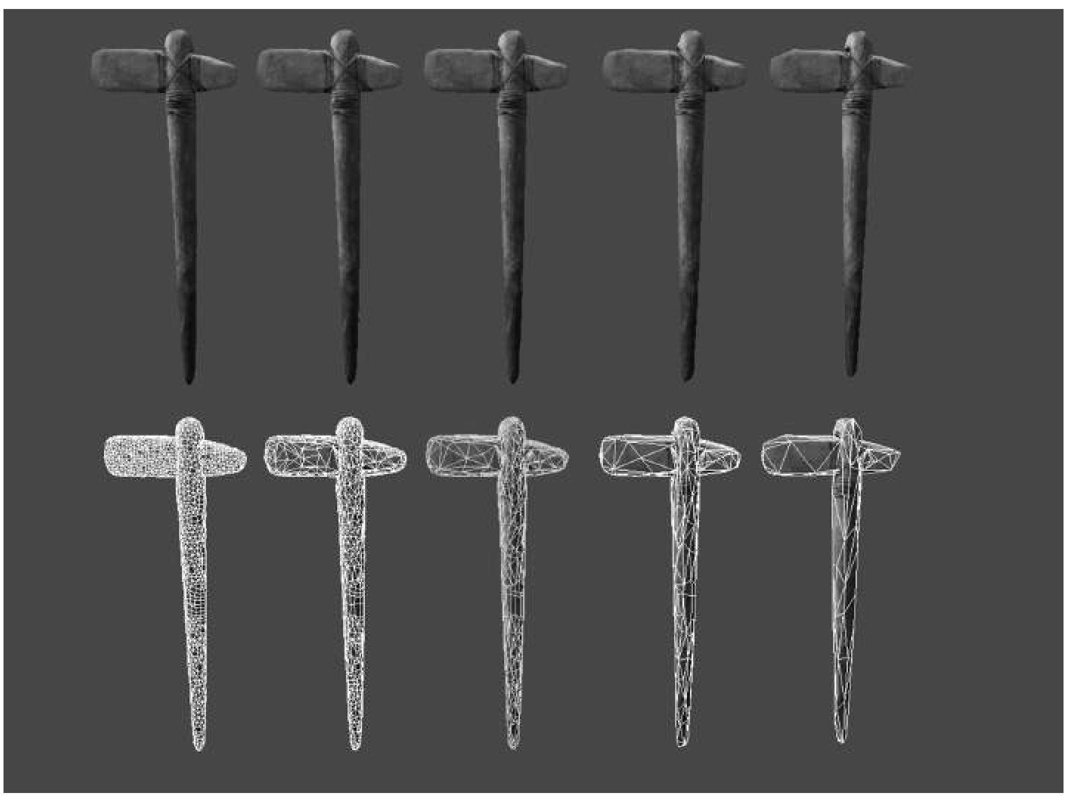
▶ **Long Description for Figure 2.5.2**

Figure 2.5.2 Texture Enhancement with Adobe Substance.



▶ **Long Description for Figure 2.5.3**

Figure 2.5.3 Exploded View of Longhouse in Maya.



▶ **Long Description for Figure 2.5.4**

Figure 2.5.4 Detailing with LOD Workflow in Maya.

▶ **Long Description for Figure 2.5.5**

Figure 2.5.5 Environmental Reclamation of Longhouse (image courtesy of Vivian Kinuthia).

▶ **Long Description for Figure 2.5.6**

Figure 2.5.6 Environmental Reclamation in Game Context.

Chapter 3
Production Technologies

The chapter delves into the increasingly intertwined relationship between architecture and videogame praxis, exploring how innovations in one field inspire new paradigms in the other. It focuses on the integration of emerging technologies like laser scan point cloud models and photogrammetry in architecture, emphasizing their role in creating accurate virtual representations of buildings and urban environments. These tools offer visualization benefits and innovative workflows, particularly valuable in heritage projects. Digital models enable interactive perspectives of the past and facilitate virtual and augmented reality applications, revolutionizing building envisioning and adaptation. The narrative traces the evolution of "digital twins" and highlights their transformative potential in architecture, especially when integrated with videogame technology. Through the Mechanics-Dynamics-Aesthetics framework, videogame–inspired digital twins enhance building engagement and optimization, overcoming usability challenges and shaping the future of architectural visualization and design.

3.1

Past Present Future

The Emerging Use of Digital Tools in Heritage Architecture

Zak Fish

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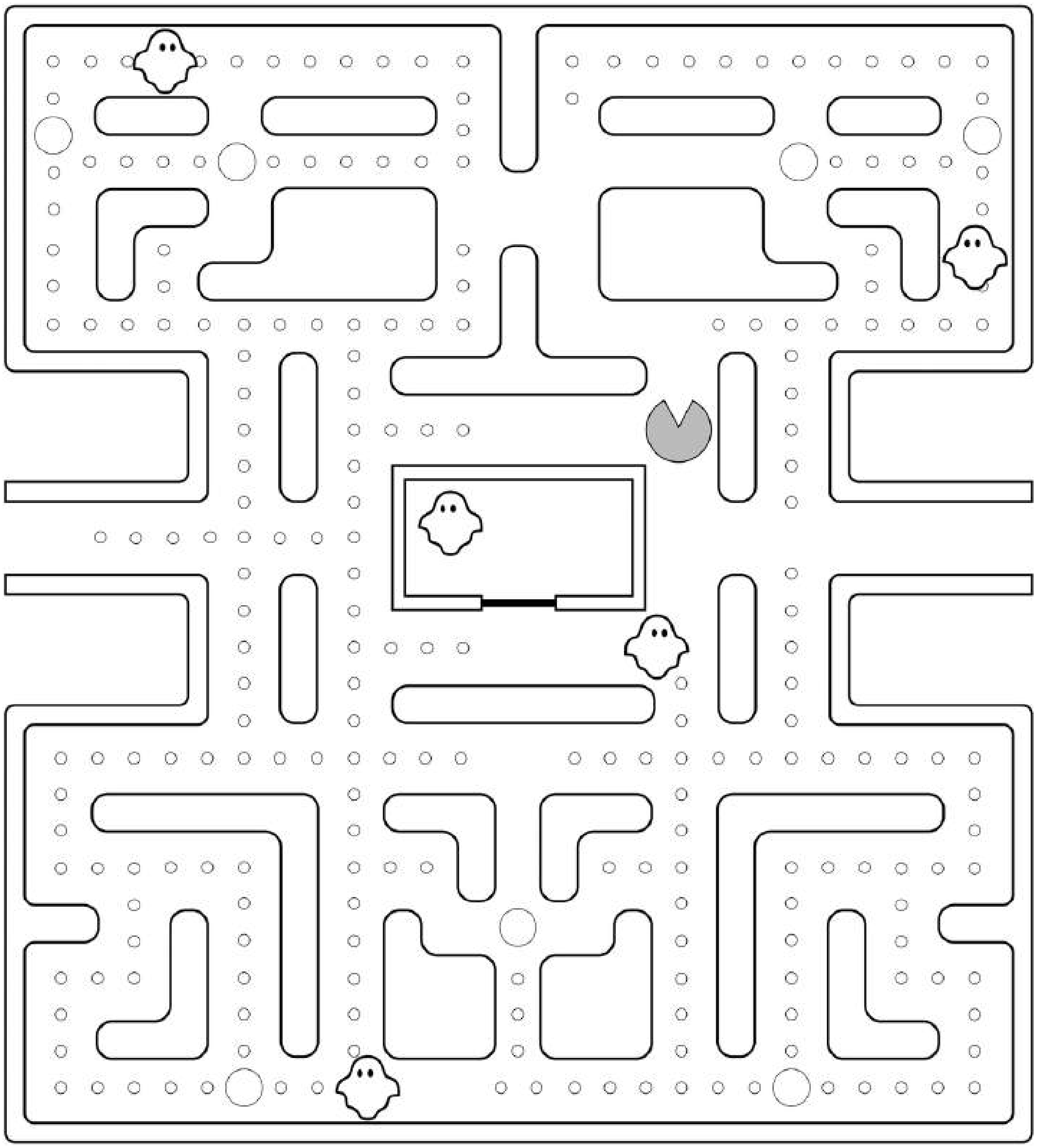
From Past to Present

> Tools provide possibilities, from these possibilities we discover advantages, advantages become a convenience, and convenience can too easily become a convention. There are alternatives: rather than supporting just the more efficient execution of conventional tasks, tools can encourage new ways of thinking. The creative use of a tool should include opportunities for the designer to embed his own design logic within that tool. Such customization should be recognized as a key aspect of design creativity.
>
> – Robert Aish (2011)

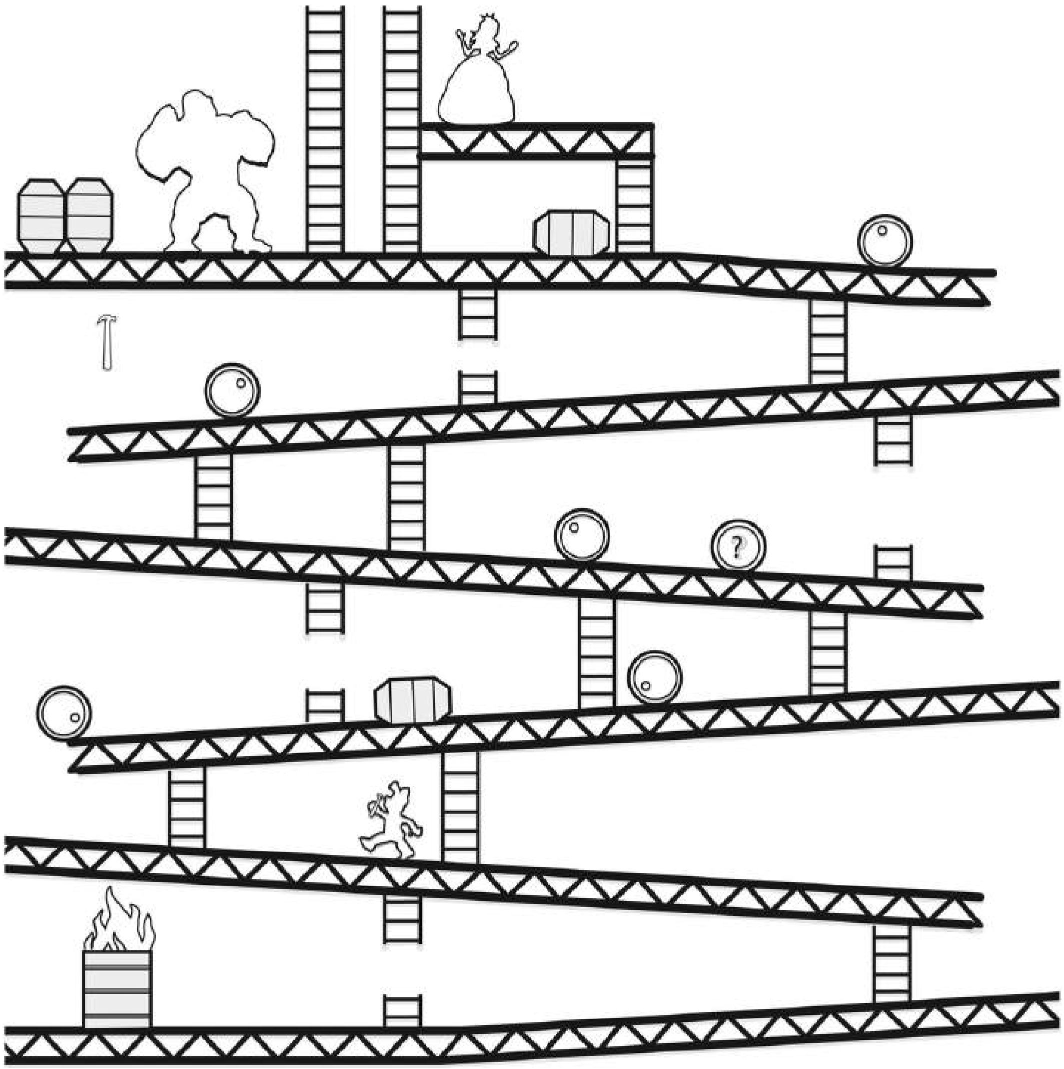
Historically, architectural drawings act as simplifications of the built reality comprised of abstract lines to convey intentions and instruct builders. Today's modern architect is an evolution of the master builder. In past centuries and in ancient times, construction was a more collaborative process, where much was left for the tradesmen, carpenters, masons, and sculptors to fill in the blanks with their own imagination. While architects can sketch three-dimensionally (axonometric/perspective drawings) to convey their intent, the most efficient way of illustrating concepts for construction are two-dimensional: plan, section, and elevation. The practice of architecture has existed for thousands of years, and so it is only natural that it should shape the very recent advent of videogames. More interestingly, now the inverse is also true. With the world of gaming growing out of its infancy and maturing into a multi-billion-dollar industry of its own (Beatie 2021), the technology around gaming is now influencing the practice of architecture. Although not common in the industry yet, we can already see that the use of these emerging tools has significant value in the documentation of existing buildings in historic architectural practice.

Like all great industries, videogames have a humble beginning. Limited by the technology available at their inception, many early games can be seen to resemble architectural abstractions due to the design constraints of small pixel grids and graphics cards. The now iconic maze of *Pac-Man* (1980) (Figure 3.1.1), for instance, is designed using a classic architectural plan with simple lines that denote walls and determine movement within the game, while in *Donkey Kong (*1981), Mario climbs ladders and jumps across beams in an environment that resembles an architectural section/elevation (Figure 3.1.2).



▶ **Long Description for Figure 3.1.1**

Figure 3.1.1 Pac-Man Plan (Image courtesy of Justin Lieberman).



▶ **Long Description for Figure 3.1.2**

Figure 3.1.2 Donkey Kong Section (image courtesy of Jake Levy).

The advancing worlds that game designers are creating progress with computing and graphic capabilities. Compare *Frogger* (1981) to the modern mega franchise of *Grand Theft Auto* (1997–present). In *Frogger*, players move a frog across a busy street dodging cars and obstacles within a limited two-dimensional plan format. With the exponential growth in graphics cards and computer processors, now, entire three-dimensional cities are imagined in game franchises like *Grand Theft Auto*. In such games, players can not only cross a street, but also drive cars, enter buildings, and interact with the surrounding world. This allows the game to move beyond skill alone as a driving force and allows for narrative, creating agency within the game for players as well.

These same technological advances have also made possible evolutions in the trajectory of architecture. A generation of "starchitects" like Daniel Libeskind and Zaha Hadid have subsequently been empowered to bring their imagined deconstructivist 3D forms to life. Frank Gehry famously adapted CATIA (computer-aided three-dimensional interactive application) software pioneered for the aerospace industry to construct the complex structural forms he imagined through models of folded paper and cardboard. While Gehry promotes himself as an artist who does not use computers to design, his office became a leader in the industry after their contractor tried and failed to create the undulating forms of Gehry's pavilion at the 1992 Barcelona Olympics. CATIA, which was first used in 1977 to design the Mirage fighter jet by French manufacturer Dassault Systems, was adopted by Gehry's office in a joint effort with IBM for the purposes of realizing Gehry's forms in the built environment. This partnership allowed Gehry to deliver the Barcelona project on time and on budget (Chang 2015). His later success with these techniques on The Guggenheim Museum in Bilbao and the Walt Disney Concert Hall in L.A. led to the founding of Gehry Technologies to share their expertise with other architects in a transformation of the industry.

While the post-modern ideas of deconstructivist architecture may have come from traditional methods like sketches and sculpture, they required technological advancements to construct their visions at grand scales. Initial computer-assisted drawing, or CAD software, mirrored hand drawing, with the benefit of making it more efficient through tools like copy/paste. CAD and 3D modeling software, along with a plethora of other advancements are empowering architects and builders to dream bigger and fabricate even more fantastic forms. Such advancements run parallel to the profitability and proliferation of the videogame industry.

There are many similarities in the creation of schematic architectural design images and first-person videogame type software. For example, the methods to virtually recreate Notre Dame Cathedral, either for architectural research or for the *Assassin's Creed Unity* (2014) videogame, follow a similar approach. Three-dimensional geometries are modeled and then textures are applied to the model's surfaces. The models are then illuminated and rendered creating shadows and depth. In a videogame these spaces are populated with monsters or characters to define the game experience. In architecture, they are more commonly used to make two-dimensional images, photoshopped with ordinary people in a realistic context.

Within architecture, flythrough animations are used to generate materials for competitions or design presentations that move a client through a virtual model of a project proposal. In an architectural animation, the choice to turn right or left down any given corridor is used to tell the narrative of how people are expected to move through the building and sometimes is done pragmatically to avoid rooms that have yet to be fully designed or modeled. These editorial choices are also seen in the virtual worlds of videogames. Unlike architecture, videogames are free to ignore real-world problems like mechanical closets and may completely disregard whether an interior space of a room even remotely aligns with the scale of the structures as depicted on the outside. Like architecture, games also make these decisions for the purpose of storytelling, with a focus on enhancing the users' experience.

Within architecture, storytelling is not by any means a new idea as architectural competitions and presentations to clients have long been a part of the practice. What has changed over time is the medium through which the story is told. Renderings and vignettes that were previously done by hand are now digitally rendered and photoshopped. Models that were once made of wood and cardboard to show three-dimensional concepts are now more commonly expressed through digital animations. This is not to say that hand drawings and physical models do not lead to successful contemporary projects, but their everyday use is being supplanted by the same graphic technology that has replaced the pinball machine with the virtual arcade.

Present day workflows in typical architectural offices are not currently using much of the advanced design technology that Gehry's office has pioneered, let alone augmented reality (AR) or virtual reality (VR) innovations. While it is likely that this technology will someday be seamlessly integrated into architectural practices and the use of such tools will be effortless, at the time of writing, the use of 2D AutoCAD is still common practice in the industry. Today's 2D CAD drafting has remained largely unchanged from its predecessors from four decades ago—not dissimilar from the maligned lack of advancements in text editing software like Microsoft Word. Functions have been added, commands replaced with buttons, and graphics improved, but the core software remains fundamentally unchanged. Although still lagging behind the forefront of pioneering offices in the industry, more recent years have seen a shift in general from 2D CAD to the next generation of software known as building information modeling (BIM) in more and more commercial offices. What makes BIM novel is that it adds layers of information and data to the digital models as they are drawn. One no longer draws two lines to represent the inside and outside of a wall but instead draws using a wall "component" that has a height, thickness, and material associated to it. This type of 3D BIM software (such as Revit or ArchiCAD) are conceptually different ways of drawing from their 2D predecessors. Much like modeling a home in the videogame SIMS (2000–present), or *Animal Crossing* (2001–present), users pick components, adding in furniture and elements from 3D libraries.

The next generation of architects are growing up as digital natives, playing 3D videogames, and are fluent in its language as a result. Only now, are we starting to see a shift where the more recent architecture school graduates are trained in these three-dimensional software platforms instead of their 2D CAD predecessors or the analogs of hand drafting and physical modeling that existed before the proliferation of computers. It has taken time for the use of 3D BIM software to become commonplace, but it is being widely adopted across architectural offices to a point where proficiency in BIM is becoming a prerequisite for employment. These 3D BIM applications have the capabilities to interact with laser-scanned point clouds and to export to augmented reality or virtual reality platforms; however, this next evolution within the technology has yet to truly take off within in the profession. Although the promise of next-generation technology is there, where one can wear AR headsets to view construction sites or walk through a building before it is built, the cost and time of using such technology limits its applications to only the largest projects that have big enough budgets to afford such tech-savvy design implements.

The major impediment to the rapid adoption and implementation of cutting-edge technology is that the architecture, engineering, and construction industry generally operates on very thin margins. Unlike in videogames, clients are not paying for drawings or digital models, but for the resulting building they wish to occupy, sell, or lease. For the average home or mid-sized building in North America, architects fight to even be involved as projects below a certain size or legal classification can be built by developers or contractors directly, without an architect in the process at all. These economic pressures force architects to propose tight fees to compete within the industry over design projects. The typical design team spends their time and energy on creative design ideas to push their portfolio of work forward and the advancement of technology in this environment is only achieved when efficiency and cost-saving measures can be made or justified. This was true for Frank Gehry and is true today for the average architecture office's adaption of 3D BIM software. AR and VR by comparison are still largely out of reach to the average firm.

From Physical to Digital: The Scanning Process

Along with the advancement of modeling, rendering, and fabrication software, emerging technologies such as photogrammetry and laser-scan point cloud models are increasingly being used to create virtual representations of the physical world. These tools allow architects, contractors, and stakeholders to digitally recreate what exists, before imagining what could be. At the intersection of the tangible and imagined, these tools have value beyond visualization. The added strength of these technologies lies in the accuracy of their representation and the potential for new ways of working. Although the present cost limits their use in everyday construction, there will come a time when the digitization of the built environment will be commonplace in the industry. This advanced technology is finding increasing value in heritage architecture projects where working around and within the details and nuances of the existing structures is of central importance to the project. More importantly, to accurately draw or recreate existing architectural details using standard methodologies proves to be both time consuming and cost prohibitive enough to justify the costs associated with using the more advanced technology.

Architectural reuse, rehabilitation, and conservation requires a comprehensive understanding of existing buildings and the urban environment. In new construction, if a building is off by an inch or two it typically does not matter. The level of tolerance required on an open green-field site is significantly lower than when existing structures are involved. On these projects, the alignment of new walls or floors with existing ones becomes imperative because even the slightest differences can be perceived when not done correctly.

In my work at ERA Architects, point clouds prove to be a valuable tool in developing accurate drawings. In addition to architectural design work, ERA Architects frequently collaborates as a heritage consultant with a diverse range of firms and organizations on a broad spectrum of projects across North America. Heritage projects are typically very complex within the context of local bylaws and regulations, and in the consideration of appropriate materials and conservation techniques. In the reactivation, conservation, and adaptive reuse of heritage buildings, the level of detail and emerging capabilities of laser-scans have come to be increasingly helpful and valuable.

Traditionally, the renovation or adaptive reuse of historic or existing buildings begins with site measurements done by hand using tape measures and pens, later translated into CAD or BIM. These drawings and models are often further aided through the tracing of archival drawings or building permits that were used to construct the existing structures. There can be considerable time savings and knowledge learned from reviewing archival drawings, but they often do not capture subsequent renovations or changes to the building that may have been made during construction. Taking site measurements too can be quite challenging as walls are often not perfectly square; such is the case whether it is from the original construction, or if they have fallen out of plumb, bowed, or sagged with settlement and time. Part of our role as heritage professionals is to identify and investigate these irregularities, which may require multiple site visits to document and discern. This back and forth, as well as subsequent drawing adjustments, takes time, impacts efficiency, and can influence the outcome of what gets built. These reasons are why the next generation of technology is proving most impactful and cost effective in the heritage context, where additional time and investments in software, scanning and modeling upfront can more than make up for the costs, headaches, and delays in subsequent phases of a project.

The benefits of this technology are especially seen on larger projects, where accurate three-dimensional surveys are used by architect and contractor alike. This is exemplified by ERA's collaboration with GEC Architects in the transformation of the University of Alberta's historic medical building into a new mixed-use University Commons.

The initial 3D model of the University Commons (Figure 3.1.4) is drawn using archival drawings from the 1930s (Figure 3.1.3) and subsequent renovations in the 1980s (Figure 3.1.5), which are overlaid onto a recent 2D survey. To help advance this complex project, we use laser-scanned point clouds in a new drawing workflow.

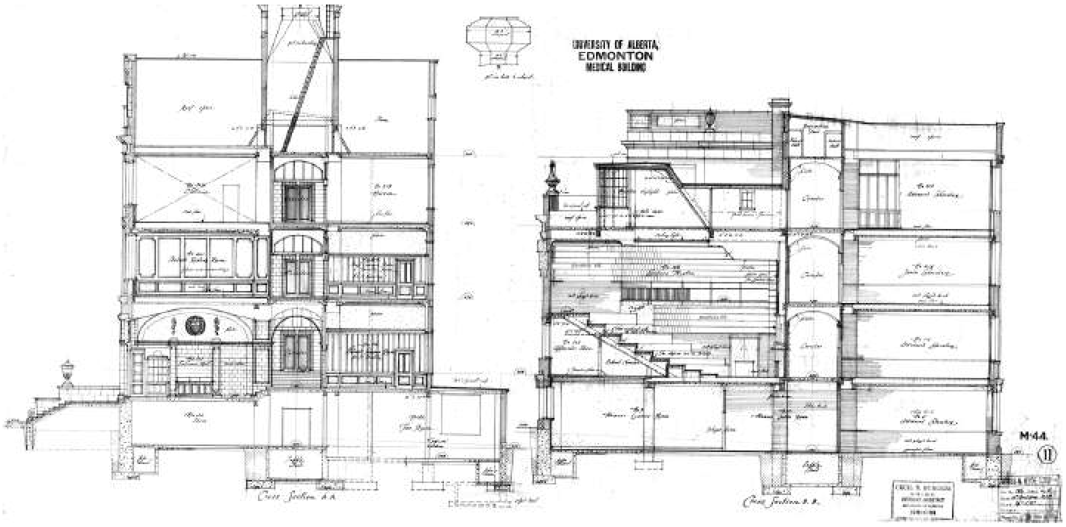


Figure 3.1.3 Archive drawing. University of Alberta, Medical Building. Percy Erskine Nobbs Fonds, John Bland Canadian Architecture Collection, McGill University Library.

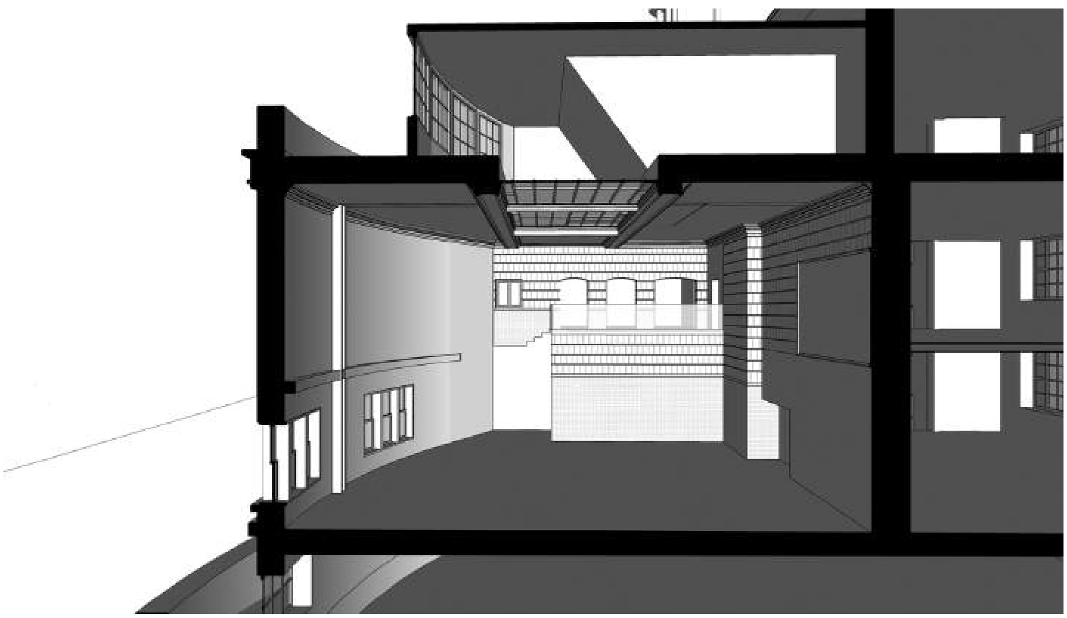


Figure 3.1.4 Concept model. University of Alberta, University Commons. ERA Architects.

Figure 3.1.5 Built photograph. University of Alberta, University Commons. ERA Architects.

The process begins by setting the requirements and commissioning the scan (Figure 3.1.6: Step 1). This includes specifying the level of detail, accuracy, and fidelity required for the buildings to be scanned. This is also when it is determined if the scans are to be done in color or black and white, as well as image and file output types. Meetings on site are often needed to identify rooms or architectural elements and features that require specific attention for documentation, such as parapets, cornices, and ornamentation. The costs of this work have come down significantly in recent years, allowing our team at ERA to purchase our own Light Detection And Ranging (LiDAR) scanner. Currently, the most common and accurate scanners for this type of work are terrestrial scanners. They involve the use of tripod-mounted cameras with integrated sensors that can include LiDAR, infrared, or other technologies. Each scan takes several seconds or minutes to complete, depending on the level of detail required and the speed of the camera itself. The scanners capture through line of site and need to be moved around to document the various faces of a building. This takes time to avoid interference from objects such as trees or furniture that block views of the elements being scanned, while ensuring there is enough overlap between scans for all the image data to be stitched together. Each scan location is then combined using software in a process called registration.

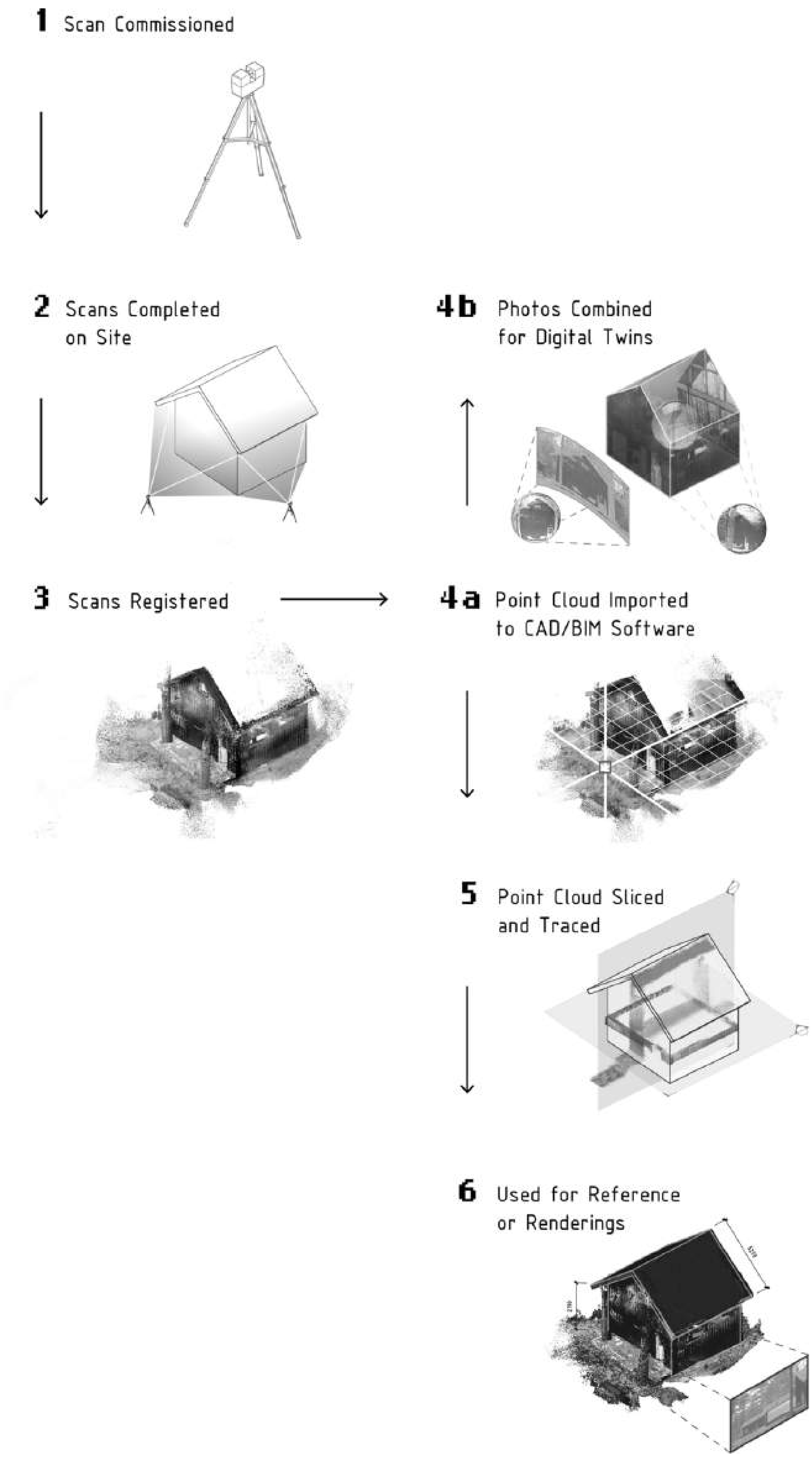

1 Scan Commissioned
2 Scans Completed on Site
3 Scans Registered
4a Point Cloud Imported to CAD/BIM Software
4b Photos Combined for Digital Twins
5 Point Cloud Sliced and Traced
6 Used for Reference or Renderings

Figure 3.1.6 Architectural scan process workflow.

Using AI technology, 360-degree photos from the registered scans can be stitched together to create "digital twin" models that are now commonly used by realtors (Figure 3.1.6: Step 4b). These "digital twins" allow for virtual walkthroughs where one can view high-resolution photos of the space, much like moving through a first-person videogame. In the architectural context, these digital models are mostly used for reference when modeling, to develop condition assessments of the building, and to better understand the existing spaces.

Separately, the LiDAR data is used to generate point clouds that can be imported into CAD or BIM software and aligned with existing surveys and drawings (Figure 3.1.6: Step 4a). The point clouds can be used for renderings and graphics, or traced within the CAD/BIM software to generate accurate models and drawings. To draw and model from point clouds, the 3D information is reduced to thin "slices" in plan, section, and elevation, to assist in tracing in the X, Y, and Z axes (Figure 3.1.6: Step 5). Once tracing is completed the point cloud file is used only to verify dimensions throughout the design and construction process (Figure 3.1.6: Step 6). This is due to the large and graphic-heavy nature of the files, which can be painfully slow to navigate.

Information from point cloud scans allows for drawing and modeling to be refined with a precision not previously possible using older methods. For the University Commons project in Edmonton, Alberta, this not only contributed to more accurate deliverables, but also allowed our team in Toronto to take measurements and make decisions with confidence from 3,000 km away. This was even more useful at the time, due to travel restrictions imposed on site visits during the COVID-19 pandemic. Incorporating these digital scans was no small feat and did take considerable time to put together. The point cloud itself was made up of over 300 individual scans taking several months to register and process. On this project, the extraordinarily large file size, in combination with the time taken to produce the point cloud, limited our team's usage of the model to construction documentation phases of the project. As this technology advances and becomes easier to use, it will become less cumbersome and easier to apply its functionality throughout the architectural process. This will open new possibilities for other applications and uses as well.

For example, mobile LiDAR scanning apps are now available for use with smartphones and can quickly document existing site conditions at low cost. As LiDAR cameras become integrated into mobile phones, there is now a blurring of boundaries in the professional tools that architects use and what is readily available in the palm of your hand. Similarly, people used to have to go to arcades to play games like *Tetris* on comparatively massive machines. Now the same games are readily available on handheld gaming devices and smartphones alike. While the race is on for more advanced mobile computing to include virtual and augmented reality, today's LiDAR scanning phone applications allow opportunities for impromptu explorations, albeit with limited capacities. Just as mobile games may differ from their original console counterparts, both good and bad, LiDAR phone applications lack the sophistication and graphic and processing power of dedicated devices, even if they are less cumbersome.

Although not as accurate as terrestrial scanners, mobile LiDAR scans do have their benefits due to the accessible nature of the technology. In my personal experience, mobile LiDAR showed real value as a tool for a remote home on Saugeen First Nation near Sauble Falls, Ontario, Canada. The work was only possible due to the speed and ease afforded by the mobile technology. In a few hours, and using only my phone to create the scans, I was able to produce a study to help the client better understand the feasibility of joining two existing buildings together. A simple point cloud allows for quick analysis of the existing structures, including the floor and roof level alignments, as well as the location of nearby trees. The end result produces both a timely and low-budget investigation of how the structures could be connected with minimal impact to the existing buildings and the natural environment (Figure 3.1.7). By comparison, traditional drawing methods of the past would have taken days to accurately produce similar results.

Figure 3.1.7 Schematic study using mobile phone LiDAR scan. Sauble Falls.

Alternate Realities: Trajectories of Heritage Architectural Praxis

When work on Mirvish Village in Toronto began over a decade ago, ERA used photogrammetry to document 24 historic buildings that are being incorporated into a new mixed-use development (Figure 3.1.8). Completed before the proliferation of scanning technologies, the photogrammetric drawings were done without the use of LiDAR or other complex sensors.

Despite lacking the panoptic views of the digital twins and point clouds used today, the accuracy of this initial documentation has been a significant help throughout my years working on the retention and conservation of these Victorian-era homes. In the last half century, these houses have been adapted into galleries, restaurants, stores, and offices.

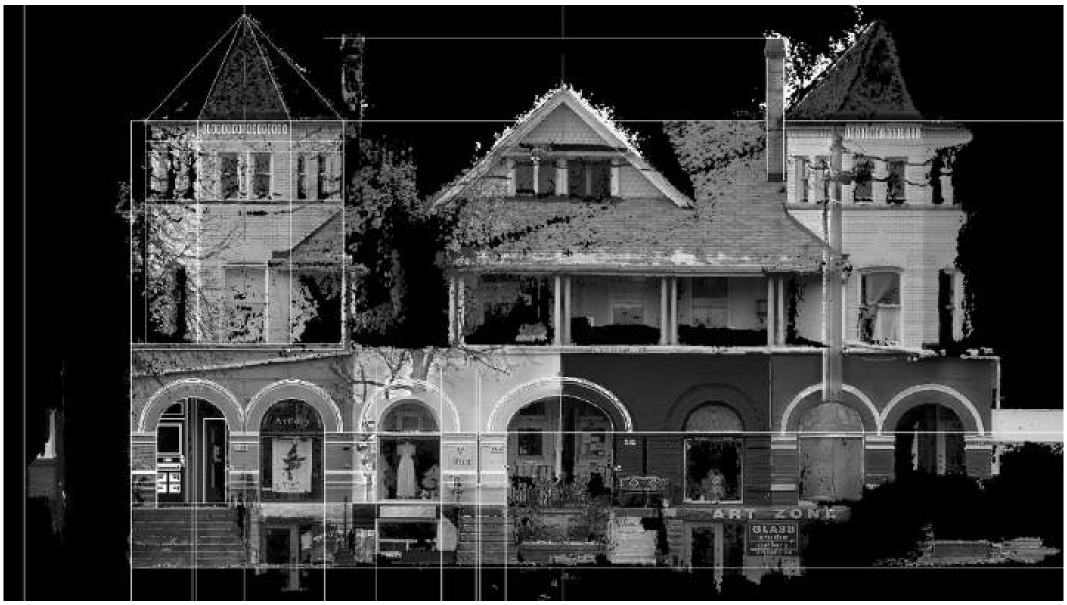


Figure 3.1.8 Photogrammetric Tracing. Mirvish Village. ERA Architects.

These photogrammetric models also serve to capture the neighborhood at a moment in time, when the buildings had been painted different colors by each of the various tenants who had subdivided the once residential homes into commercial uses. The use of vibrant colors on the building façades dates to the 1960s and is seen as a unique character defining attribute of the neighborhood’s history, differentiating it from the architecturally similar but unpainted Victorian homes in the surrounding area. Today, as construction on the development is progressing, the layers of paint have been stripped away to restore and repair the brick and stone masonry in preparation for the new development. In this unpainted state they more closely resemble the 20th-century homes as they were originally built over a century before (Figure 3.1.9). As construction comes to an end and tenants return, the buildings will inevitably change again as they evolve with new uses and users alike (Figure 3.1.10). While scanning technology is a powerful tool in capturing the conditions of the built environment, these documentations are static, representing frozen moments in time. In heritage architecture, there are constant debates in the conservation of buildings as to what period any given building should be restored to. Should they be brought back to the original date of construction in the 19th century or to a time after a significant renovation in the early 20th century? Or, as in the case at Mirvish Village, is their more recent transformation into an artistic and commercial enclave more apt and inspiring? The role of the architect is to project new designs and alternate realities, for owners and occupants to adapt and breathe life into them, much like game designers who create worlds for users to play and get lost in.

Figure 3.1.9 Construction Progress. Mirvish Village. ERA Architects.

Figure 3.1.10 Rendering. Mirvish Village. Tandem Studios courtesy of Westbank.

Assassin's Creed Unity made headlines in recent years for its highly realistic depiction of Notre Dame Cathedral in Paris. The game designers animated it with such immaculate detail that, following the destructive fire of 2019, much conjecture was made that the models and renderings of the game could also be used to recreate the church. That did not become the case because the artistic license of game design comes at the cost of true historical accuracy. French law also came into play as much of the artwork within the cathedral has copyright restrictions. These included the organ, sculptures, and stained glass (de Rochefort 2021). While the look and feel were preserved by the game designers, modifications were made as needed to avoid, of all things, copyright infringement. With these issues at play, it is understandable that the fidelity of the videogame model would not be accurate enough to aid in the reconstruction efforts that require precision to the millimeter. Videogames saving architecture? Not yet.

Before we attempt to recreate the past, we must ask if we even should. The decision to recreate and repair Notre Dame to how it was before the fire did not come without fierce debate amid much speculation and reimagination of what it could be.

At a smaller scale, I have worked at ERA Architects on the commemoration of St. Thomas Ontario's Alma College, which was also tragically lost in a fire. After the once prestigious private girls' school closed, it was abandoned for years as it awaited a new use.

In reimagining lost or damaged structures like Alma College, we ask not only if it *can* be recreated as it was but also if it *should* be recreated as it was. What seems like a simple question at first reveals a series of questions that prove more complicated and nuanced than one might think. Can the original materials be reused? Can new materials be used to replicate what was lost? Should it be reinterpreted in other materials to reference the past, or should it be recreated at all? Is the building even going to be used for the same purpose moving forward as it was initially designed for? In rebuilding lost or damaged structures, it is the architect's responsibility to determine *what is of value?*

When Alma College's grand halls burned in 2008, a LiDAR scan was commissioned to document what remained before demolition, in the hopes of rebuilding anew. Unlike Notre Dame, most buildings do not have the good fortune of being highly studied and laser-scanned before damaging and destructive events occur. As the majority of the structure at Alma

College was lost, viewing the scans within the point cloud software more closely resembles the World War II installments of *Call of Duty* (2003-2006), or the post-apocalypse landscape of *Resident Evil* (1996–present) than they do of an actual building.

Figure 3.1.11 Alma College after the fire - LiDAR Model Screenshot. Zak Fish courtesy of The City of St. Thomas.

These scans not only capture the details of the remaining brick, but also of the forensic police cars that patrolled the heartbreaking scene. Although the scans did not capture all that would be required to recreate the building as it once stood, they have been a captivating tool in our work to commemorate Alma College. Archive drawings of the building leave much left unsaid in comparison to the scans that capture the texture of the brick and mortar to the millimeter. While photographs from old school yearbooks are helpful, they do not compare to the three-dimensional capabilities that a LiDAR scan encapsulates. Although Alma College no longer stands today, it will soon be the new home to a much-needed residential community for the city. It is our hope that the scans taken of the building in its final days will be used to create a memorial to commemorate what once was.

To serve as a monument to Alma College's historic past, our team at ERA proposed a memorial tower at the center of the new neighborhood. One option being considered is to construct the monument using metal panels, perforated with patterns generated from images of the LiDAR–scanned building from before its demolition (Figure 3.1.13). This presents an opportunity to look through what once was, into a future of possibilities of what can be. What form the structure ultimately takes, however, will be shaped by the complexities of reality. There will be constraints of budget, fabrication techniques, and consultations with the community. Unlike videogames, *in real life* one cannot imagine worlds without also being grounded in reality.

Figure 3.1.12 Memorial rendering. Alma College. Zak Fish/ERA Architects.

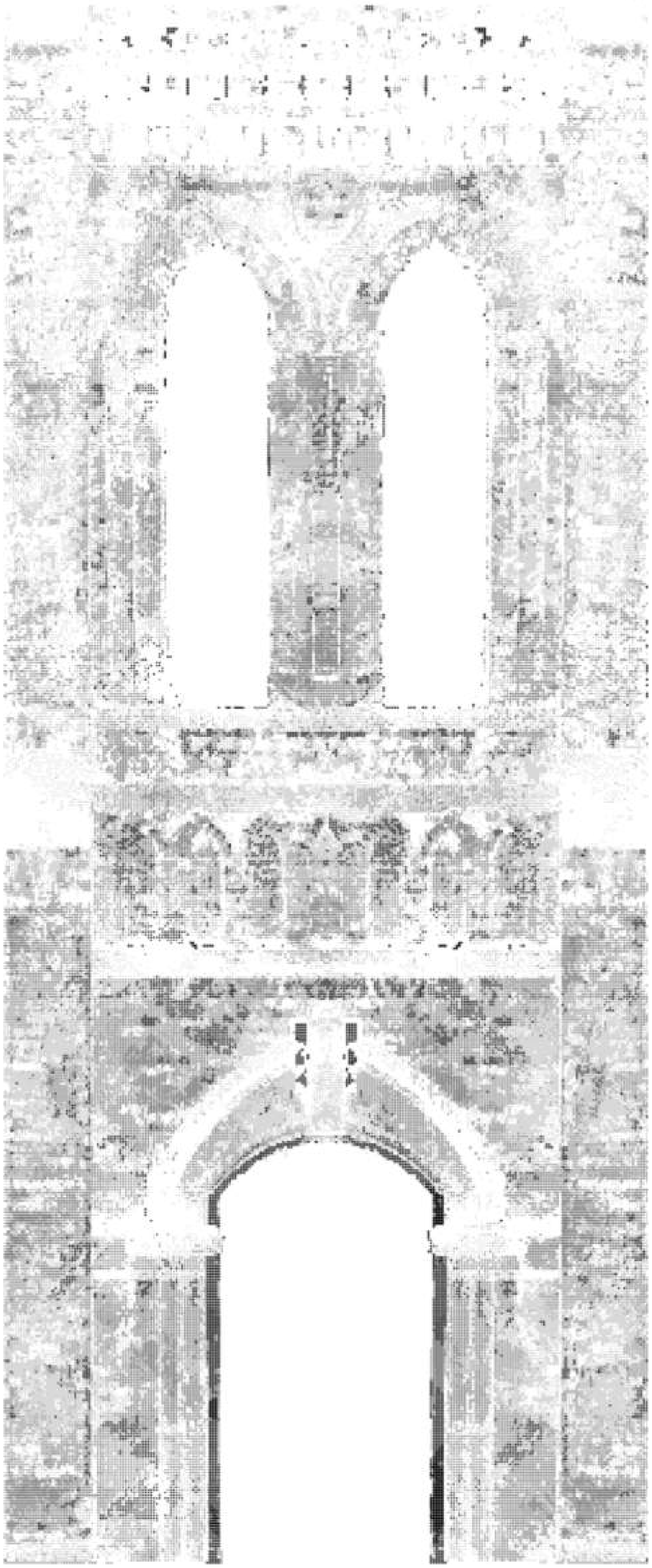


Figure 3.1.13 Detail of perforated panel drawn using laser-scan point cloud imagery. Alma College. Zak Fish/ERA Architects.

Videogames, on the other hand, offer infinite possibilities. With advancing technologies, new innovations are constantly on the horizon that promise unique experiences or hyper realistic worlds. It was not too long ago that *Pokémon Go* (2016) captured the world's attention. Using smartphones to augment reality, Pokémon were suddenly everywhere in the "physical" world. New hangouts were created in once empty parking lots and other obscure locations due to the "presence" of these virtual creatures.

Further parallels can be drawn in the disconnect between the exterior and interior of buildings in videogames and *facadism* in heritage architecture. Facadism is the practice of preserving the exterior façades of older buildings while constructing new ones behind it. It is often viewed as a compromise between the desires of the local community and developers. In efforts to maintain historic character and identity in rapidly densifying cities like Toronto and abroad, municipalities have emboldened heritage authorities to preserve the façades of designated heritage buildings, while permitting the construction of towers and stadiums of vastly different forms beyond the retained walls. Confronted with conflicts between a building's historic uses and the intended program of the new ones, architects are forced to make hard choices. One of the most problematic examples of this practice is when the structural concrete floor slabs or sheer walls of a new building bisect the windows of the historic façade, perverting their original intent.

The dissonance that heritage professionals can face with this phenomenon challenges even the radical forms of Bjarke Ingles Group (BIG) and Frank Gehry himself. Both architects brought grand designs to a stretch of King Street in Toronto's historic fashion district, known for its factories of post-and-beam structures and brick façades. BIG's initial vision of a pixel mountain designed with his iconic Danish Lego motif (Figure 3.1.14) and Gehry's classic dancing forms went through an iterative design to address the City of Toronto's desire to retain more existing heritage fabric of the neighborhood. Through this process, my colleagues and I at ERA Architects had the privilege of working with both architects at this intersection of modern design, technology, and heritage, in a negotiation of form and civic function. In the conservation discourse, creative solutions are often needed to address the contemporary challenges of city building.

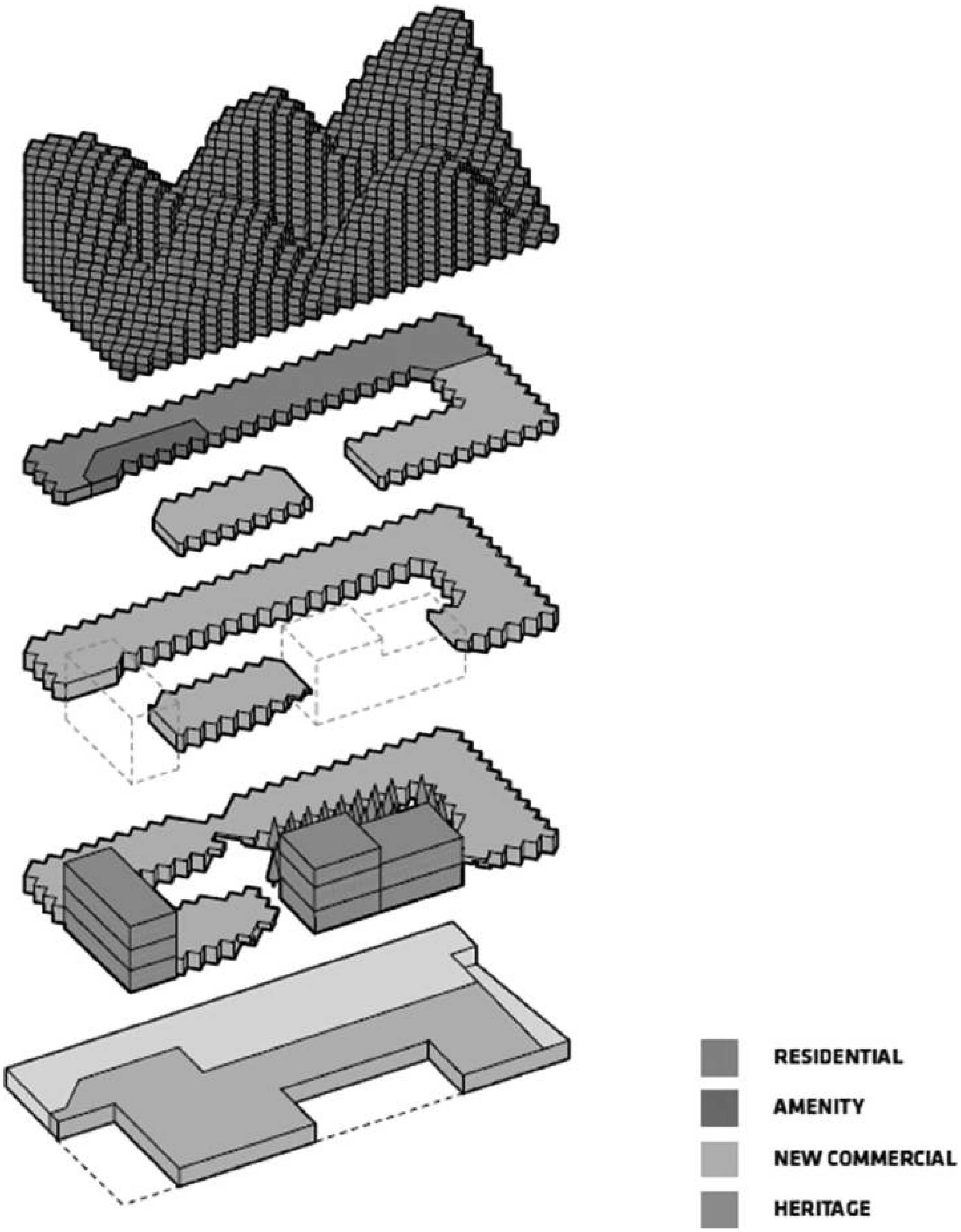


Figure 3.1.14 Programming concept with retained heritage buildings highlighted in orange. King Toronto. Bjarke Ingles Group (BIG).

Ultimately, BIG and Gehry were able to adapt their imaginative forms in a way that retained portions of the existing Victorian buildings (Figures 3.1.15 and 3.1.16), which they had originally intended to demolish.

Toronto's urban fabric, which Gehry himself describes as "mostly banal" (O'Toole 2012), benefits from the addition of these sculptural forms, and their talented teams of designers have developed ways to find harmony in this conflict better than most. But buildings like these, most often designed without the circus of attention and controversy of award-winning designers, frequently have glitches of alignment between new structures and old. When done poorly, facadism can yield bad compromises where visible tension between interior-design vision and whatever exterior façades were retained produce an end result as jarring as a glitch in a videogame.

Figure 3.1.15 Rendering. King Toronto. Hayes Davidson courtesy of Westbank.

Figure 3.1.16 Construction photograph of heritage façade retention. King Toronto. Zak Fish.

168 Upper Street by London-based studio Groupwork can be seen as a critique of such practices (Figure 3.1.17). Like traditional conservation

projects, they developed a digital model of a 19th-century Victorian building that was bombed in the Second World War. Their drawings of the lost building were made from archival photographs and LiDAR scans of other still existing portions of the building that mirrored its form. Their three-dimensional model was then used to robotically rout molds to cast the concrete forms of the exterior walls. However, in constructing their designs, they chose not to create an identical copy of the building as it previously existed. Instead, contemporary windows and doors were inserted to relate to the building's new modern use, and deliberate distortions were added, which resulted in missing and mismatched architectural details. They replicated what once was, but with "digital inaccuracies" that were selectively chosen at key points for structural, functional, and aesthetic reasons (Groupwork n.d.). These easter-egg–like glitches are not unlike what one might see running through a videogame of recreated London. This alternate reality evokes a city that is both real and imagined, departing from a static rebuilding of the historic façade. In this play of material and form, there is no mistaking it for a recreation of the past, as it acts as a critique of memory and reproduction.


Figure 3.1.17 Distorted Façade. 168 Upper Street. Chanel Dehond.

The shared language of the videogame industry and architecture is the digital model. As the technology for digital modeling develops, its impact is visible across both industries, each pushing the other in often unexpected ways. In architectural practice, these emerging digital models provide a new perspective of the past through an interactive lens to the future — one where users can walk through tangible-built environments and lost historic buildings without even having to leave their office chair. The potential to output to virtual reality or augmented reality allows users to see a building come to life before the foundations are laid. With endless possibilities in sight, we are now in a full-circle moment where the buildings that once inspired videogames are using the very same technology to envision and adapt the built environment of the future.

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3.2

Interview with Conor Black and James Ward

On Their Roles as Architect and Design Computation Specialist and Associate Director at Arup Architecture

Conor Black and James Ward

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What is the current state of the AEC industry and its relationship with videogame technologies?

CB

I have an architectural background, but then computer science degree on top. I sit in this bizarre pivot point between the architects in Arup and our technology group. So particularly when you talk about overlap, I am right at that sweet spot.

The way in which architects work in practice and industry, and the way in which videogame design teams work coming together is an extremely interesting time where we can use videogame technology like Unity Unreal, visualizations, interactivity, and data capture for wayfinding. From the industry point of perspective, it is really interesting. Take the type of team that we're formulating now — a coder, a graphics expert, maybe a texture expert might make up for the mini videogame team, but then you'll have the senior junior director architect as well working on a project. So when it comes to industry and practice, it's a fascinating overlap and mix that we are experiencing, and different expertise is pollinating the architectural world.

This type of practice is getting utilized more and more, particularly what we would describe as computational design, particularly London going outwards in Europe. You will see Foster and Partners, Zaha, who have computational design teams, where they have these oddities of people that are texture experts or shader experts or, just simple C-Sharp or C++ coders entering that space. That's always interesting because it's a stressful design process to be an architect, and a very different process to design a game, arguably.

Can you describe the visualization and simulation potential of gaming in the AEC industry?

CB

The really low-hanging fruit that came up quicker than AR was that of configurators — a combinatorial, permutational, interactive thing that enables potential clients to view design iterations or whatever the situation may be. We've done a few configurators here and there for big retail projects. We have seen lots of AR and VR being used. We're talking more about AR and digital fabrication, which is the interesting new one. It's not necessarily just about visualization. It may be that gaming technology might be just the vessel or the mouthpiece for clever stuff that we do in other situations. If we're doing complex optimizations, let's say, we ordinarily so far would do the optimization in MATLAB or some other software that's been around forever and then use gaming tech as the mouthpiece.

Then you go into a quantifiable simulation. Doing the quanta, then doing the calculation of the simulation in the game engine itself. So instead of having motion simulation or a CFD like OpenFOAM and then just showing it, doing those calculations in the engine with the point being that you could have interactivity in it, you can start manipulating things and then hit go. For example, smoke simulation or evacuation is something that we've looked into with our fire engineers. That's all about smoke visibility. That's all well and good doing inside the simulation. But in a game engine, you can physically see, or not see, according to the visibility counts that you do in the CFD. Then you can give that to fire departments, or you can design for better evacuation routes, safety, etc.

JW

What I find interesting about the gaming industry is the way that I don't think fidelity is such a big deal — it's actually playability. Like so many games that my oldest son still quite likes, for example *Roblox*, which you look at and think, wow, this really isn't that good. Then you play *Flight Simulator* or something and it looks amazing. You're sitting in a flight sim because I bought into it. You sit there in your plane and after a little while of flying through New York skyscrapers, you get a bit bored because it's like, well, okay, it's super high fidelity, but *Fortnite* is a lot better of a game, conceptually.

What you see in the computer gaming industry is when games like *Fortnite* are quite good is something like the real-world physics. When you move on something, the way you move is actually influenced by some sort of physics model. It is actually quite realistic. What we try is to direct the finite resources to those points in gaming where those resources are best spent.

So therefore it isn't about total fidelity, it's about what assumptions you can make so that you can pull out the tools that are going to give you a real benefit. But given the intuition, you can't really replace, at the moment.

Do you see anything that's on the horizon that would improve accessibility or interactivity?

CB

Yes, for sure. We will write about *"faking it*," and I have seen a lot with our façade engineers, particularly glass. It's not real glass, you're not getting the absolutely correct g value, the amount of light that's going through versus the light that's getting reflected. That's a great example of how we see faking. Another example is for the Heathrow consultation, when they were going to put another runway into Heathrow, they needed to do a public consultation. We did a load of acoustic simulations about what that would sound like for certain people in certain areas. We used the game engine to basically put them in the scene. There was an interface where they would interactively choose what airplane was coming over their head. They would listen to a calibrated decibel level of how it would sound. That's a great example of a bit of interactivity and also accessibility because a decibel number on a piece of paper doesn't really mean anything to anyone. Hearing it by itself means nothing to anyone because you put it on, it will sound loud no matter what. But if you hear it and compare the sound to a different plane or versus what it sounds like now, you really get a proper experience of it.

In terms of looking forward, obviously ML is everywhere, machine learning is what we're particularly interested in, particularly generative geometries. Because of the nature of the interactivity of game engines, having that interactivity with the computer itself is a really useful vessel. Generative geometries, using the computer as the designer, more of the creative element of it, is something that's on the horizon. We see things like shape grammars, which is seen more in academia, but there are opportunities present and particularly with architects and designing using grammars as opposed to its specific instructions as it were.

Game engines can bring in real data that can influence our simulations, allowing us to predict behaviors. For example, we have a lot of smart technology in buildings now that is recording occupancy data. When everyone's going to the toilet at three o'clock, we can start to predict behaviors according to pursuing profiles.

We have talked about how it is great to visually simulate design ideas that don’t necessarily follow the same rules of physics. What are some beneficial or detrimental impacts of videogames in architectural practice?

JW

I find it slightly frustrating when I see things like *Minecraft* that my son plays. In our computer games, your world is somewhat unbounded. A computer game world tries to make it easier and more accessible and tries to fix things in a sort of quite prescriptive way. In Minecraft, everything looks like a modulation of a block or a cube. So you actually have on some levels, enormous creative flexibility, because you can have millions of these cubes that make all kinds of things like ships and whatever you like. But in our world, particularly our mesh modeling tools, are almost unbounded in their creativity.

What I find incredible, particularly about the mesh tools and subdivision polygon modeling, is how you can just start with a simple polygon, and you can extrude the edges and smooth it off and build and build and build. You are not limited in your scope to imagine, within the constraints of the 3D model, obviously, but you are not limited. Then you think of *Roblox*, it is just astonishing how far you can push your imagination. The worry is that whilst my sons are pretty smart, it is going to ultimately be detrimental that people are going to look for easy tools. I am a great believer in a world of pushing people to use hard tools.

I worry that way of seeing computers keeps people in the easy. *Flight Simulator* is a quite successful game, but where it fails is due to it becoming too complicated and it becomes almost inaccessible to everyone, other than to a niche group of fairly geeky individuals who are actually interested in real-world flight. Whereas my sons don't really care about the real-world physics. They just want something that could fly through a canyon or shoot down onto other enemy fighters.

My worry is, are we going to breed a generation who is really good at this, but then possibly are capping the potential? When we played with LEGO, we were bounded only by the number of pieces we've got, but there's almost billions of different ways we could put them together.

CB

One is the ease of realism that you're getting from these things gives an implied completeness to whatever you're doing. In these game engines, it is very easy to get the realism out of them, which implies a completeness that might be misleading. I think it is sometimes dangerous, and that's why some of those who are doing a sketch always seem a bit better because of the seeing completeness of it. The roadmap to creating something meaningful in these game engines is very different to the architectural design process. It's not as incremental as one line.

JW

Another benefit is simulating views. In London, there is something called the London View Management Framework.

London is a very unusual city. It is one of the few cities other than I think Beijing, strangely, that we don't use zoning to define where buildings get built. We actually use protected views. This concept came up after the Second World War, though a lot of London was bombed and people started just building buildings like the Hilton hotels, one of the more famous ones, and some of the others.

Then suddenly everyone went "*you can no longer see St. Paul standing on this bridge. That was really nice to see St. Paul standing here*." So the first thing they did is they introduced something called St. Paul's Heights, which is like this sloping range of planes around St. Paul's, a quite easy mathematical way of capping the built development around St. Paul's.

Then they introduced something called the London View Management Framework, which was extensively developed by John Hare, which is very reliant on gaming technology, because of the scale of the models. John essentially buys an enormous Z map model of the whole of the city of London, then he models all the consented schemes that the other architects have given him over time. He builds up this enormous database, then you have these parameters. You can build something as long as you don't make anything worse. So for example, when you're looking at a view of St. Paul's, providing you're not in another view, you can build something behind St. Paul's from this theoretical point, as long as it doesn't make the view worse. That new building doesn't make the view worse because it's hidden by St. Paul's or something similar. There's lots of other examples. You get this incredible building typology, and that's why skyscrapers in London are such weird shapes, unlike any other city in the world.

Right to light is a similar constraint. It's a little bit different, but it's a legal constraint that's unique to London where buildings can own the right to see the sky. That's a geometric envelope. In London, you get this fascinating combination of rights of light envelopes that will give you these very geometric, weird, almost jelly molds, as Miller Hare called them, that you build your building in. Then you have to fit your building within this weird shape and try and make a coherent composition out of it. In our office it would be physically impossible to navigate around models of this complexity without gaming engines.

3.3

Interview with Winrik Haentjens

On His Role as Computer Graphics Supervisor at Proximodo, a Visual Effects House

Winrik Haentjens

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What are your favorite kinds of projects to work on in your current role?

My favorite project would have been the first season of *Mandalorian*. It was my first project as CGI supervisor, and we worked extensively on creating CGI creatures and environments. After that, I've mainly been involved in *Star Trek* projects, including four seasons of *Star Trek: Discovery*. `I also worked on a bit of *Star Trek: Picard* and now, three seasons of *Star Trek: Strange New Worlds*, which would be my favorites.

When you're working on these projects, how does the work get divided?

It is definitely a "divide and conquer" approach. We bid on specific sequences and then get them assigned or awarded to us. We focus solely on those sequences while other studios handle different ones.

The demand for visual effects is extensive for shows like *Star Trek* or *The Mandalorian*. One studio alone wouldn't have enough resources or bandwidth to handle everything at the quality level expected by the client.Oftentimes, the main client will try to assign similar sequences to the same studio. However, sometimes due to limitations in bandwidth or resources they need to split them up differently. In such cases, we also share our assets. For instance if we create an environment, we'll package it up and provide it to another vendor as a starting point. This ensures that things start from a similar build and then they can modify it as needed for their sequence.

What would be your role in a particular sequence?

We start building before anything is shot, holding calls with the art departments and reviewing the environments. I also deal with the post–VFX side of things. We would get footage that is either shot on a green screen or on a virtual production wall, then replace the entire background and augment what we need to.

Is there a lot of architectural influence in the environments you design?

Shows like *Star Trek* have a very defined visual style guide, so a lot of the architecture that we are dealing with on the show is all custom made by the art department. That also gets reflected in our CGI builds. Oftentimes we build up a small section of an environment, and then we take those architectural aspects and modify them by redesigning some things to live in that same visual language and multiplying them digitally across our scene.

Do you feel like there are aspects of your environmental set design that differ from the way one would design architecture?

Definitely. When we are set designing, we approach it from an aesthetic standpoint where functionality is not as important. It doesn't matter to us how many people a building can hold, as long as it looks incredibly cool.In our design process, we always consider the sequence and all the different shots that need to be covered with our environment in mind. Unlike real architecture, where you're constrained by the physical environment and base your camera placement on that, our approach is a bit different. We determine where we need to place the cameras first and then build our environment around that, ensuring it looks good from all angles that we need. However, maintaining continuity can be a bit tricky.

Is it challenging to design spaces exclusively for film? How do you navigate understanding what the space is supposed to be and considering it from the camera's perspective during the design process?

Depending on the project, we often receive a lot of concept art and key style frames from the client. These are generally rough and only provide a basic idea of the composition and style they're seeking. We take that information and frequently delve into real-world references that capture the visual aesthetic of the environment.Afterwards, we customize these references based on the camera specifications. The level of detail we need to achieve depends on how closely we must replicate them. We always strive to base our work on something from the real world, often elements from various cultures that we aim to incorporate and even mix together to achieve the visual look we are seeking.

Do you feel like gaming worlds have at all influenced the way that you think about the virtual environment that you design? Or do

you feel like real-world references play a bigger role?

I think about art in terms of the influences it draws from, especially videogames. I'm a big fan of collecting books, particularly those about videogame art because they offer so much inspiration and apply directly to what we do.I recently returned from Europe, where I photographed many old, cool buildings. These photos serve as both inspiration and practical references for future projects. I find that pulling inspiration from the real world is incredibly beneficial for me. It adds authenticity to my work, which is crucial, especially when striving for realism. Of course, there's a difference when working on something highly stylized, like in videogames.

Do you consider what occupying the space would be like when you design sets? Do you feel more influenced by the function of spaces or their aesthetics?

I think a lot of it depends on the story for us. Most times when I'm looking at different structural details, I'm reading about how they add to the scale of the building. We are always trying to make a building look large, which can be tough to do. *Dune* did that really well, with very basic building structures, but they feel so enormous. I think that's just a combination of proper detailing and lighting. I'm always reading how the architecture kind of affects the lighting and that kind of thing, which always helps, especially on something as grand as a cathedral, for example. It could be hard to not make that look like a small toy when you're capturing a single frame or just a shot on a set.

What would be an example of a set where you experienced challenges within the design process?

We worked on an environment in the second season of *Strange New Worlds*, where we were trying to balance details. For example, do the windows on a building look like someone could comfortably look through them, or do they seem too small or too large in comparison to the scale? That's why I always advise artists to imagine a little cube beside a person when they're building things. Just make sure that when you're constructing a door, a person could properly fit through it.

Do you put yourself into the space you're designing and think about whether it makes sense in terms of height, or do you usually design in more of a bird's-eye view in a 3D model? Do you sometimes find that these viewpoints contradict each other in terms of how the space is perceived?

For the post–VFX side of things, we visualize space in a bird's-eye view, but ensuring coverage from various angles. Particularly for virtual production, we are constrained to keeping the camera inside the volume so most of our reviewing happens from a standing height perspective. We pan around from that vantage point, and sometimes we'll move the camera around within that space. Ultimately, the volume and the camera are crucial for creating the illusion, so we can't deviate too far from that.

Have designs you created for these projects influenced other media?

Yes, definitely. With projects like *The Mandalorian*, we shared a lot of our assets that were reused for their videogame by Lucasfilm's Videogame Department. We typically integrate these assets into the pipeline, possibly with modifications, but it provides a starting point. Moreover, in virtual production, we often create impressive structures or props that the art department then builds physically to feature on practical stages. We have even had our models 3D printed or used in VR projects.

Have you ever had to look into structural systems and similar aspects? What kind of architectural research do you conduct for your projects beyond just looking at photos?
We always aim for believability. For example, if you have a floating dock, it detracts from realism. So when designing, we ensure it appears functional and realistic, even in entirely futuristic settings and we want it to feel structurally feasible. Earlier in my career, I worked on Discovery Channel–type projects, where accuracy was crucial. For projects like simulating the Hoover Dam or lift locks, we delve deep into understanding the internal workings and functionality, relying on blueprints and client-provided information for accuracy, even down to measurements. However, for highly creative projects, we start from scratch. I advocate grounding designs in real-world principles, even for fantastical structures. We often reference real structures to inform our designs, ensuring they're both imaginative and plausible. In this way, we operate very similarly to design architects.
So let's say you're designing a fantastical building in the future. What steps do you take to make it realistic and ensure that viewers can still relate to it?
If you look at *Star Wars*, the buildings maintain elements similar to smokestacks or chimneys. Hopefully, by that time, we'll no longer be burning fossil fuels, but people can relate to these features. Adding a chimney with some smoke adds life and scale to a building, grounding the environment in familiarity. One challenge I face with CGI and architecture is making designs feel lived in. If a client wants a new structure to look brand new, it can appear artificial. Adding details like trash cans or weathered surfaces creates a sense of realism and scale. Designing pristine, futuristic interiors, like those of spaceships, can be

tricky as everything appears glossy and new, which can look fake. Adding imperfections, like a smashed window, helps to make it feel more believable.

Do you also think about practical aspects of your designs, such as where the characters may have found materials or gone about the process of construction?

Absolutely! We engage in a lot of that, especially with *Star Trek*. There are so many differences between the various alien civilizations that we always have to consider. Let's say I designed an environment for the Kalpiens, who are weird, fishy-like people. When building their structures, we aimed for a very natural look. Even though they used mud and other materials for their huts, the design still had a futuristic touch. On the other hand, whenever we created environments on the Klingons' planet, they were always super rocky and dark, featuring a distinct green rock that we used consistently whether it was carvings or statues. This process is highly influenced by the culture we are trying to represent, as well as the nature and technological advancement of the species.

Are there some key architectural concepts or ideas that you use in your work that you consciously think about?

It's a bit tough to say because the process varies quite a bit, but I'm always telling people to base it on reality. No matter what we are doing the more we can base it on reality, the better the end result will be. Even for really high-tech stuff, the amount of crazy, cool buildings that have actually been built is fantastic. Even if it's just grabbing different buildings' elements and putting them together. If you base it on something that's already been built, it's going to look more believable than trying to design it from scratch. A lot of the visual troubleshooting has already been done; they've figured out what they need to do to make it structurally sound and that kind of thing. Unless you're a very experienced digital artist who does a lot of environments or architectural detailing, there's a lot to learn there, and achieving a realistic result visually is tough. I still struggle with it, and it's always going to be something you need to research and always go back and look up references.

Do you feel like there is anything in particular architects need to know about designing sets or buildings for TV or film? Would you say that there is anything that you feel is important, or that they might do wrong if they were to enter that design space?

I would say, really playing with scale, adding elements that make the space look big, depending on the environment. We always struggle trying to build spaces that have no point of reference in terms of how big they are. I think that always helps by including things that people are visually used to seeing, whether it's a doorway, a bench, or something that we can relate to the size of a person. We find that if we are dealing with architectural structures that really have no point of reference, then it's really hard for us digitally to try and sell the scale, especially in relation to our actors.

Do you feel like there needs to be a greater level of fidelity between the digital spaces and the real world? Do you ever watch movies or TV and notice the flaws or mistakes that people have made in the design?

I'm constantly noticing "Oh, no, that was terrible," "that could have used a lot more love," or "that didn't fit the foreground at all." I find it all depends on the budget of the production. If you're adding a trash can, you gotta build that trash can and integrate it into the environment. I find the lower-end productions suffer because they just don't have the budget to push these details. Now, there are productions like *The Mandalorian* or *Star Trek*; they have much higher budgets, and they're able to work in more details and iterations.I'm sure that goes for real architecture and real buildings as well. You could make the coolest building in the world if you have an endless pot of money, but that's not always the case.

For a construction project, most of the expenses come from materials, contractor labor, and so on. In contrast, for visual effects, is it primarily about the design itself?

Yes, we do allocate a significant portion of resources to the building process. However, most of our time is spent refining and iterating on the design, making necessary adjustments.

What do you anticipate would be the future of the relationship between architecture and film and videogames?

I believe that as we progress into the future, architects will be increasingly inspired by the digital creations we develop. They may potentially aim to push their work towards a more futuristic and digital realm. Especially now, with the emergence of AI technologies, which we are incorporating extensively in our design processes, these tools are reshaping our workflows for designing structures and environments. I anticipate that new tools like these, impacting our design processes, will start to merge and become more useful for architects. We are likely to witness more visual similarities in the work produced as a result.

Does 3D modeling and architecture, in general, have roots in animation? Perhaps there's technology being developed that could

soon become popular and change the way architects design buildings?
I definitely believe so. With 3D printing becoming widely available, it’s poised to bridge the gap between animation and architecture. Artists can now use this technology to create intricate mold trimmings or even entire structures or architecture to produce various items for houses or buildings. 3D printing will undoubtedly revolutionize the design process.Furthermore, scanning techniques such as photogrammetry and LiDAR scanning are being employed. While these methods are already in use, there’s potential for significant crossover between animation and architecture in terms of technology and techniques.
Do you feel like the fact that architects are increasingly influenced by spatial design of film and videogames is concerning? Especially if these young designers are guided more by aesthetics than by function?
I don’t think so as long as not everybody goes dystopian and some move more toward utopian, taking beautiful aspects which tend to be missing from modern concrete architecture but were very present in the 1800s. I believe that design happens in waves, and we are going to return to pulling some of the old elegance back into design and move away from the flat, angular, and detail-less craze we are currently experiencing.

Figure 3.3.1 3D model of environment.

3.4
Full Circle
Leveling Up Building Digital Twins with Videogames

Jenn McArthur

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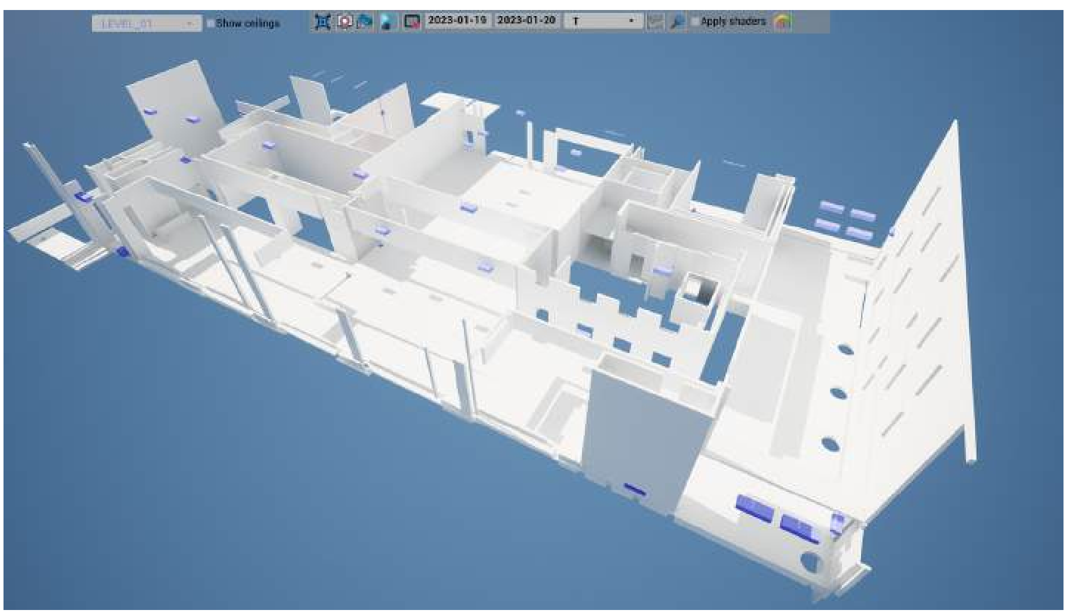
To many, the term "digital twin" brings to mind images of sci-fi movies where holographic models are manipulated to design advanced buildings or cities. However, humanity has recognized the value of using models to leaShift changern more about the "real thing" for centuries. In ancient China, figurines were used to plan and simulate battles (Little 2006). Centuries later, shipbuilders used scale models to test and refine their designs, while more recently NASA's use of a full-size mock-up and computer simulators of the Apollo 13 spacecraft allowed them to troubleshoot the mission and save the astronaut's lives (Allen 2021). Within the architecture profession, we have seen an evolution from these physical twins — most notably the scale models found in architect's offices around the world — to digital representations from 2D CAD to 3D solid models, to BIM, supported by a wide variety of simulation software to use that digital data to predict energy performance, daylighting, structural behavior, and ventilation. These representations have been referred to as "digital shadows" because they represent the building at a single point in time but do not evolve with them. Digital twins, in contrast, are live copies of the physical building, constantly being updated with real-world data that it can process to provide valuable information to improve its performance.

Where did the idea of digital twins come from? While NASA claims it coined the term itself in 2010 (Piascik, et al. 2010), Michael Grieves is widely recognized as the inventor of the concept, presenting it at a conference on project lifecycle management in 2002. Grieves recognized the value of tying together real space with virtual space, sending real-world data to the virtual space (and subspaces) where it could be analyzed and used to run simulations and then feed information back to the real object (Grieves 2002). Over the intervening decades, advances in cloud computing, IoT devices, sensor networks, artificial intelligence, and visualization tools have transformed digital twins into their present form, where they are increasingly being used to design, build, test, and optimize the world we live in. In some fields (notably manufacturing), *cognitive digital twins* — those capable of learning the normal behavior of their physical counterpart, recognize errors, and provide real-time guidance and even instructions to resolve them — are already in use.

One of the most exciting developments in digital twins is their integration with videogame technology. Taking advantage of videogame design principles, digital twins can be developed that are highly immersive, engaging, and intuitive, making them easy for anyone to use regardless of their technical background. This chapter presents how the mechanics-dynamics-aesthetics framework from videogame design was applied to level up a digital twin of a multiuse building, making it easier to navigate for a range of building users.

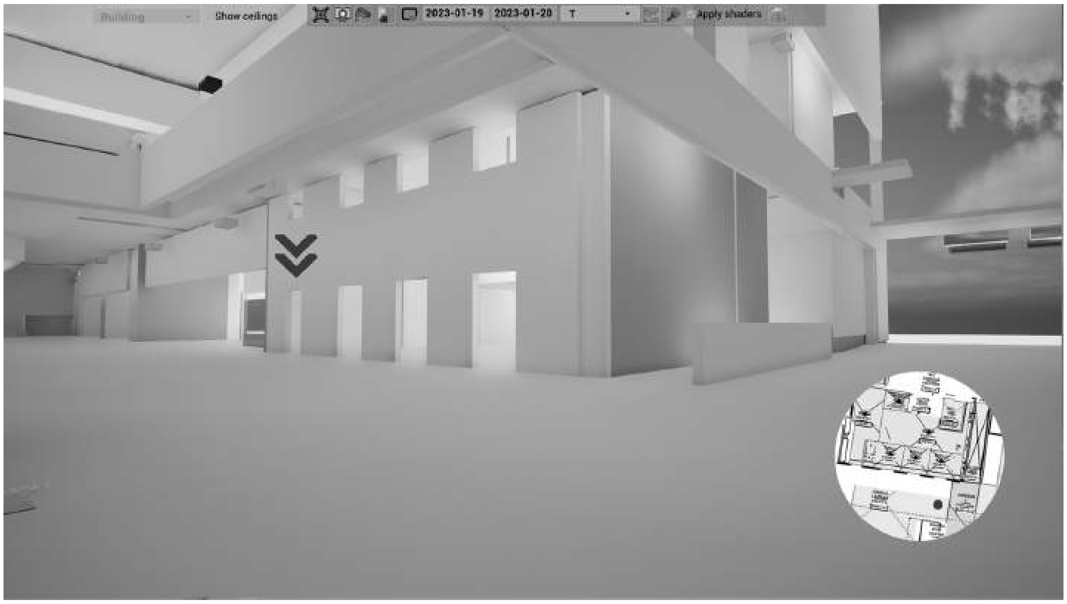
In videogame parlance, mechanics refers to the rules defining what is permitted in the digital twin — for example how much freedom players have (autonomy) and what they can or cannot do (affordances) — and how to communicate it (signifiers). Dynamics describes how users can engage with it, for example how to move through (transversal) and navigate (wayfinding) the limits of the virtual environment. These are enabled by the affordances described previously. Finally, aesthetics refers to the design of the game environment, including the visual design, music, and sound effects; the game's visual and auditory design, including its art style and sound effects. Applying these principles to digital twins transforms them from often-intimidating technical tools to highly functional games that engage end users.

The first step in this process is to define user profiles and define the mechanics for each. For example, these could be building visitors (who can see and navigate the building), maintenance staff (who can also investigate issues and query building data), and facility engineers (who can run simulations and change the real building behavior). These functions are used to create various modes (Figure 3.4.1 and 3.4.2).



▶ **Long Description for Figure 3.4.1**

Figure 3.4.1 See it mode.

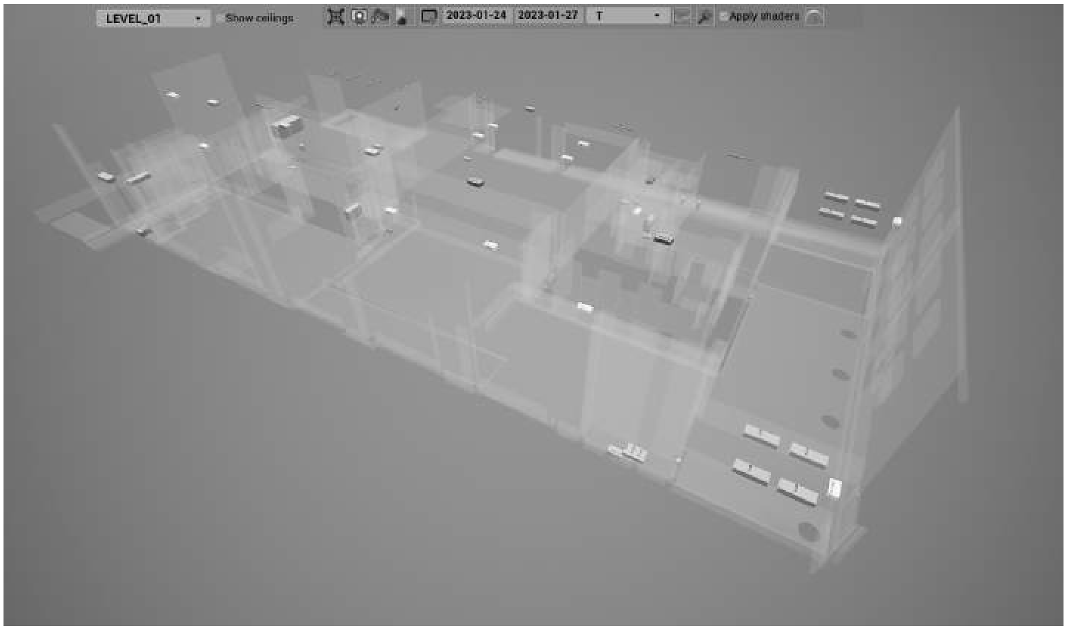


▶ **Long Description for Figure 3.4.2**

Figure 3.4.2 Wayfinding mode.

Player autonomy and affordances are then defined for each profile. For visitors to be provided with wayfinding tools, they need to have some limitations, namely the inability to fly or walk through walls, to allow a path-finding algorithm to create a navigable route for them. Similarly, they need to be given limited freedom — the choice to use an elevator or take the stairs, for example, but not to wander off route, nor to leave the confines of the building. To implement this navigation, a virtual mesh was created using the Unreal Engine. This enables a path-finding algorithm (A*) (Yap 2002) to automatically identify the best pathway from the starting point to the destination including vertical transportation elements such as stairs and elevators, the same way nonplayable characters navigate the videogame environment.

Facility engineers need a different set of affordances. Assumed to be familiar with the building, they do not generally need to use wayfinding; instead they might query an equipment location to view it in context. To optimize their time, they are granted the ability to navigate freely in 3D, passing through walls and ceilings, to look through walls, and to leave the confines of the building to view it at all at once. For this user profile, access to the building data is paramount. This is achieved through a series of APIs, accessed by clicking on equipment or engaging with the toolbar across the top of the Investigation Mode view (Figure 3.4.3 (a)). Within this view, the facility staff users can not only visualize current data for a piece of equipment (Figure 3.4.4) but can also select a time window to query the data lake for a range of historical values for one (Figure 3.4.5) or multiple (Figure 3.4.6) pieces of equipment. In *optimization* mode, two new affordances are granted: the ability to access AI algorithms to detect faults, predict energy consumption, and/or recommend new controls strategies; and the ability to send new instructions back to the building system using the digital twin. At the time of publication, this latter mode has not been fully implemented.



▶ **Long Description for Figure 3.4.3**

Figure 3.4.3 Investigation Mode for Facility and Maintenance Personnel.

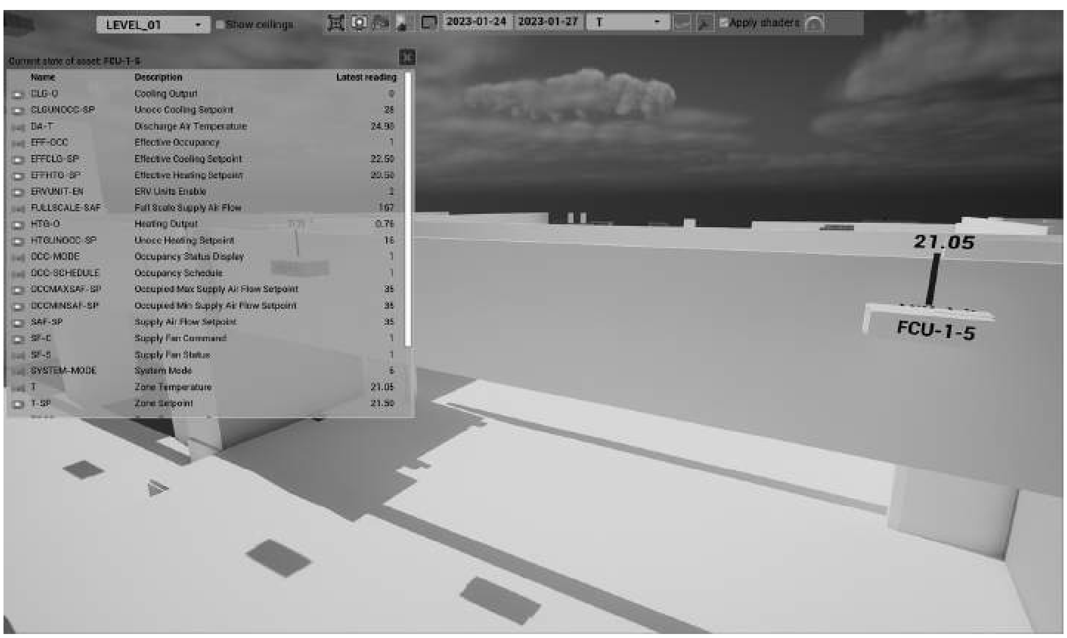


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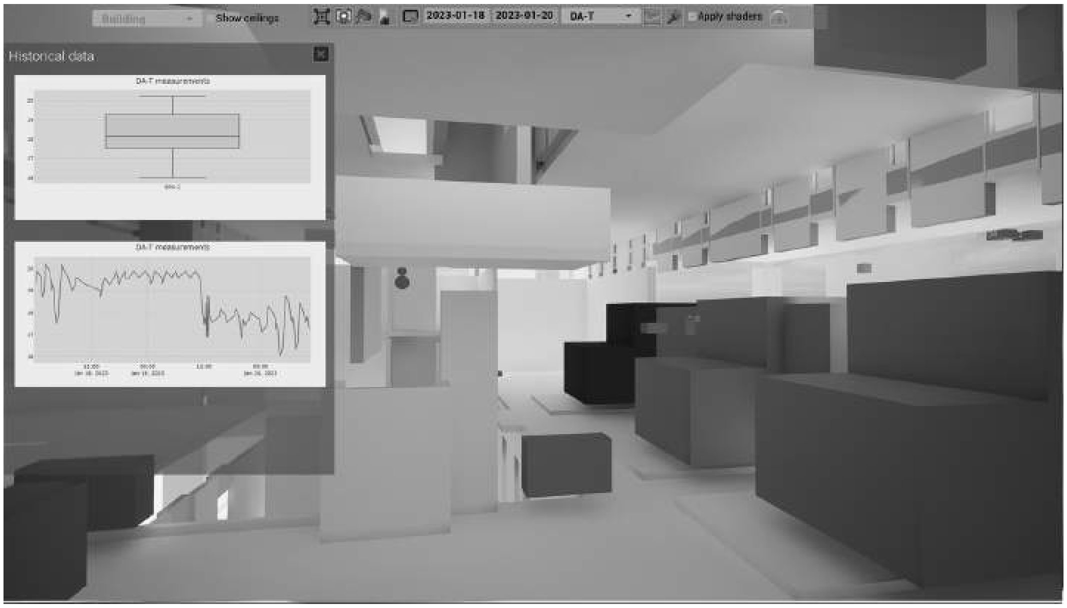
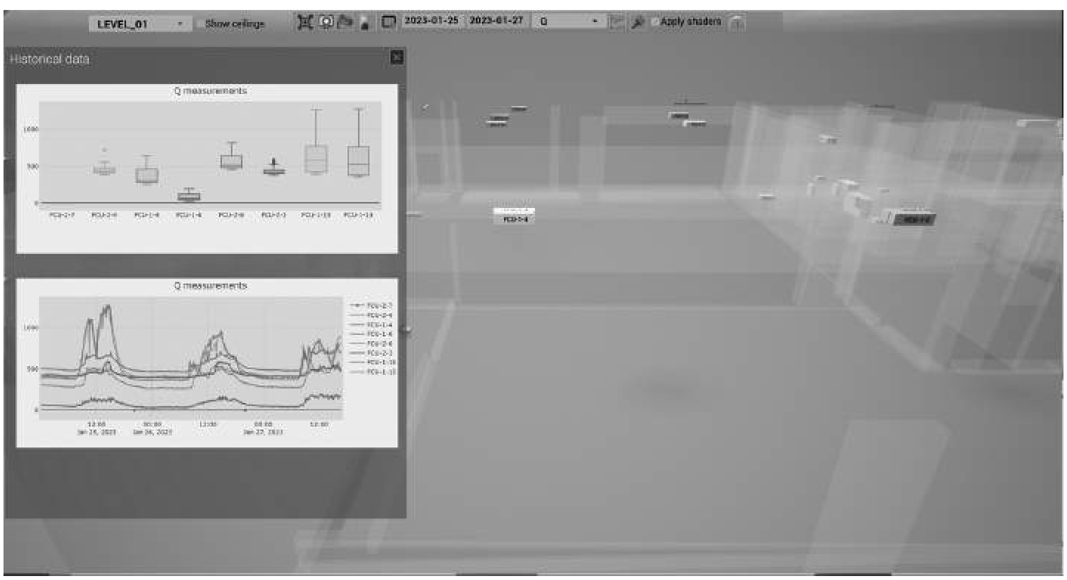
Figure 3.4.4 Single equipment real-time data query.



▶ **Long Description for Figure 3.4.5**

Figure 3.4.5 Historical Data Query.



▶ **Long Description for Figure 3.4.6**

Figure 3.4.6 Multi-equipment historical data queery.

For all users, signifiers such as knobs to open doors and panels, stairs and elevators, and dials or buttons on equipment can indicate the opportunity to engage with particular elements. Whenever possible, their design is similar to that of the real world to make it as intuitive as possible. To avoid confusion, only elements that can be manipulated for a given user profile are shown.

Beyond enhancing user experience, aesthetics are also a key consideration for data presentation. The application of human-computer interaction and design theories (Pin, et al. 2018; Mata, et al. 2024) can be helpful to inform digital twin development. For example, drawing from critical facility design principles (Gruhn 2011), asset colors change based on sensor data to indicate conditions. In this case, a three-color gradient is used with normal conditions shown in white, low values in blue, and high values in red. Increasing saturation is used to quickly show how far outside the normal range (Figure 3.4.7). Equipment without information is shown in grey. The thresholds for "normal conditions" can either be defined by the users or learned from building historical data using AI.

Figure 3.4.7 Temperature ranges are indicated by color shades based on a prescribed operating range of 20°C–24°C.

Preliminary user tests of this digital twin have demonstrated the value of videogames to overcome one of their biggest barriers to adoption: usability. Facility managers agreed that the digital twin videogame was much more engaging, accessible, intuitive, and powerful than BIM–based digital twins.

From design through construction, and throughout the building life, videogames allow users to engage with buildings in ways that were previously unimaginable. Integrating machine learning and predictive analytics, these tools can run what-if scenarios, identifying the optimal solutions for sustainability, energy management, occupant comfort, emergency response, and many other applications. Drawing from videogame design principles, digital twins become even more powerful tools to make our built world truly interactive.

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3.5
Production Technologies Projects

Zak Fish

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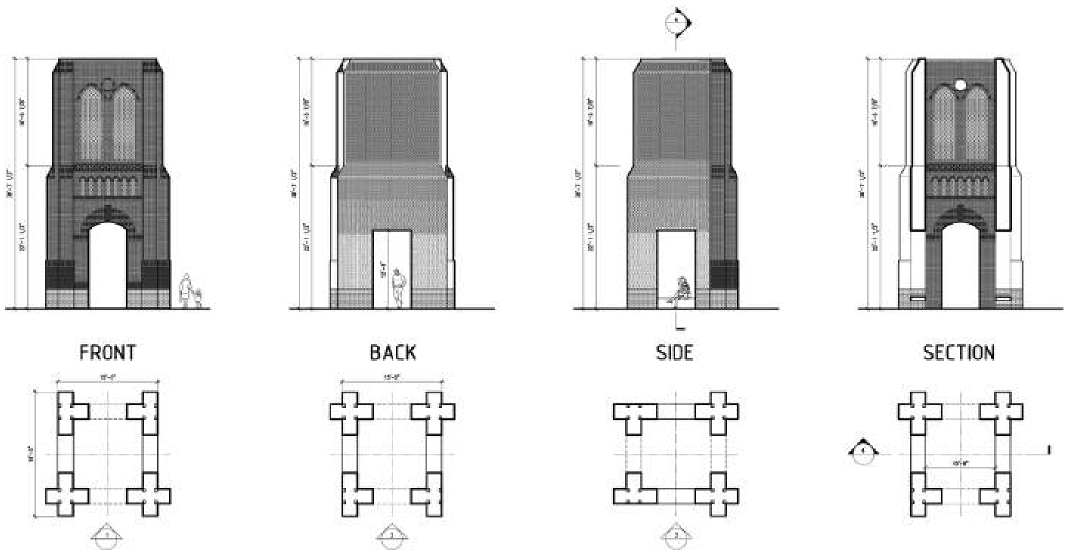
In many architects' and game studios' portfolios, digital documentation of architectural work evolves with an emergent workflow. Combining laser scanning, photogrammetry, and LiDAR, they capture intricate details and spatial dimensions with unparalleled precision. This comprehensive approach ensures a holistic understanding of historical structures, facilitating meticulous restoration and preservation efforts as well as high-fidelity context for gaming environments. ERA Architect's integration of diverse tools not only streamlines processes but also enriches architectural narratives, fostering a deeper connection between past, present, and future within their esteemed body of work.

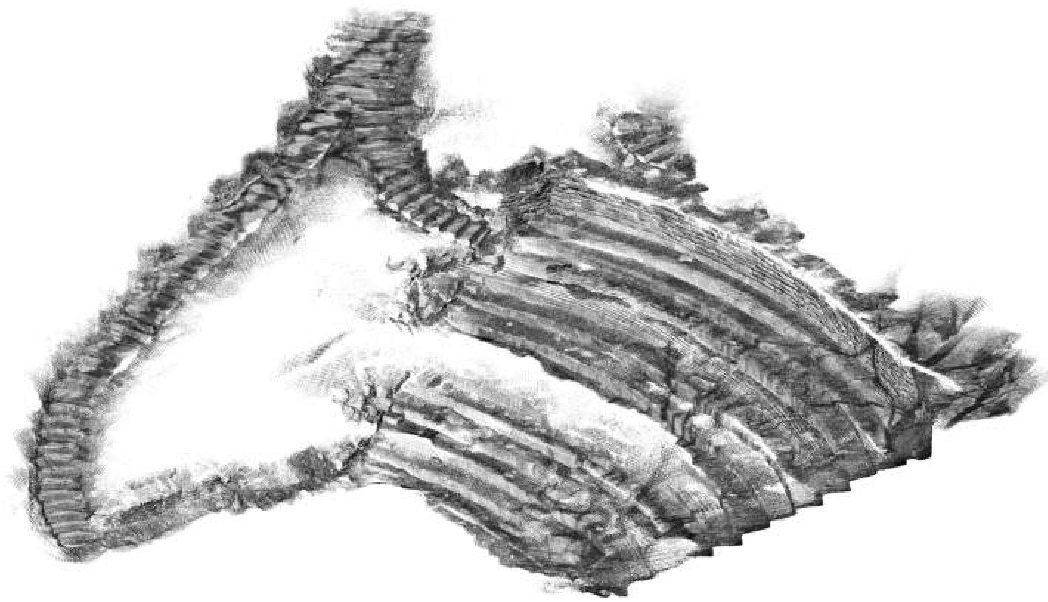


▶ **Long Description for Figure 3.5.1**

Figure 3.5.1 Memorial Tower Design Drawings. Metal panels perforated with pattern from laser scan of building prior to demolition. Alma College. Zak Fish/ERA Architects.

▶ **Long Description for Figure 3.5.2**

Figure 3.5.2 Terrestrial laser scan software screenshot. Alma College after the fire. Zak Fish courtesy of The City of St. Thomas. 2008.



▶ **Long Description for Figure 3.5.3**

Figure 3.5.3 Mobile scan axonometric. Alma College's historic amphitheater. ERA Architects. 2019.

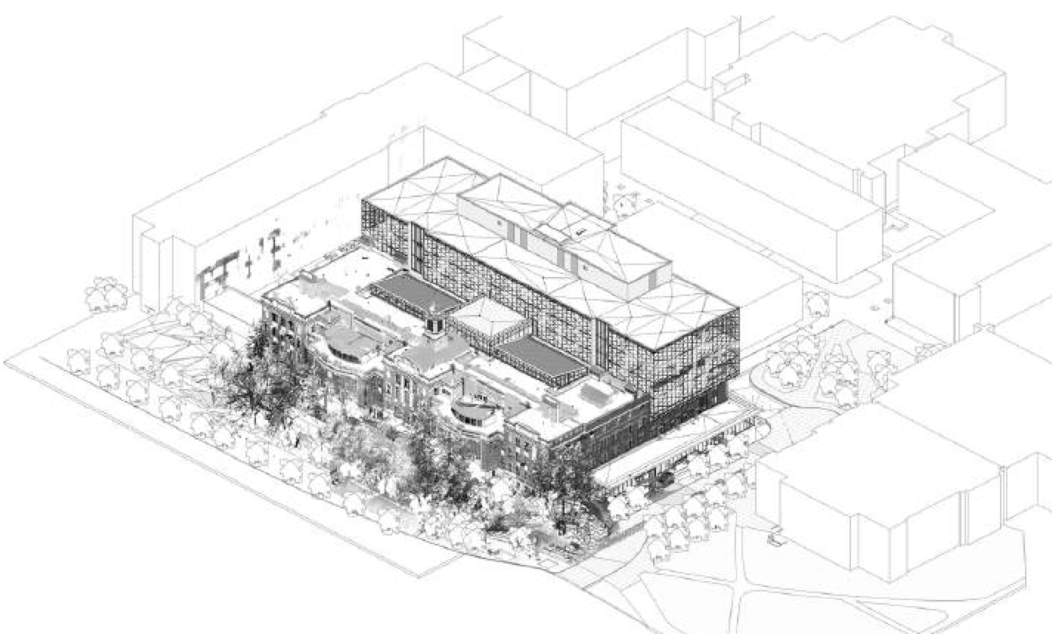


Figure 3.5.4 Point cloud overlaid on BIM model. University of Alberta, University Commons. Zak Fish/ERA Architects.

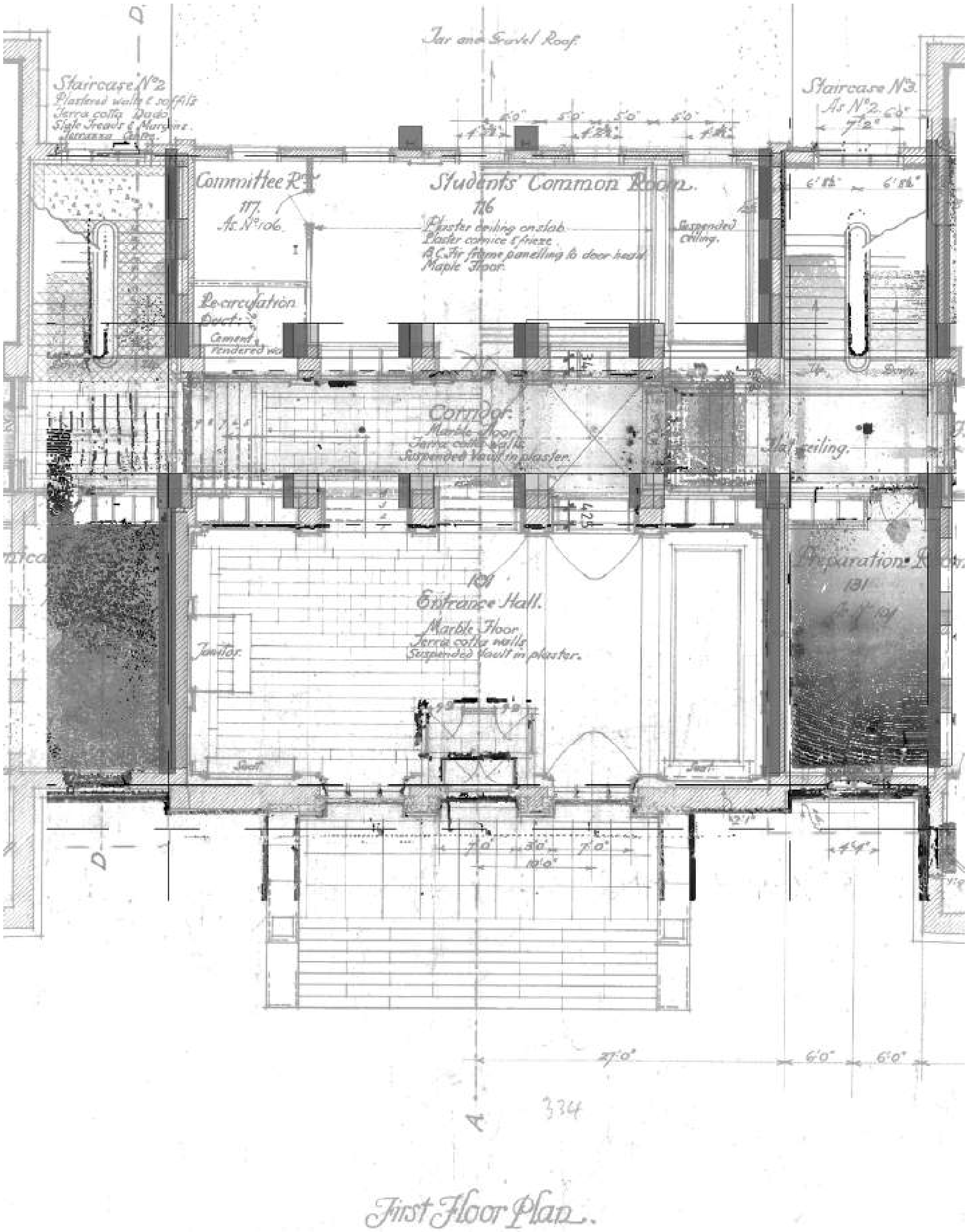


Figure 3.5.5 Point cloud overlaid on BIM model and archival plan drawing with discrepancy highlighted in red. As-built Entrance Hall Study. University of Alberta, University Commons. Zak Fish/ERA Architects.

Figure 3.5.6 Construction progress aerial photograph. University of Alberta, University Commons. Adrien Williams.

Figure 3.5.7 Pilot flying drone in Turbine Hall for aerial photogrammetry. Hearn Generating Station. Zak Fish.

Figure 3.5.8 Terrestrial LiDAR Scanner in Control Room. Hearn Generating Station. Zak Fish.

Figure 3.5.9 Technician operating Terrestrial LiDAR Scanner in Boiler Hall. Hearn Generating Station. Zak Fish.

Chapter 4
Design Pedagogies

This chapter highlights the ways in which game design and architecture have informed one another in the classroom. Through understanding pedagogies of design, the creation of space in both disciplines turns out to have a lot of similarities in implementation. While game design pedagogy searches for a path forward as the field grows in complexity, it traces a lot of potential overlaps with the architectural design studio course. This specialized course in architecture degree programs presents a new opportunity for game design to reach the multifaceted and far-reaching platform for building expertise that architecture heavily relies on. On the other hand, as architectural design searches to understand its past in relation to new tools, borrowing from game design education can power architecture courses to new frontiers. In the architecture classroom, virtual tools can help students explore workaday skills like time management alongside the metaphysical techniques of worldmaking and collective imagination. The future of design education will be shaped through these shared frameworks of study.

4.1

Infinite Play

Video Games as Teaching Tools

Damjan Jovanovic

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Design Games

The problem of origins of architectural design methods usually goes hand in hand with the question of the precedent, type, and model, with all the historical baggage that it entails. Robin Evans, in his influential 1995 book *The Projective Cast*, brought another discussion to the table: the role of *pure geometry* and its place in the process of design. Geometry brings order, but more importantly, it brings stability — "dead geometry is an inoculation against uncertainty" (Evans 1997). Or as James P. Carse more broadly put it "to be prepared against surprise is to be trained. To be prepared for surprise, is to be educated" (Carse 2013).

The significance of the Euclidean progression — from point to line, to plane, to volume — in the foundational stages of design thinking cannot be emphasized enough. Moreover, understanding and internalizing this concept is crucial for any student of architecture, as it grants a sense of ontological security. It is an idea of immutability, of 'geometry without qualities' that lends such a strong reliability to the notion. The notion is seductive, and it produces a curious split, as it separates the world in two — an underworld of base, essence, a core which is geometry, and an overworld of accidental properties, secondary notions, immaterial effects — qualities. In other words, "the creative, intuitive or rhetorical aspects of architecture can therefore ride on the back of its geometric rationality." To this story, Evans adds a discussion on *projection*, and ways that projection complicates things, invoking *drawing* as a new, relational space and adding new and unexpected notions into the mix — instability, images, and therefore, *imagination*.

The creation of the New (geometries, aesthetics, imaginaries, pedagogies, architectures …) is an inherently technical idea, rooted in a specific medium or material. This means that the medium of production of design determines to a large extent, and through visible and especially invisible forces, both the outcome of design and even more importantly for the story about education, ways of seeing and ways of thinking that are behind the design process itself. In other words, tools are always and foremost tools of thinking, and tools of seeing. It is in these ways of seeing and ways of thinking that we can locate the main access point to imagination in this context, and everything that comes with it, especially the elusive idea of the creation of the New.

The pedagogical question of today might be as follows: in the post-computational era, when we have all the tools of geometry at our command, when mathematical complexity of the highest order is manageable by algorithms we have at our fingertips, when any form is possible, when certainty is guaranteed and (hyper)rationality is taken for granted — what are some of the ways to introduce uncertainty and instability and win back the imaginal, intuitive, and creative aspects of design process?

A question such as this one must, out of necessity, contend with the problem of design tools, and ways that design tools embed aforementioned histories. Design software embeds geometry as its base, as it is expressed by the existence of geometric primitives as defaults, and cartesian space as the design space. This invokes notions of stability, immutability, and control on different levels — creative and technical, but also socio-political. Design software is a goal-oriented geometric control toolbox. Is there an alternative?

A surprising meditation on this is found in the oeuvre of Marcel Duchamp, whose work — most famously exemplified by "The Three Standard Stoppages" of 1927 — embodied the desire to break through and bend the correct ways of thinking about technology and point to the possibility of at least imagining the alternative. Duchamp's response was not one of luddite refusal, but one of playful engagement, and of revolutionary questioning of first principles, through total rethinking of technology. It was a project of resistance against what later O.M. Ungers called "the one, correct way of thinking" — of dismembering the world into discrete units by the natural sciences, which in architecture becomes manifest through primarily the notion of the cartesian grid as universal space (Ungers 2023). A lifelong player (and grandmaster) of chess, Duchamp knew a thing or two about systems, apparatuses, and technologies, and ways they are able to *enframe* human thinking and behavior (Heidegger 2008). In many ways, Duchamp's life project is a project of liberation through play, manifested in constructing weird apparatuses that challenge the dominant ideas of technological enframing. It is also a project of endless construction, destruction, and reconstruction of new personal identities, none of them stable or reified. We could say that design games are essentially Duchampian in spirit. In architectural design, the ethos of play is a natural response to the black boxing of design methodologies and their unwitting surrender to positivist engineering as the only horizon of design.

Games have the capacity to disrupt existing models of engagement, existing recipes for design. In surrealist games, any notion of systematic, rational form-making is erased and these games were designed as means of disestablishing the aesthetic and political implications of well-known models. A well-known example is *Exquisite Corpse*, a collaborative drawing or writing game where participants add to a composition in sequence, but they are not allowed to see what the previous person contributed. These games were derived as means of freeing the creative process of conscious control, as a way of opening up the potential. Unlike other software, computer games tend to problematize the notion of subjective agency through either exposing and putting into question the ability of a player, or by disturbing the mere notion of a goal.

A general, simplified definition of a game could describe an object composed of five basic and necessary components: the player(s), the opposition, a goal, a series of decisions, and a framework of rules. Another kind of a game is described by James P. Carse, who sidesteps the reading of games as adversarial structures to foreground the idea of an Infinite Game (Carse 2013). In Carse's reading, "a finite game is played for the purpose of winning, an infinite game for the purpose of continuing the play."

It could be argued that game engines present an alternative form of design software, for three main reasons: their capacity to collapse rendering and modeling into the same, real-time, interactive, and experiential three-dimensional design space; their capacity for real-time physics simulation; and perhaps most interestingly, their shift of design problems from objects to *worlds*.

Game engines also open up a possibility of seeing design procedures as games and design processes as forms of play. In many ways, this opens up a whole series of new questions that go beyond understanding games as experiences, or games as social actions, into understanding games as procedures that challenge established ways of design — design games.

This could be a primary model for what an architectural design method can be in the post-digital era. Even more than this, it will be argued that the idea of an infinite game, when applied to the extremely challenging toolscape of today, might well be the only feasible way to navigate the world of immense technical complexity (which, if we follow all the arguments so far, presents then an equally complex conceptual framework), while remaining open to the inner energies of one's own creative flow.

Simulations

It is also important to clarify here that we are talking about computer games, which, along with their obvious status as games, have another status, one which is at least as important: they are *simulations*, a new kind of technical objects that belong to histories of technology and of visuality.

The digital turn brings with it a set of unique challenges and calls for a near complete refactoring of our understanding of historical forms of representation. With the digital, we are neither inhabiting the material history of drawing, nor the much-publicized domain of the *image* (May 2019). Instead we are inhabiting the elusive territory of the medium of *simulation*. A simulation is a computer program that changes and evolves in time and has potentially endless, different outcomes. Or put differently: simulations are interactive, non-linear cultural (visual and narrative) formats that can change and evolve in time and have potentially endless, different outcomes. So, the term here is not used in its technical sense of it being a simulation *of something*; in other words, its utility is not foregrounded. A simulation is only partially a visual object: it could be better described as a *world* inasmuch it is a construct with internally coherent rules that produce emergent effects.

Drawings in the age of simulation are defined by the very term simulation. A computer can simulate any older media. From another point of view: analogous how early automobiles looked like horse carriages in order to be palatable to the audience of the time, simulation, a natively digital medium, has for years had to pretend to be something else: a drawing, a render, a video, or any other historically and critically established medium. The power of this medium is that it completely subsumes the previous media (Manovich 2002) and can, in a fundamental sense, display any of their effects. What is the medium specificity of the simulation? As mentioned in the discussion on game engines, we can identify three major components, all revolving around the main idea of real-time interactivity. The pedagogical project presented here is envisioned, first and foremost, as an exploration of the medium of simulation on its own terms, and this notion of medium specificity is absolutely central to every argument made further on. As an example: a rhino model in its "natural" state of nonlinear interactivity, pure virtuality understood as potentiality, is not a drawing but a simulation.

Due to this obligation to historical formats of representation, design in the post-computational era is still understood as a projection-based process of modeling, dominated by a monoculture of seeing, which we call the orthographic sequence. This monoculture promotes a highly specific, detached, and quasi-objective mode of looking at a World of the architectural project, with only a few, highly controlled access points. A plan is a totally curated image/model, where the access to the underlying space presents an extreme form of control. This architectural monoculture is itself an outgrowth of what Martin Jay would call "the dominant *scopic* regime of Cartesian Perspectivalism" (Jay 1999). Since simulations contain virtual cameras, which trace their lineage to perspectival construction, the true innovation of the format is in the types of movement and dynamic access, which blow up abstraction and push designers to "think in" full resolution immersive models, instead of thinking in plans and sections. This is why working with simulations could be considered a radical practice — the language of abstraction that is so tied with the current monoculture of seeing is rendered powerless when faced with the infinitely deep and wide space of the simulation.

Content

Platform Sandbox is a collection of connected, intertwined versions of the same base videogame developed through eight years as part of a larger pedagogical project targeting specifically the problem of the creation of the *New* (styles, identities, expressions) in architectural design, and also, how the creation of the New might be taught in the emerging post-digital landscape, or the era of the *simulation*. In this way, the games are the same *platform* — a conceptual and technical base that allows for explorations in different domains: aesthetics, technology, identity, politics, psychology, all unified through the banner of education.

Platform Sandbox has seen four different numbered versions, as well as at least five offshoots deployed in exhibitions and online spaces, including one fully multiplayer game version played through Twitch. The game was designed as an end to end tool, where modeling and rendering are done at the same time, allowing for the creation of finished renders at the moment of modeling through the taking of screenshots. It produced a design tool that works in real time as a modeling tool, while being able to create all the material effects of rendering — simultaneously. *Platform Sandbox* was first made in Unity in 2015, with some of the last versions being completely remade in Unreal Engine in 2021.

The use of a game engine provides a very robust base geometric toolkit, together with a state-of-the-art physics engine, coupled with a real-time rendering stack that is able to visualize vastly different aesthetic expressions — all at once. This combination of factors informed the basic design of the platform, which featured a model space denoted by an empty cartesian grid and the 3D model collection menus, as well as a collection of UI switches for physics and other properties that could be activated during runtime. In this way, a model space becomes a physics sandbox in which the user/player can experiment with additive modeling strategies in varying degrees of control. As the player is modeling, they can switch between different kinds of simulated forces that reorganize and rearrange objects in model space.

The software was based on an earlier videogame called *Junkspace*, which was published in 2015 and is still available as a free download on the indie-game platform itch.io. This game took its name from the text by Rem Koolhaas lamenting the loss of architectural meaning and providing a path to follow by mining this loss *as new meaning*, producing new stuff that OMA called in a contemporary exhibition, presciently, *content*.

The main idea for the game was simple: instead of featuring a collection of basic primitives as its main design language, the game uses a collection of actual architectural objects. In the case of *Junkspace*, this was a collection of OMA 3D models found online at the time, and these objects formed the basis for the components the player could use to build and aggregate structures. The structures are all held together through a physics handle, so that they form a coherent but very noisy and ultimately formless model. Playing or modeling is done by selecting and placing objects in real time, but the time of a single play session is limited to five minutes, after which the entire simulation restarts to an empty model space of the grid. The game features random moments of spontaneous creation, in which the game is adding a random number of objects into the scene without the player's input. The grid space also features two humanoid agents, a designer and a critic, that are programmed to walk around and follow the mouse cursor in an attempt to destroy the structures.

The "goal" of the game is, in concordance with the notion of the Infinite game, to simply play and make compositions (or more precisely, "non-compositions") and save screenshots of those that look interesting. During playtime, a player might spontaneously develop personal rules of how to play, how to compose, but the game does not force a ruleset beyond the time limit. A screenshot UI button enabled the players to save the current view as a render image, together with all the UI elements. All this was combined with an active physics handle that allowed for real-time rigid body simulation to be performed on all the objects in the scene to produce an extremely rich visual space, with some pretty wild outcomes that looked straight out of Valve's *GMod* or Keita Takahashi's videogame *Katamari Damacy*. The tagline of the game reads: *"Junkspace is a God simulator set in the mind of an architect. This means it is just like any other architectural design software. Almost."*

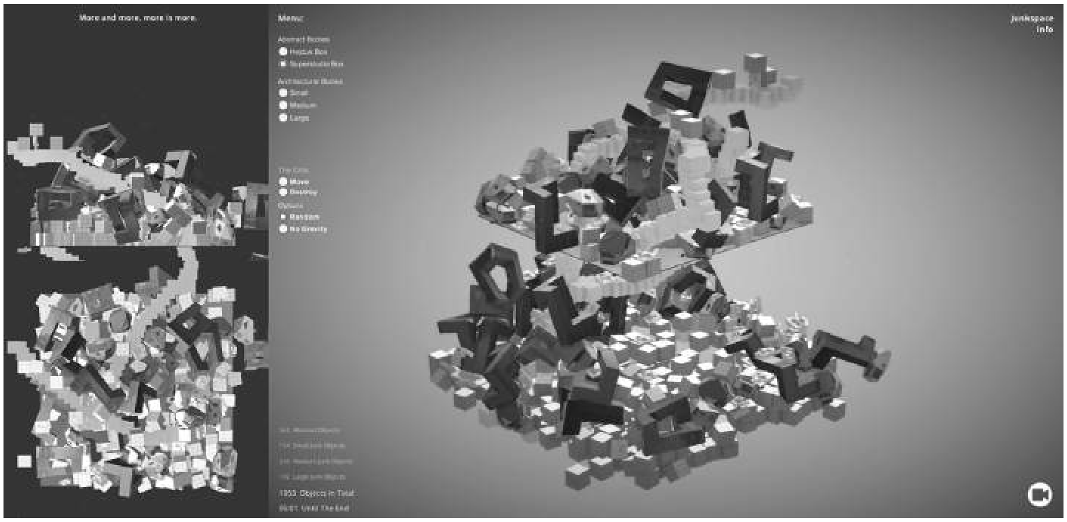

Figure 4.1.1 Junkspace v.1, in-game screenshot.

Platform Sandbox version 1 was deployed to 33 students at the two-week workshop at the Staedelshule Architecture Class in spring 2015. The game utilized almost all of the features of *Junkspace*, with some crucial differences — it was reimagined as a personalized design tool, so that each version used by the students could be unique. This was done by asking the student to bring their own collection of models (and histories), and then to work on the back end of the game and learn about shaders, materials, lights, and textures in order to visually customize and personalize the game, until the “original” is almost unrecognizable. Another difference was the use of architectural parts, or parts of buildings as components, rather than whole building 3D models. This enabled for much finer-grained strategies of “non-composition” as well as a much larger variety of formal outcomes. In the workshop, each student was expected to source and bring 5–10 3D models of parts from a single architect, import them, and then work inside the game engine to customize the *Platform Sandbox* in order to produce a unique, personal aesthetic space within which the modeling game can be played.

Platform Sandbox was designed to resemble a standard, default way in which design software operates and, especially, how it looks. Interaction is only possible in the main perspective view, thus preventing any design being done in either plan or section. This reinforces the importance of the volumetric diagram as a primary means of operation. The software does not allow creation of any primitives, it depends on messy chance interactions between a range of 5 to 10 found assets, which have been imported into a menu structure. Different forms of configuration are possible: random, physics-based collisions and intersections (Booleans). Each design session is constrained to 20 minutes. It is imprecise, messy, and fast. The controls are more videogame-like than design software–like, as an almost choreographed use of mouse and keyboard is required. The “goal” is to create compositions, in one of four ranges of scale. The scale is simply defined by the number of elements in the scene: small for three to five, medium for five to 20, large for 20 to 50, and extra-large for over 50 elements. This configuration enables the creation of a massive amount of models in a relatively short time span, and this speed and quantity enable the emergence of genres of expressions within the studio.

The results can be exported as geometry with textures to be further developed. The user interface design and some parts of operation were customized by each student, which enabled us to conceptualize screenshots as already finished drawings in their own right.

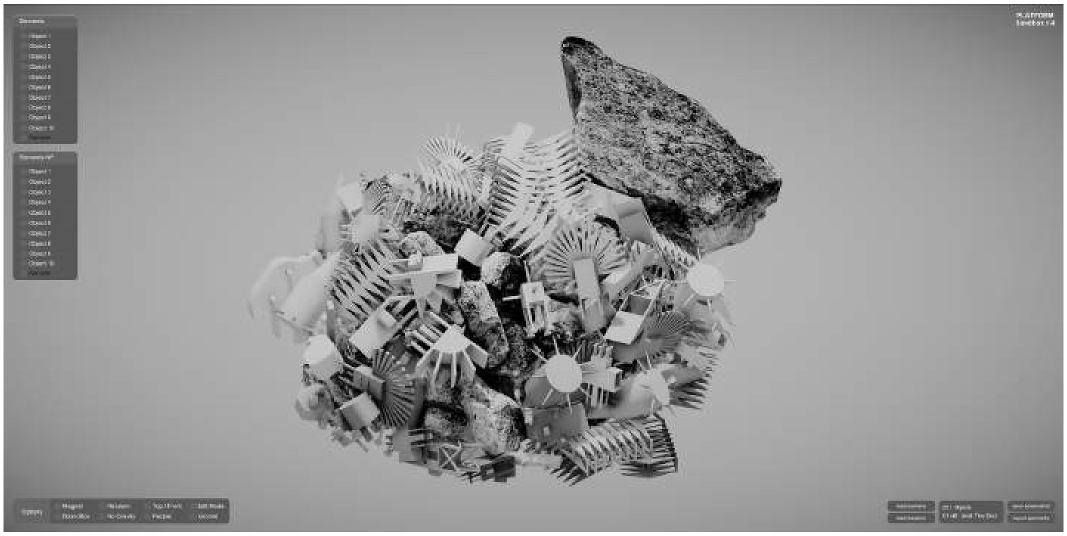

Figure 4.1.2 Platform Sandbox v.4, in-game screenshot of the default mode.

The game is built upon a foundation of randomness, play, and exploration. It eschews the rigidity of traditional design tools, embracing instead the fluidity and unpredictability of the digital realm. This is evident in its embrace of “Playful Physics,” a Duchampian notion that introduces randomness and chance operations into the design process. This approach challenges the traditional deterministic approach to architectural design. Instead of a linear, predictable process, design becomes an exploration, a dance between intention and serendipity. By doing so, *Platform Sandbox* challenges architects to relinquish their obsession with precision and control, urging them to embrace the serendipitous and the unexpected — it is ultimately not about abandoning structure but about reimagining it in a more fluid, dynamic context.

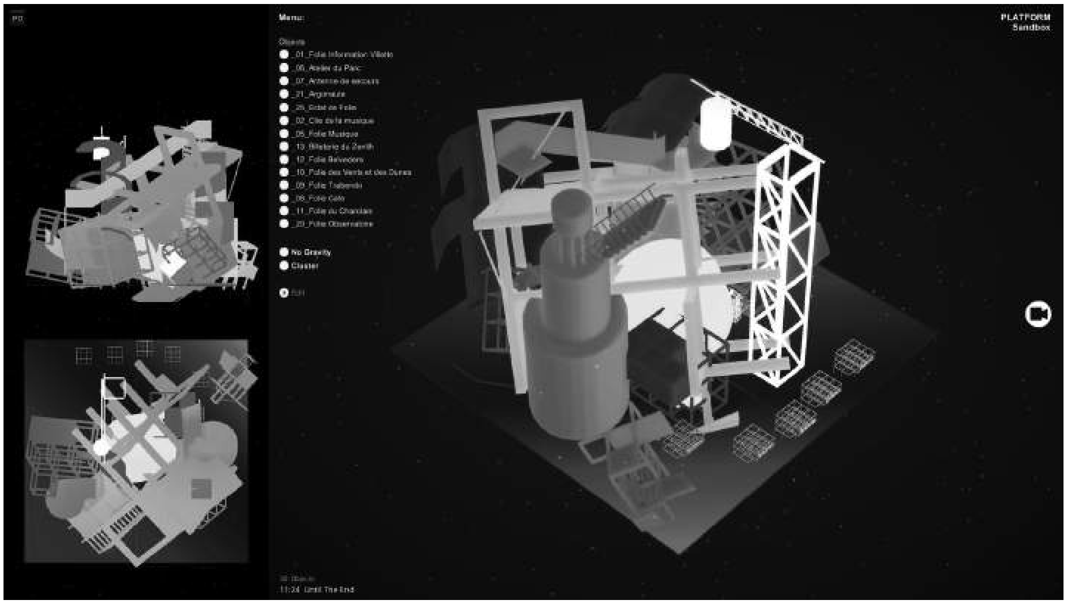

Figure 4.1.3 Platform Sandbox v.1, in-game screenshots from the versions customized by Yara Feghali and Umut Karakus, SAC 2015.

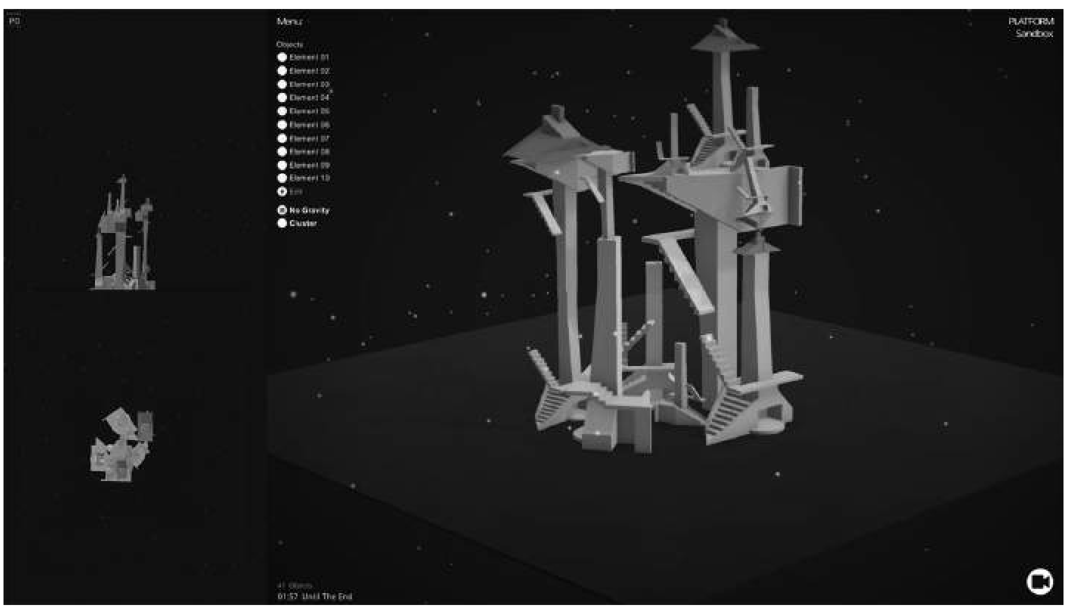

Figure 4.1.4 Platform Sandbox v.1, in-game screenshots from the versions customized by Yara Feghali and Umut Karakus, SAC 2015.

Figure 4.1.5 Platform Sandbox v.2 and v.3, in-game screenshots from the versions customized by Shuruq Tramontini and Mijail Franulic, SAC 2015.

Figure 4.1.6 Platform Sandbox v.2 and v.3, in-game screenshots from the versions customized by Shuruq Tramontini and Mijail Franulic, SAC 2015.

Platform Sandbox versions 2 and 3 were incorporated into the studio syllabus for the first year of SAC in the fall semesters of 2016 and 2017, respectively. These two versions were heavily redesigned to feature a more robust geometry and rendering core, but more importantly, in these two versions the notion of content becomes expanded to include 3D models of various scales and origins, not only architectural objects or parts. Suddenly, any object can become part of the game, no matter where it comes from, as long as it belongs to an expanded idea of the player's individual aesthetic expression. The player now has an opportunity to introduce a completely personal set of new rules into the game space, in order to be able to produce consistent aesthetic and compositional results, but the rules are intuitive and always prone to bending or breaking. The true goal of the game is to open up the player for a possibility of having an experience of a creative moment of play.

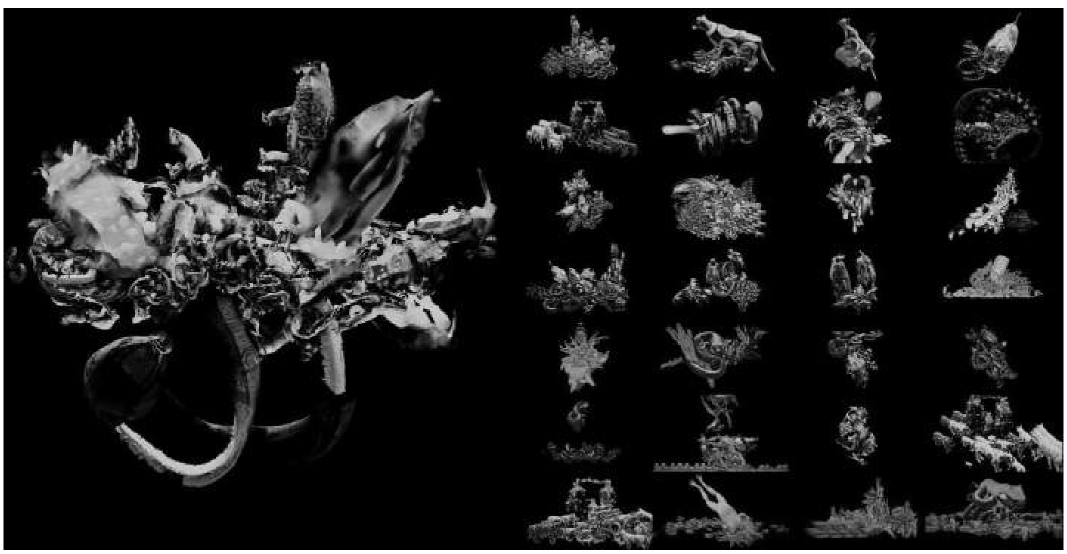

Figure 4.1.7 Platform Sandbox v.4, in-game screenshots and printed matter from the versions customized by Linzi Ai and Yash Mehta, SAC 2015.

Figure 4.1.8 Platform Sandbox v.4, in-game screenshots and printed matter from the versions customized by Linzi Ai and Yash Mehta, SAC 2015.

Version 4 was the first one to be incorporated into the visual studies seminar for thestudents at SCI-Arc in Los Angeles. The seminar, called “Become the Internet,” presented in many ways a culmination of the entire project, as it featured the most advanced version of the game as well as some new ideas that anticipate the rise of generative AI just a few short years after. In this version, the players started from expanded collections of images and models as a mine for the game’s pieces, enabling them to produce proto-versions of generative AI in their own style.

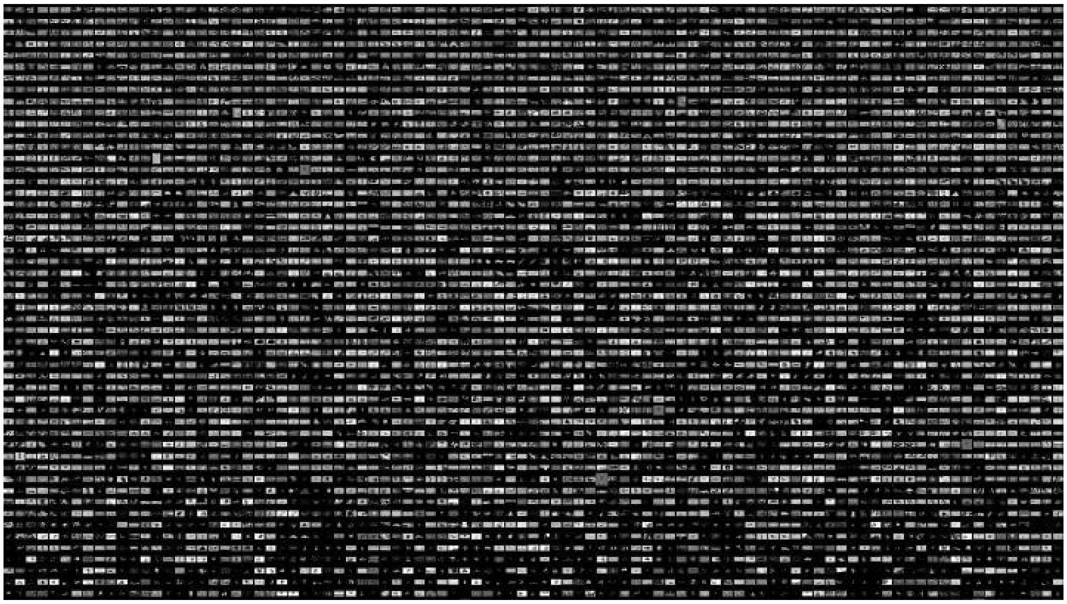

Figure 4.1.9 Platform Sandbox v.4, in-game screenshots, whole collection, a cambrian explosion of personalized aesthetics and identities all coexisting on the same flat plane of reference.

One of the main outcomes of this version was the foregrounding of the new idea of the New. Each design library is made from objects and images found online, from something undefined that we can only call *content*. Content is not data, information, or knowledge. Content is how all of that exists online, melted together in the regime of software. In this way, a platform is a machine for decontextualization; it allows for the infinite remix of content. This also affects our notions of authorship — if the Albertian author is concerned with what is behind the image — what is the meaning of the image, a platform author is concerned only with what is in front —what an image produces when it meets other entities, what is it able to engender.

Platform authorship promotes the images that are able to host multiple and different regimes of representation within the same world. Within the digital regime, simulations are the default, host format, where all previous genres of representation and ideas of pictorial space are collapsed and reformulated. Simulations replace animations as a preferred format of the ever-changing digital work, as they bring ideas of contingency, randomness, and real time as defaults that a designer needs to contend with.

All kinds of images, texts, objects are able to coexist within the same space in this realm. Because of this, each player can produce a micro genre of expression, based on their own aesthetic interest or affinity. They are encouraged to formalize the elements of a genre and understand what it takes to produce a coherent expression.

Eventually, the players collectively produce a Cambrian explosion of content, a massive catalog of digital models and establish a collective visual *possibility space*. The question of course becomes how to evaluate and select on such a large scale.

It is interesting that this image from the default version is now part of the permanent collection of FRAC in Orleans. Out of all the thousands of images over the years, easily 100s of thousands, this is the one. The work I think points to limits of classical modes of interpretation and evaluation, but also limits of archiving and collecting design culture.

The implications of design games in architectural education go beyond mere tools and techniques into the epistemology of the discipline. In traditional pedagogical models, knowledge is often seen as fixed and authoritative, passed down from teacher to student; design games disrupt this hierarchy. They position knowledge as something fluid, emergent, and co-constructed through interaction. In this model, the teacher is no longer the sole authority but a facilitator, guiding students as they explore, experiment, and learn through doing.

But why introduce playfulness into a discipline that has historically been rooted in precision and predictability? The answer lies in the very nature of the digital realm. Unlike the physical world, with its immutable laws and constraints, the digital space is malleable. By immersing students in a space that is both structured and random, both historical and contemporary, the software fosters critical thinking, creativity, and adaptability. It offers a sandbox, where mistakes are not just tolerated; they are celebrated as opportunities for innovation.

This playful approach also addresses a fundamental challenge of the digital age: information overload. With the vast array of histories, tools, platforms, and resources available, the design process can easily become overwhelming. The risk of paralysis by analysis is real. By introducing elements of randomness and play, architects can break free from the confines of analysis and tap into their intuitive, creative instincts.

Play and Digital Space

The digital age has revolutionized architectural tools and expanded operational realms. As we delve into the 21st century, the distinction between physical and virtual spaces blurs, paving the way for new architectural landscapes. With digital technology, the design of space has undergone a paradigm shift; architects are no longer confined to the physical world but are now designing virtual spaces as tangible in experience as any physical structure. An interesting conceptual inversion can be made if we follow the fundamental insight of Robin Evans ("architects do not make buildings, they make drawings of buildings" (Evans 1997)) and realize that, for all intents and purposes, *space has always been virtual*.

Figure 4.1.10 Meme by author.

Platform Sandbox was designed as a gateway to a virtual world, a realm where the rules of physics can be bent, where genres of expression coexist, and where identities are always in the state of formation. This emergence of virtual spaces has profound implications for architectural design. First, it liberates architects from the constraints of the physical world. Gravity, material limitations, and even time can be manipulated in the virtual realm, allowing architects to explore design possibilities that were previously unimaginable. This allows the designers to focus their attention on the process of design itself, and rediscover playfulness. Design becomes a dedication to play as a fundamental human condition.

Beyond design, these virtual realities also challenge our perceptions of space and place. In the virtual realm, space is not just a physical entity; it's an experience, a sensation. Places are not defined by geographical coordinates but by digital markers. This redefinition has societal implications. As more people inhabit these virtual spaces, social norms, cultural practices, and even economic systems will evolve. The virtual realm will not just be a space for architectural exploration; it will be a living, breathing entity, with its own communities, cultures, and complexities.

Architectural education and practice must recognize and adapt to this new frontier. The next generation of architects will not just be designing buildings; they will be crafting worlds. They will need to be adept not just in design principles but also in virtual reality technologies, narrative crafting, and digital ethics. They will need to navigate the delicate balance between the freedoms of the virtual realm and the responsibilities of crafting spaces that are inclusive, equitable, and resonate with human experience.

In the traditional paradigm, the architect was the master planner, the visionary who orchestrated every detail of the design. But in the digital realm, this role is evolving. The architect becomes a facilitator, guiding the design process rather than dictating it. It’s a collaborative approach, where the boundaries between the architect, the tools, and even the end users become blurred. Everyone becomes a co-creator, contributing to the design narrative.

This collaborative, playful approach also has profound implications for architectural education. Instead of rigid curriculums and predetermined outcomes, education becomes an exploration. Students are encouraged to experiment, to take risks, to learn through trial and error. The focus shifts from rote learning to critical thinking, from memorizing formulas to understanding underlying principles. It’s a holistic approach that prepares students for the uncertainties and complexities of the “real” world.

The emergence of virtual realities and architectural fictions is not just a technological advancement; it’s a philosophical evolution. It challenges architects to think beyond the tangible, to explore the vast expanse of the virtual, and to craft spaces that, while intangible, are as real in experience as any physical structure.

In conclusion, the fusion of games, interactivity, and architectural education offers a transformative vision for the future of the discipline. It calls for a shift from passive to active learning, from authoritative knowledge to co-constructed understanding, and from isolated design exercises to holistic, play-driven projects. As we embrace this vision, we must remain open to experimentation, willing to adapt and evolve in response to the ever-changing dynamics of the digital age. For in the interplay of games and education lies the promise of a more vibrant, inclusive, and innovative architectural practice.

> Because infinite players prepare themselves to be surprised by the future, they play in complete openness. It is not an openness as in candor, but an openness as in vulnerability. It is not a matter of exposing one's unchanging identity, the true self that has always been, but a way of exposing one's ceaseless growth, the dynamic self that has yet to be.
>
> — James P. Carse, *Finite and Infinite Games: A Vision of Life as Play and Possibility* (Carse 2013)

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4.2
The Digital Imaginary
The Confluence of Author and Product in Physics Simulation Engines

Viola Ago

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Introduction

Over the last few years, there has been a pedagogical shift toward a subjective lens in political theory — one such shift in particular highlights the possibilities offered by lyrical influence over conventional cognitive narratives (Bennett 2020). In the creative disciplines, a subjective turn can at the very least offer a simple alternative to vetted but exhausted traditions — ones that have long asserted a distancing of the author and the work. In recent articles I have argued for alternative approaches to creative endeavors through an experiential conflation between the author and their work through a conflation of their imminent physical and digital worlds. More specifically, interweaving a subjective lens with the emergence of new forms of interaction and expression through the digital platform —

specifically videogames and real time physics engines — can offer possibilities in design that are refreshing, friendly, and arguably necessary.

Technological changes and implementations often are sudden and jolt traditional ways of life and, by extension, quickly create new spaces for learning, playing, and even relearning the world. My first encounter with videogames took place in the late 1990s by means of a bootleg Rambo 1994 console in transitional Albania. This first contact marked a leap from an utterly material and tangible world to a mediated and digital one, not unlike the nature of the broader societal and political shifts: from oppression to freedom, from isolation to an imaginary shared collective.

Temporal Flows, Rhythms of Creativity

In our transitional post-tyrannical communist moment, the videogame phenomenon transcended mere entertainment and offered a blending of different modes of existence — the digital and the physical, the leisurely and the mundane, which in turn reimagined the roles and meanings of objects and events. Suddenly, objects and events, familiar and strange, became agents of creative and unintended interactions: playing videogames accidentally started to occupy the spaces between chores and homework, between lunch and soccer practice. This blending phenomenon challenged the conventional understanding of objects and events, suggesting that through new mediated modes of creative and technological engagement the boundaries between the ordinary and the extraordinary can be dissolved.

In addition to measurable objects and activities in a day or in a creative moment, there are other *quiet agents* — ones that resist the mathematical measures in favor of conceptual ones. The mathematical measure of an object or event is one measured as changes of state set against change in time: $\Delta T = T2 - T1$. The conceptual measure of an object or event is in one measured against rhythms (Grove 2019). Gilles Deleuze and Felix Guattari call this conceptual measure of objects/events *temporal flows* and they argue that this gives life to otherwise common, banal, logical things (Grove, 2019). Material theorist Jairus Grove calls this the *rhythm of creativity*. How exciting, for someone who is interested in the creative force of immanent things/objects/events measured against the uninvited, unplanned, unexpected.[1]

Situations, a Pedagogical Thesis For The Creative Discipline:

What follows is an interest in developing *situations* for creative work that benefit from the serious consideration of immanent (banal and novel) objects[2] and the creative author's cultural, biological, anthropological, or sensorial self. In fraying the boundaries between object and event through the expected/normative and the uninvited/unplanned, the creative author is granted a condition of infinite possible permutations of interactions of known-with-foreign, of mathematical-with-conceptual measures — and by extension of real-with-fictitious. This type of situation can be overwhelming (who wants to be confronted with infinity in our accelerated, content-inundated world?), difficult to navigate (where does one start or comprehend the possibilities?), and distanced/impersonal — or rather, falsely objective[3] (how do you ask a creative author to care about something they have no lived knowledge of?). I want to pause here for a moment and I will reiterate my situation thesis by thinking about creative work that can unfold in a real-time physics simulation engine platform. We have many tools from the traditional long-vetted architecture design approach that help us work through the infinite possibilities or the navigation issues in a design problem (this includes Western design thinking pedagogies of the 20th century, style epochs, and the move toward computers and 3D modeling environments). However, these issues are better repositioned (not resolved) by means of using simulation environments in regulating the third problem from above: moving from a distanced position between the author and their creative object to a position that is personal, unapologetically subjective, and related to a lived/experienced rather than learned encounter.

This situation pedagogical approach can responsibly respond to and actively resist vetted structures of design culture and scholarship that are still forcefully teaching the Western Canon and the Beaux-Arts oriented model. Though a byproduct and by chance, I consider this an enormous accomplishment for creative design-oriented workflows (situations); one that has asked my students to engage with design briefs in responsible, active, critical, intelligent, and uninhibited ways.

The motivation for this situation apparatus is to prepare students for a polarized world where on the one hand we have the old guard, on the other, the activist, and in the middle, the menial. Respectively: on the one hand, the Western senior white mostly male *established* creative/scholar — who holds almost all of the institutional pedigree and power — unsuccessfully being asked to relinquish their stronghold; on the other, the knowledgeable, creative, and academic institutions (mostly run by said established powermonger) struggling to — by varying measures of authenticity — diversify and decolonize their curricula/programming; and the careerist socio-politically comfortable middles, who are either fortunate enough to disengage or who disingenuously latch onto every buzzword and urgency at any cost to help further them in their personal gain trajectory.

How does one prepare, train, and advise cohorts of students in architecture, design, creative disciplines, and critical thinking who will, upon graduation, be active, hopeful, and honest participants in this polarized but potential world?

A caveat on expanding and collapsing definitions, meaning, and ontologies

One thing that will become apparent is that against all the efforts for clarity in describing the use of a physics engine through a conceptual measure event as a situation-based pedagogical approach, it remains vague due to its innate resistance to our human-centric and vetted architecture discourse–oriented language. This pedagogical approach is by definition nonstandard, non-normative, and in flux and cannot be defined by a formula or linear structure. At most, crudely put, this pedagogical thesis is based on a subjective tripartite participation model: something familiar, something foreign, and something unexpected.

In a similar manner, the project proposals to follow evade the well-established evaluative criteria in architecture — they cannot be evaluated by their precedent study, plans, sections, elevations for example. I am careful in placing new pressures on our discipline, especially during a moment that is so densely inundated with violence and instability, but I assert that we must start working toward teaching methodologies that will liberate us from the Western stronghold in hopes to propel us toward responsible ways of conducting studio format courses. It is the ambition of this project at large to continue to design situational conditions that can provide the necessary training to creative authors to think critically, collectively, imaginarily, genuinely, and responsibly.

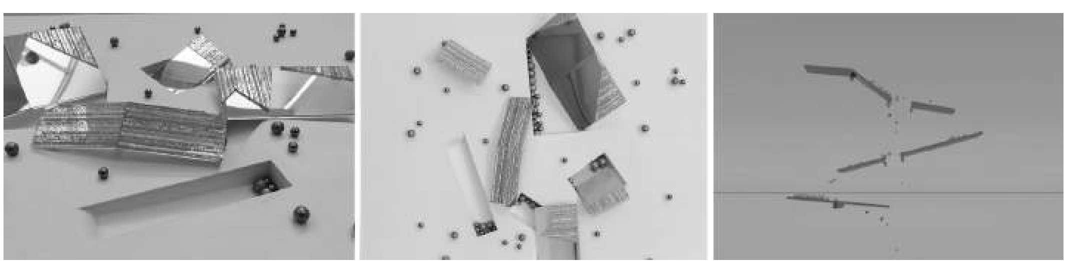
A brief journey, physics simulations, and student work

I have a cognizant but also casual (unforced) history with physics simulation engines, starting with the abovementioned counterfeit versions of *Duck Hunting*, *Super Mario*, *Robocop*, and others. More earnestly, I was introduced to physics simulations in the early 2000s from playing AAA–games such as Eidos Interactive's *Tomb Raider I, II, III* (PC) and *Legacy of Kain, Blood Omen* and *Soul Reaver* (PS2). In the mid-2000s, once I started studying architecture I became enamored with digital platforms and algorithmic processes entirely. In the early 2010s, I gained interest in digital simulation tools for their novel form generation potential (Lynn 2013). I continued to work in simulation engines through the mid-2010s as time sequences that diagrammed the genealogy of designed final forms or compositions. Following a deep dive into computation, I then returned to this inquiry in 2016, with some design and research work and more formally in 2019, with my Anyone Corp's *Log 46* article as I surveyed the field for authors dallying with or diligently exploring physics simulation engines (which included designers, architects, filmmakers, videogame designers, software developers, sculptors, photographers, artists, and technologists) (Ago 2019). I have since been developing a design-research and pedagogical body of work that takes seriously the opportunities offered by the physics simulation platform through writing, designing, testing, prototyping, workflow building, disseminating, and more importantly, through teaching.

PART 1: Initial stages: simple diagrams and the digital imaginary:

From 2019 to 2021, I used my Wortham Teaching Fellowship's generous course load at the Rice School of Architecture to simultaneously design and deploy a workflow method that offered students specifically the following: a means of departure from the postmodernist mandate (especially strong in this context[4]), a release from the aged method of architecture design in the *studio* (scope, building type, site, program, services, etc.), an opportunity to explore and consider things that have been recently overlooked in architecture (working with air, empathy theory, digital aesthetics, fictitious material behaviors, fake physics, erroneous attributes, borrowing from newly considered peripheral disciplines such as film and videogames), encouragement to develop a personal and sensorial design approach (using new materialism theory and phenomenology of empathy), to meaningfully and fearlessly contend with issues of Western slow violence[5] in the built environment and pedagogy (my students had designed a winery in the south of France the year prior) (Ago 2020a).

The works in Figure 4.2.1, Figure 4.2.2 and Figure 4.2.3 are materialized conditions of the digital video sequences and physical compositional models from a fall semester design-research seminar using simulation engines. Though the physical models and the digital video sequences borrowed cues from one another, they also existed independently with their own respective agencies — in other words, this was not an exercise on the fidelity of translating physical behaviors digitally and vice versa. Rather, the physical and digital models were selectively mined and pursued by each individual creative author calling on their own sensorial apparatuses.[6] The video sequence of the digital simulation experiments presents material and object behaviors that are impossible in our physical world. Figures on the right and middle show a collection of fallen panels resting on an indented ground plane littered with bearing balls. In the video sequence, a screen-capture in the right column, the panels are suspended in midair, they slide away and toward one another to choreograph different pinball-like openings and barriers, and the spheres sometimes go through the openings, sometimes bounce from the surface of the panels, and at other times, go through them as though the panels are an illusion, not real. The left and central images in Figure 4.2.2 photograph a physical model consisting of two parts: a particulate system that implies a circle inscribed within a square without explicitly drawing it, and a deformed rigid clay artifact suffering a superimposition of the behavior of cloth acted on by an underlying vertical dense volumetric grid. In the video sequence, screen-captured in the right image of 4.2.2, we sense invisible forces inscribing the circle in the particulate field and the Z-axis motion of the volumes that challenge the cloth-ness (soft bodies dynamic) of the blue rigid ceramic artifact. Figure 4.2.3 photographs a model that wants to submit to the behaviors of its virtual composition, where suspended geometries slowly fall through a gridded plane and suddenly cause it to partly crumble. This sequence is seen in the side view on the righthand screen-capture in Figure 4.2.3.

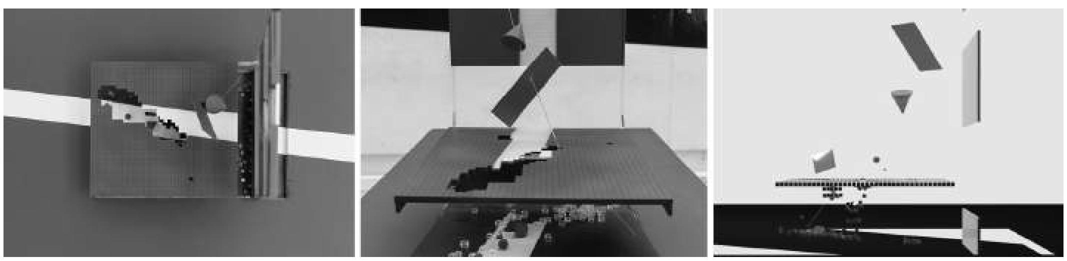


▶ **Long Description for Figure 4.2.1**

Figure 4.2.1 Fall 2019, research seminar student work (images courtesy of Alida Fabrega and Neil El Souri).

▶ **Long Description for Figure 4.2.2**

Figure 4.2.2 Fall 2019, research seminar student work (images courtesy of Stacy Sy and Beril Uzmen).



▶ **Long Description for Figure 4.2.3**

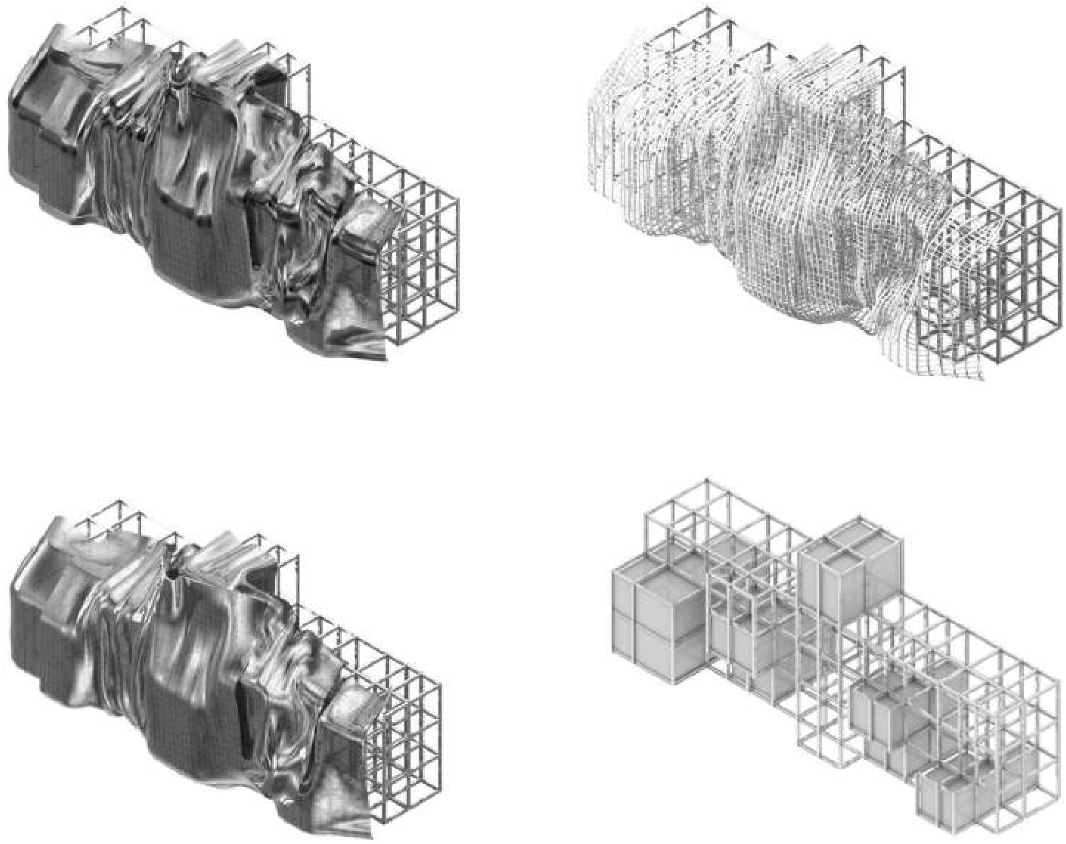
Figure 4.2.3 Fall 2019, research seminar student work (imagery courtesy of Rita Xiong, Benson Xie, and Owen, Wang).

This course asked students to digitally simulate — naturally or unnaturally — behaviors of objects and materials in the digital environment. To start, they were asked to generate geometric 2D and 3D primitives, assign default-value physics forces to them, and play out interaction sequences among all the parts in the scene. More importantly however, and this was the most difficult part of beta-testing this methodology, the students were asked to develop a language to communicate with their digital geometries and simulated actions. They were asked to find something that was external/unexpected/foreign to the authentic/default physics simulation or the geometry collections that they were working with and use that as a *soft* conceptual measure for their designs. In so doing, not only did they start to develop an intimate (and axial with a point of inflection[7]) relationship with their compositions, but they also took away the power of the established, exclusive, rigid critic to evaluate the work through conventional traditions by bringing in another (conceptual) measure that was neither in the Canon nor in the vetted inventory of evaluative metrics for design (I expanded on this in the second launch of this situation methodology).

More specifically, these students constructed simulation timelines that lightly borrowed compositional cues from prompts that were delivered during digital tutorials, readings, peripheral disciplinary references, and to varying degrees, individual experience/knowledge. More specifically, students were encouraged to pay minute attention to the physical interactions of digital bodies on a screen, to sense the physics of the scene, to attune to the effect of the interactions of the geometries, to give in to the pull (or resistance) toward the visual unfolding of the simulation, and then subsequently, to slightly alter input values, and play/run the simulation, again, and again, and again. They were asked to listen to their internal *selves*, what they liked and disliked, and to respond to that internal apparatus of influence rather than allowing their cognitive/taught understanding of architecture and design to guide their creative process. To iterate, though the learning curve is steep, sidelining the question of mastering the digital tools (in fact, they were encouraged to use different software packages and engines and to alter the physical simulations using anything from built-in ready-made plug-ins, attribute editors, tool settings, to even editing in code), these students were asked to build imaginary, internalized, precognitive sensorial-based compositions that, in evading a human-centric language, attempted to invent an alternate one (not necessarily verbal) that allied their internal creative selves with their creative work. To illustrate once more with the model from earlier, students were asked to work with the mathematical and conceptual measures of digital objects and simulation events through the inflection of a foreign element. Respectively, the mathematical measure of the size, orientation, and position of the geometric primitives and the conceptual measure of, for example, rhythms (again, and again, and again), falsehood (metal behaving like paper), glitched (a digital cube's geometry glitching to bad polygons), unease (a body landing on a grid of spikes), and comic moments (a stair inflating to a balloon), in the relationship (axis) between author and simulation. Some of the conceptual measures observed in this first phase (Figure 4.2.1, Figure 4.2.2 and Figure 4.2.3) included: a soft body dynamic stretched over an unrealistic framerate, the plasticity of a metallic rigid body deforming fictitiously, the intentional non-allocation of a collider object in a scene of object-to-object force-impact. It is in this non-hierarchical, fluid, liberated environment that an individual author's sensibilities are being interrogated and trained.

PART 2: At the confluence of digital physics engines and contested sites

This first instantiation (in Part 1) was intentionally abstract such that it didn't tempt or make the space for students to default to conventional methods to guide their processes and projects. These include the go-to 3D modeling tools/software packages (loft, extrude, subd's, etc.), and the typical architectural design guiding forces mentioned earlier (scale, orientation, program, site). The ultimate intent is not the removal of these methods; they are simply not adequate to be the primary and sole respondents in designing for our current moment. This conceptual measure situation pedagogy can remain in the abstract but it can also be furthered all the way to fully fleshed out architecture design projects. In a dual resolve — to satisfy the curricular requirements of the course and to test this teaching method — these students developed and completed architectural proposals, on a real site, with a proposed program (Figure 4.2.4, Figure 4.2.5, Figure 4.2.6, Figure 4.2.7 and Figure 4.2.8) that derived from their abstract and sensorial imaginary compositional projects (Figure 4.2.1, Figure 4.2.2 and Figure 4.2.3). The following year, the second instantiation of this methodology saw pleasantly wilder, more frustrating, but also more diverse, inquisitive, and fearless responses to a more delicate prompt (Figure 4.2.9, Figure 4.2.10, Figure 4.2.11 and Figure 4.2.12).

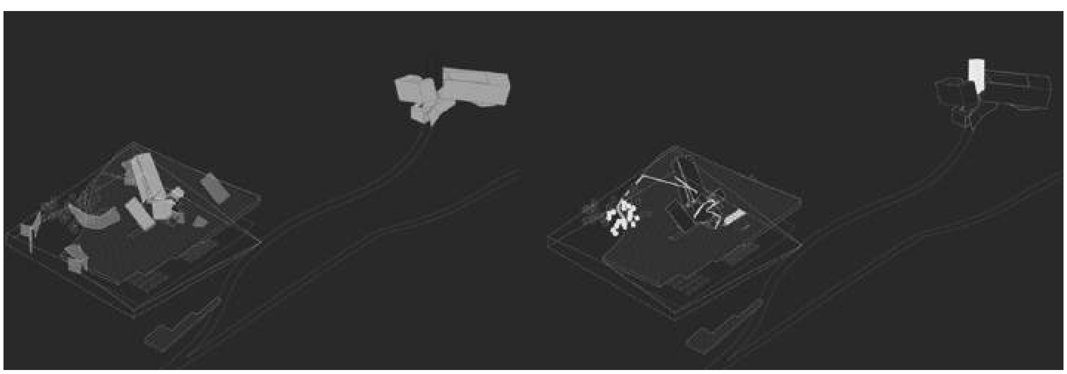


▶ **Long Description for Figure 4.2.4**

Figure 4.2.4 Winter 2020, studio student work (courtesy of Beril Uzmen).

▶ Long Description for Figure 4.2.5

Figure 4.2.5 Winter 2020, studio student works (imagery courtesy of Beril Uzmen).



▶ **Long Description for Figure 4.2.6**

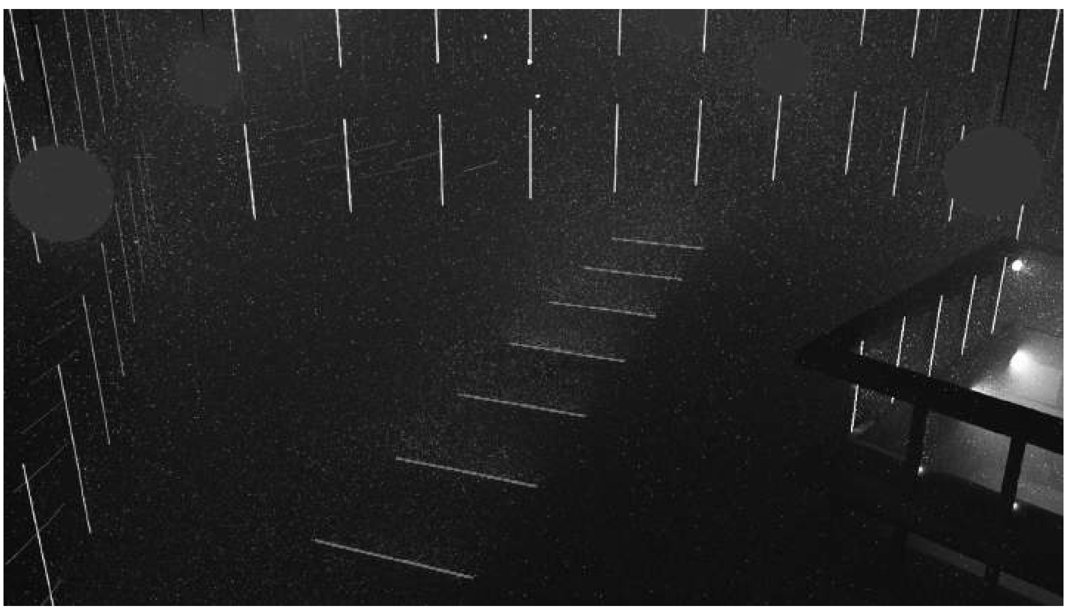
Figure 4.2.6 Winter 2020, studio student work (imagery courtesys of Rita Xiong).

▶ **Long Description for Figure 4.2.7**

Figure 4.2.7 Winter 2020, studio student work (imagery courtesy of Rita Xiong).

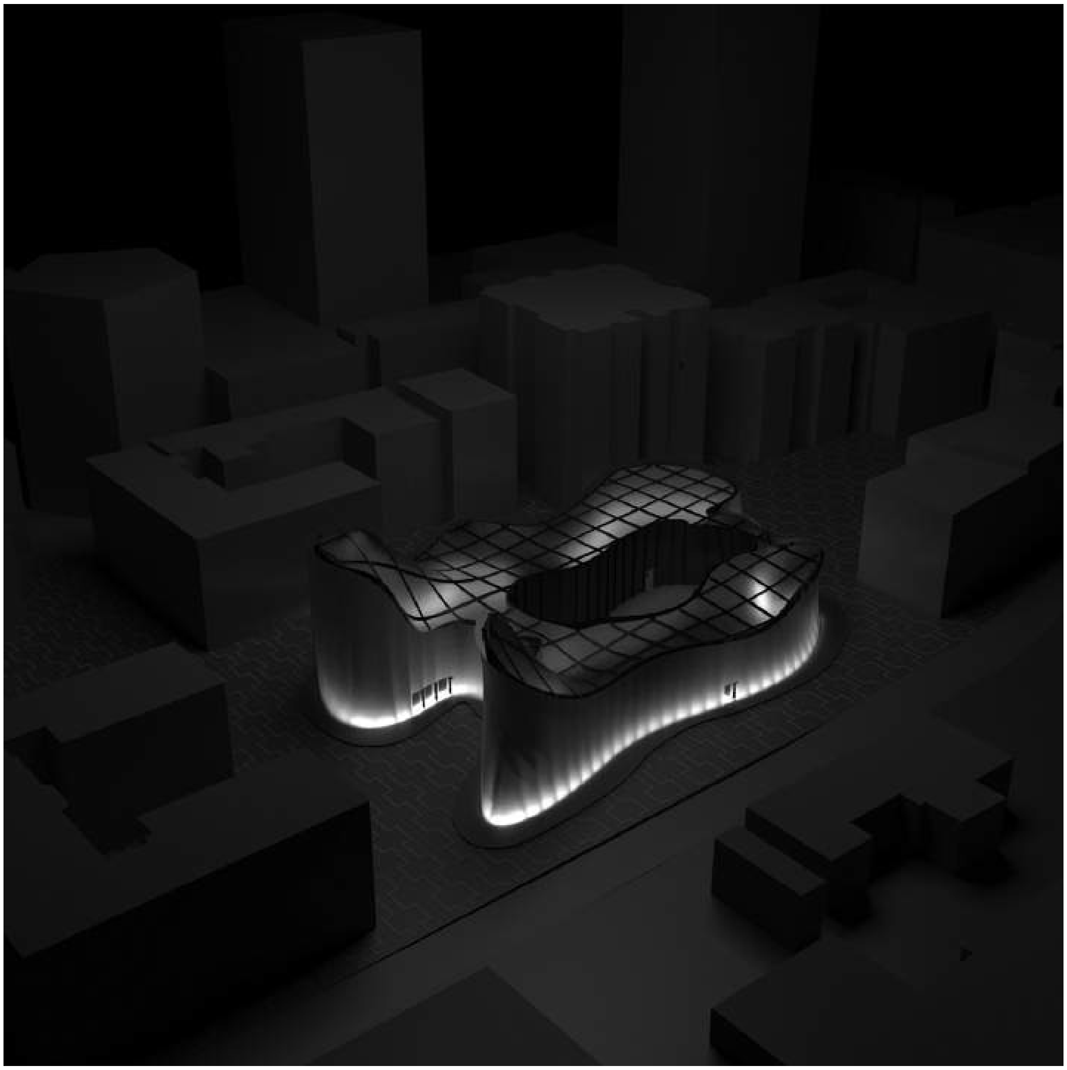
▶ **Long Description for Figure 4.2.8**

Figure 4.2.8 Winter 2021, studio student work (imagery courtesy of Marlena Fleck).



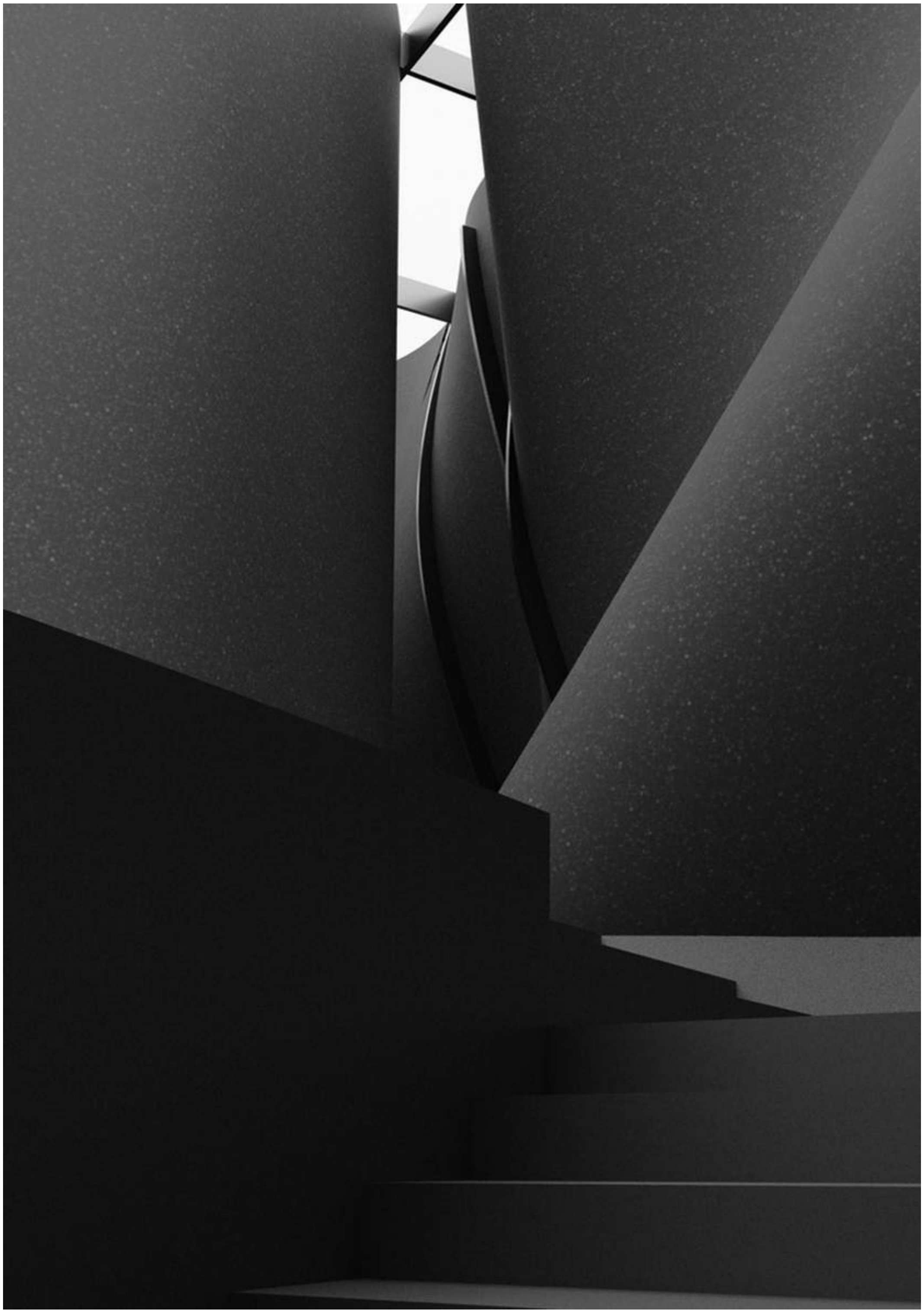
▶ **Long Description for Figure 4.2.9**

Figure 4.2.9 Winter 2021, studio student work (imagery courtesy of Marlena Fleck).



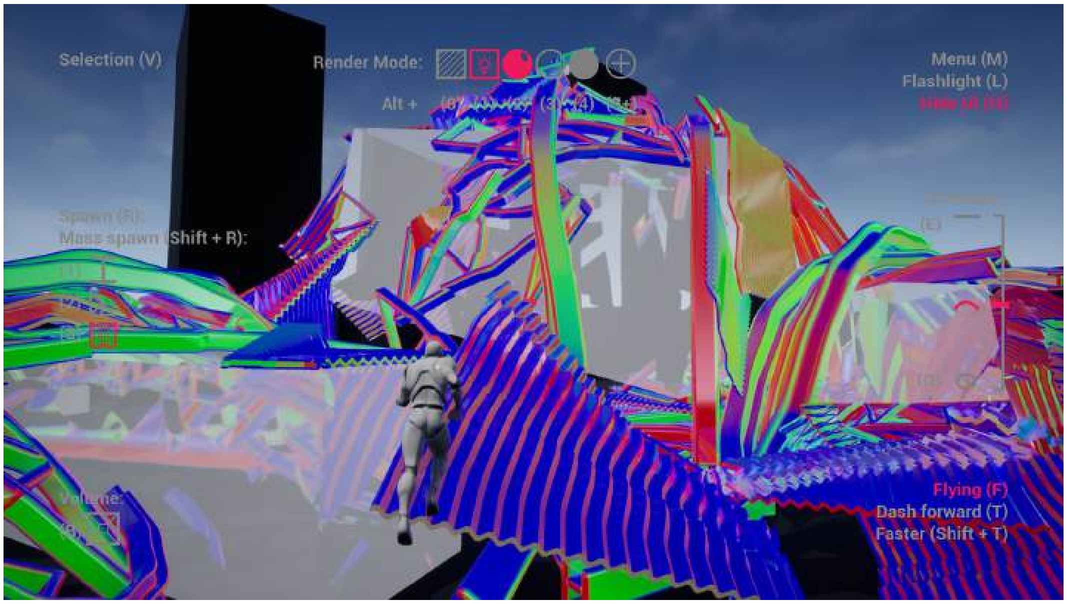
▶ **Long Description for Figure 4.2.10**

Figure 4.2.10 Winter 2021, studio student work (imagery courtesy of Eric Baik).



▶ **Long Description for Figure 4.2.11**

Figure 4.2.11 Winter 2021, studio student work (imagery courtesy of Eric Baik).



▶ **Long Description for Figure 4.2.12**

Figure 4.2.12 Winter 2021, studio student work (imagery courtesy of Wenyi Zheng).

The first instantiation observed a relationship of reciprocal influence between author and platform/engine. The second iteration built onto this reciprocity, but also recontextualized it by the added pressures presented from a contested and complicated site. In the first instantiation (Figure 4.2.4, Figure 4.2.5, Figure 4.2.6, Figure 4.2.7 and Figure 4.2.8), transformations were understood as materials and forms behaving in response to the influence of fictitious physical forces. In the second, students continued to develop this alternate nonhuman, nonnormative, imaginary language from the lens of a recent, real, architectural event: the government ordered illegal demolition (May 2020) of The National Theater in Tirana, Albania, built in 1939, in the Italian Rationalist style during Benito Mussolini's colonization of the region. The demolition was simultaneously making way for a new theater and luxury residential developer-backed planning on state-owned land designed by BIG Architects. Their theater design was shaped like a bow-tie, clad in glass and steel and promised modernization and Westernization (Ago 2020b). The demolition was fiercely resisted by artists and activists and its erasure was felt gravely by the general public.[8]

In our studio, one new theater proposal rebuilds the demolished theater's stage, enclosed in a glass vitrine, that is only possible to view and experience by rendering air particles and light emissions. Though the proposal envisions itself as a building, its visual language is rooted in digital environments and real-time atmospheric effects to experience its space. In Figures 4.2.10 and 4.2.11, we see a proposal for a new theater, an ethereal resemblance of the demolished one. This proposal resides in the space between the monument (that the corrupt government desires) and the memorial (that the general public mourns) by respectively: using a glass and steel roof, loosely following the footprint of the demolished theater, and by adding fictitious agency to known materials (the slumping of the glass structured roof and the cloth dynamics of the populit[9] cement/concrete walls). The third project, Figure 4.2.12, displays a scene from a videogame designed in the place of an architectural proposal or building anew. This project reconstructs a different type of cultural artifact for the public audience, one that requires the participant to log in online and use a built in digital library that consists of structural components mined from the demolished theater (beams, trusses, corrugated sheets, populit clad panels, columns, etc). The videogame gives the unnatural ability to a human player to lift and throw heavy structural members in the air, and watch them drop, droop, and melt over an invisible underlying volumetric construct that resembles the demolished theater.

In addition to critical readings and thinking, using physics simulation engines and videogame platforms allowed the students to gain an alternate type of familiarity with the site, viewpoints, material behaviors, scale, feelings. They were asked to neither reinforce nor erase the site's embedded cultural and socio-political history, and to be neither truthful nor malicious to the material contingencies found in the at-the-time existing demolition rubble or the previous erect theater. In other words, the course was not interested in extremes, sides, or solutions. Students were given a variety of resources to help them enter the site through familiar methods of knowledge acquisition (readings) and experiential digital interfaces (simulation platforms). They engaged in discussions on articles and sources from journalists, activists, artists, and critical thinkers and were advised to experience existing, previous, and related theater artifacts in the digital simulation/videogame environment. That was the setup. In working toward their creative proposals, they were then asked to trust their sensorial apparatuses to meld the critical learned knowledge with the digitally mediated/simulated experienced one in order to understand and sense the site in question so that they could respond to it from a subjective position of responsibility and care. This exposure to the site, problem, and project brief allowed the students to discover and be influenced by a variety of uninvited/unplanned agents to provide the conceptual measure for their creative responses.

Conclusion: software and ideology, the lens of the creative author

Learning how to use physics simulation engines is not an easy or quick endeavor. Similarly, in evading parts of the digital for some students, as I have advised at times, if one works on physical simulations in analog and replicates it in the digital — as the digital is unmistakable and ultimately the default medium in the current world — also requires a high level of skill acquisition. As commercialized and commodified digital content and availability (connectivity) grows exponentially (we still operate in a centralized, top-down model), two things are happening: our students are inundated with perfect images and quick filters and single-function apps that alter images subjected to mainstream standards; and by extension, they are indoctrinated in app-based modes of thinking and working — fast, easy, user friendly, touch-screen, cloud. Whole software packages and workflows essential to creative authors exploring and producing meaningful work seem at risk of becoming obsolete or worse, available to a select privileged few, because software skills demand time, emotional energy, mental strength, and expensive computers and are quite often counter-intuitive.

Notes

1. In a recent article, I wrote about the phenomenology of empathy as a foreign/unexpected intervention that enters the scene of a creative act. In one example, I refer to the moment when you click a computer mouse or press the arrow up key on the keyboard to run an action or alter an input value in a digital simulation. The mouse click and arrow key are foreign (mechanical, physical, physiological) events that enter a digital simulation and suddenly create an axis of nonverbal, but empathetic, communication between the creative author and the designed scene. (Ago, 2020, 48–57).
2. I borrow Bruno Latour’s terminology of immanent objects that already exist in the world, past the transcendental mode that some types of visual studies field enforced. Latour prioritizes using existing objects

in interesting ways rather than creating visual works that are poetic, transcending, sublime, etc. See: (Latour 2011).

3. Falsely objective because modernism's assertion of its objective approach to design and scholarship was in actuality completely subjective — it was the aesthetic disposition of a very small and exclusive group of a Western ideology who had the power and authority to monolith the discipline, publish it, and sell it to everyone.
4. Incidentally, being confronted with the hyper rigid, post-modernist, forcefully regulated, determined pedagogy and embedded curriculum at Rice School of Architecture was perhaps simultaneously the most extreme and perfect condition to test out this methodology.
5. Grove, J. V. (2019). The Anthropocene as a geopolitical fact. In *Savage ecology: War and geopolitics at the end of the world* (pp. 35–58). Duke University Press.
6. Note, the individual student's unique sensorial predisposition is a very complex aspect. In a classroom, I consider the individual sensorial predisposition as one that has been and is consistently influenced by the self (cultural, biological, physiological), by the collective, and by the absorption of new materials (Bennet 2020).
7. Axial refers to the one-to-one back-and-forth axis between author and simulation engines, and the point of inflection refers to the two directional axis being inflicted upon by the external/unexpected/foreign agent.
8. The general public understood the building and its program to be of monumental value to the culture and history of the performing arts at the national level. Regardless of its bitter colonizing past, the theater had amassed critical value from its 70-year long cultural programming history (Pllumbi 2022).

9. A combination of cement, algae, and wood shavings that was invented and used in Italian Rationalist architecture, such as the demolished national theater.

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4.3

Interview with Rik Eberhardt

On His Role as Program Manager for the MIT Game Lab

Rik Eberhardt

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When you're teaching game design classes, how do you approach explaining to students how they should think about their games or how do you get them to leave their comfort zone?

We start by trying to figure out where the students' knowledge starts because every year it changes. MIT students often do not have time to play games because they are focused on their studies, so we try to connect them to playful moments throughout their regular life.

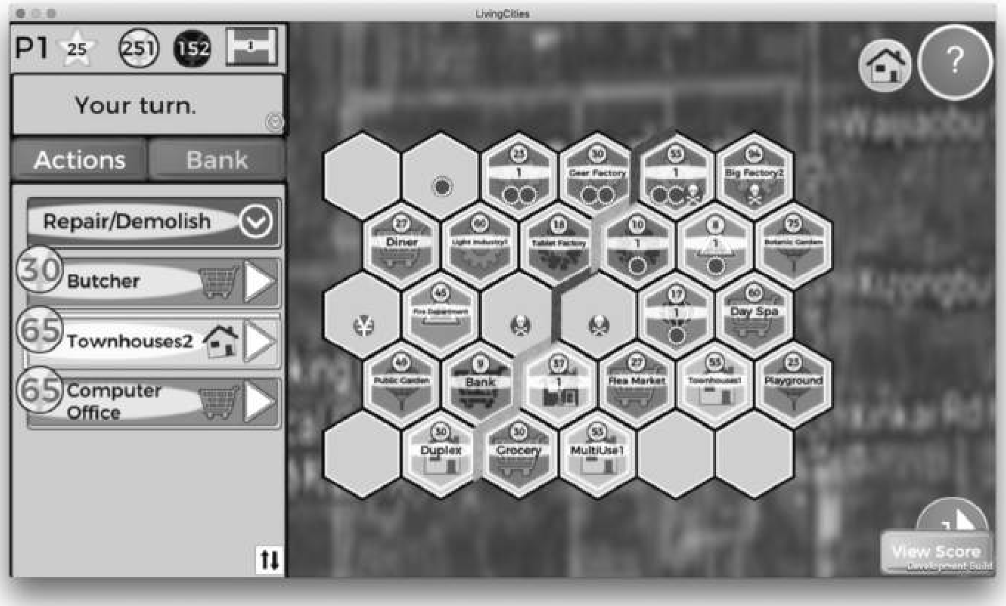

Figure 4.3.1 LivibleCities game by the MIT Game Lab.

How are we playful? What do we play with? Sometimes that means talking about the hacking spirit of playing with things, getting things to do things they weren’t meant to do. Sometimes we connect to games they played as a child or games that they watch. A lot of folks these days watch more games than they have time to play. We do make an effort to have gameplay be a part of the classroom experience throughout.

We try to get them to play lots of kinds of games, exposing the students to games that they might not have seen, the kinds of games that don’t get a lot of news and that are not talked about in mainstream videogame discourse, but might be talked about in independent game discourse or academic game discourse.

Do you feel like architecture plays a role in the games that you play with students

and/or the games that they end up designing?

Absolutely. We don’t always have the ability to make 3D environments in classwork just because of the effort or skillsets required. When you are designing a 3D environment, it just makes sense to think about, what is the size of your avatar, and how does it connect to the space around you? How is that space used?

The interface, how we connect with and how we use things is very much a part of the class and in our discussions on usability. We always talk about “Norman doors” and affordances. How is a thing designed, how does that design allow you and give you affordances on how to use it and what it can do and what it’s capable of? We talk about that significantly.

I am not trained in architecture, so I don’t know exactly how well this stuff relates. But for example, theme park design is very much related to game design, particularly when it comes to a navigable space where I want you to go from one point to one point. Or I might want to hide the things that I don’t want you to see, but I also want to make sure that you see the things I want you to see. That’s a large component of it.

When we were running the GAMBIT Game Lab, we were running it as a production studio, almost like a charrette, so people could talk about each other’s design. I think they do that a lot in our intro to game design course. Just trying to get students to give design feedback to each other and to take design feedback from each other.

When we were first starting up these courses, one of the things we investigated was how architecture design studios have been run and have been taught.

Which of your projects are more spatial in nature?

We created a game prototype about socially responsible real estate development, a digital multiplayer board game where you have four players all building inside of the city. We had a couple different learning goals; one was to teach and expose students to the idea of debt and capital, how real estate products are created, and how you would optimize so that you would not be in debt. We wanted players to make decisions that were beneficial for them, but also not detrimental to others. Because if they did work entirely selfishly, the system would make it even harder for them to do well.

We did it by thinking about the worst places we've seen in the US, with little to no zoning and regulation, where anything is built anywhere. The goal was to think about, outside of the game, how do we regulate each other? How do we talk to each other? How do we decide what we should or shouldn't do? Our players would say things like, all right, let's play it again, but this time let's make sure that if anybody wants to build a factory, you only get to build it in this location. So, they're kind of doing a zoning activity on their own.

Do you feel like games help the players understand the built environment that they occupy?

I think the difference depends on the type of player who's coming to it. With the real estate game, we had different discussions depending on the players' backgrounds, we played it with students and professionals, but it was always around social responsibility and how it relates to their everyday life, their urban life, or to their work life.

Students' discussions would usually be about some basic things around how business works, but also how social responsibility is an important aspect of business. The cool thing with the professionals when we played it with them is it offered a place to have a hard discussion. They weren't talking about any of their projects, instead they were discussing this make-believe project that was horrible, and then were able to have a conversation about what they did in the game and whether it was responsible or not and what the incentives were like in the real world that would cause these bad things to occur. We had two real estate developers, someone from the government responsible for zoning, and a landscape designer who was focused on green spaces and things like that.

I don't think they would have the same conversation if they brought their own project into discourse. There would be higher risk, there'd be more on the line, and they might talk less about problematic incentives. This allowed them to have just a freewheeling conversation that didn't feel like they were being judged. Playing a more abstracted game than something like *Cities: Skylines* ensured that the discussion was on the social responsibility issues at the heart of it rather than the accuracy of the simulation.

Do you feel like the occupation of digital spaces is shifting the public's perception, what space should be in real life?

First, I want to explore every little nook and cranny and do all these different things with the space, but once I am given tasks and quests, my exploration of the space drops off dramatically and how I perceive the space changes.

It's hard to make vast generalizations for games because there's so many kinds of games and experiences. Considering a multiplayer environment in *Minecraft* or *Battlefront*, a place where you can do a lot of different things anywhere, there's only so many different tasks that are being assigned to you at any one time. Your perception of the space falls away and you see that it outlines this and so really you get this narrow vision of what you are doing at that moment. In *Battlefront* you are probably looking for a player to shoot at and that player is hiding from another player etc. Versus in *Minecraft*, you are constructing a building or mining. You get very tied to what's immediately in front of you.

There's this thing I saw with first person shooter players a while ago, they would reduce the graphical complexity of the game to make sure that it was really fast. To the point where you were basically fighting in this gray box against other gray boxes and you're focused on what's in your crosshairs, not really the massive environment that the designers made. With these kinds of play spaces and particularly with digital games, I only care about the task I have at hand, and I will approach the space differently.

When I'm living in my house and doing things within my house, I'm very focused on the things I'm doing at that time, but when I enter a new space in the real world, I've got all these layers of regulation and laws and cultural assumptions that determine what I might do or not do. With a videogame, those things still exist, but there's a fluidity or flexibility I might have, and is especially different if there are other people in the gamespace with me.

What is the role of architecture within videogames?

Architectural design in videogames isn't just the physical space, but it's also the interactions that are allowed and the game mechanics. The placement of architecture has affordances and creates new abilities. With the nature of a game being a playground, some number of players will explore the boundaries. That's how you get speedrunners who use graphical glitches, the equivalent of a parkour enthusiast in real life. They're not using the space in a way it was intended, instead moving through space in an interesting way and exploiting elements that may or may not have been intentionally designed.

In real architectural and urban environments, there's areas that could be playful but they designed the play out of it by putting in things like a metal piece so people can't skateboard or lie down on a bench. You've limited the use of that bench to no other purpose other than sitting in a particular way.

When I play a game that involves real world things, the game bleeds into the real-world space. *Katamari Damacy* is a game where you're rolling objects into a big sticky ball and that ball gets bigger and bigger and bigger. After a play session, say the next day, I'd look around me and think okay, this is a messy environment. This is where the ball would go and this is how big I'd have to get the ball to be to get through to pick up this one thing. We are using similar metaphors to things we use in our physical life.

Do you feel like in videogames architecture or spaces are less hostile than in real life?

I don't know if hostile is the right word, but it's much more constrained. The fact that you blocked off this environment and didn't let me go through it means that I have to exploit a glitch to clip through.

Videogame environments have many more constraints and so much more you can't do versus what you can do. The fun becomes how do I get past these constraints to exploit them and do things that wasn't intended or allowed.

That said, there's also things that are designed so that they allow explorative play to occur. If you look at the various iterations of games that involve parkour mechanics from *Assassin's Creed* to *Mirror's Edge* to *Prince of Persia*, those games set things up in a way that feels like there are multiple ways to get from point to point. But they're usually constrained to allow only one or two ways with minor variances. Often there's a decision being made about which ways are allowed, but who and why the decisions being made vary because it could be a technical constraint, a performance constraint, or a design constraint. Maybe we don't have enough polygons to make this thing look exactly right or we don't want them to do this because we know if they do it it's going to error out or cause a bug. I don't think in a videogame you can divorce the space from the other elements of the design. Everything becomes part of this greater designed object.

How do you feel like people's understanding of these cities change when they only occupy these spaces virtually and not physically?

I could experience a city by watching video tours of the space, versus interactive tours. I could also experience a city through videogames like *Fallout 3* where I'm actually inside of this altered Washington, DC with massive amounts of constraints about where I can go within the space and where the locations don't really match its real counterpart. I think DC is an interesting example because I suspect most people who don't live there have a common understanding of what it might be like but only through key landmarks. There is the White House, the Monument, the Mall and nothing else outside of that is known, or not considered part of DC.

There's an opportunity for these virtual experiences to open up the city. If you were to ask me to make a digital environment that would expose people to new parts of DC, I'd probably look at the Rock Creek area and other natural locations or look at the Washington Cathedral or other neighborhoods that don't get that kind of exposure.

When I think back to the *Assassin's Creed* games, particularly the ones that take place in European cities, the Ezio ones, many of the buildings still exist, like Notre Dame is still there. The London version of *Assassin's Creed* didn't resonate with me so much and I wondered if it was just because it didn't have any landmarks that really connected with me, unlike with Paris and the Eiffel Tower in a similar game, *Saboteur*. When you're looking at what they're doing with the space and see how much of the city they are experiencing, how is the city being presented to them? What purpose do they have for the city? And in most games, it's often very constrained and goal oriented, the city exists for game reasons only. With tourist-style videos, you can get the essence of the place, but the spatial relationships are broken.

In the videogames, you get the essence of the spatial relationships, but they're also broken. I understand that the Mall is here, the Monument is there, and the White House is there, and that there are other big buildings that have things inside of them. But I don't ever get a realistic portrayal of anything. But in a game, that's not what I'm looking for.

How does the New York City in *Spider-Man PS4*, which is very much a caricature of the idea of the city without any real urban correlations beyond a couple buildings, change the player's understanding of the urban space?

In *Marvel's Spider-man*, Central Park is so small. It's because you're Spider-Man and you have massive amounts of power but it's also weird to use your webs to maneuver through Central Park because there's no tall buildings to swing off of. So, they make it a little bit narrower. When I'm inside of Central Park in the real world, it's huge and I have a very narrow view of everything because there are always obstructions, whereas in game, because we're trying to get you to be able to see a little bit ahead, they generally give you a much wider perspective of the space. With these kinds of superhero games, I don't want you to feel lost, I want you to feel powerful. With a horror game, I want you to feel a little bit lost and a little bit vulnerable because that's the kind of experience I'm trying to create for you.

So then we start thinking about a hard divide between games and simulation. With simulation, we're modeling something that we want you to have some kind of understanding that we're modeling it as close as we can to what it might be in the real world. We're really thinking through the scale that might even be closer to you, the perspective that you see might be really closer to what you'd actually have in that experience. Whereas a game, we're going to muddy that stuff up and mess that stuff up because we're actually trying to get you to do this other thing.

Are there any imminent innovations in videogames that architects should be aware of and what do you feel like their impacts will be on both industries?

One thing they've been dealing with, is people looking down at their phones all the time while they're walking through real space. I do always wonder, is augmented reality ever going to hit to a point where I'm inside of a space and interacting with that space and interacting with my phone and the data feeds that I'm getting are such that I'm actually, like, connecting the space I'm in into my device?

The things that Disney has been doing lately with *Star Wars* is less about architecture for livable spaces, but rather bringing videogame fantasy into living, physical spaces. Disney converted a hotel to be an imaginary spaceship that you cruise the galaxy in the *Star Wars* universe, that was also connected to the Galaxy's Edge theme park. In that regard, it was the interior architecture of the building. You're in the "ship," you're live-action role playing, but there's also scenes between actors that are basically being done on stages. The stages are just made to look like things that should be there, like there's a gangway that actors are fighting or talking on and we space-tourists can all observe it because it's happening in this public space.

Tourism is in the fantasy of a space first. For tourism, I'm going to a place that I'm not from to visit because I either want to experience the fantasy of it, I have a fantasy I've seen in the media, or I want to experience my fantasy of the authentic place: what I imagine it is like to live in that space. I think we've seen a lot of games capture the fantasy part of these spaces, but not necessarily trying to capture a lived authenticity. I think there’s an opportunity here, maybe in pre-visualizing new developments as playable living environments?

4.4

Comparing Pedagogies of the Architectural and Game Design Classrooms

Christopher Totten

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Introduction

The architectural sociologist Garry Stevens once argued that "All forms of education transmit knowledge and skills. All forms of education also socialize students into some sort of ethos or culture." (Stevens 1995) This is broadly observable — students from different schools may gravitate toward different areas in design or have preferences for different processes — but the short history of game design education offers an acute case of these ethos and cultures evolving in real time. As game designer and researcher Brendan Keogh observes, these programs grew from an economic desire by game studios to have a reliable pipeline of new hires, but shifted over time to more holistic design programs as interest in the social and cultural impact of games grew (NYU Game Center 2017). As the field became more established, opinions for what makes a "good" university game design program arose. Some guidelines, like those from *Princeton Review*, emphasize language about industry-preparedness and technology (Princeton

Review 2023b), while others emphasize “soft-skills” such as collaborative skills (Extra Credits 2012) or the ability to function as a creative worker in broader cultural applications (Keogh 2023). As such, instructors often struggle to make curricula that balance the technical necessities of the medium, collaborative skills, and the awareness of the gaming medium’s place in culture. As game design itself seeks knowledge from other cultural and intellectual traditions as varied as literature (Howard 2008), art history (Sharp 2015), and punk rock (Lowthorpe & Taylor 2017), we may also seek the educational traditions of other fields. In this context, this chapter will consider game design pedagogy in the context of architectural design pedagogy.

Much has been made of the connections between game design and architecture in the game industry disciplines of level design — the arrangement of spaces to guide player movement — and environment art — the visual theming of a game’s world as constructed with pieces of 2D or 3D art assets. Successful design education relies far less on design students “mastering” so-called technological “secrets” of design (Keogh 2023) and more on developing students’ ability to generate solutions within shifting constraints and cultural factors (Barney 2020). This training, in turn, produces designers who exercise design not as a set of solutions, but as a practice of creative problem solving (Yatt 2005). This distinction between rote “training”-style educational models and a “studio” style focused on training the creative habits of a designer holds promise for pedagogy in younger areas of design, such as games.

Through comparisons of the cultural factors that shape each field’s pedagogy, key areas relevant to both architecture and games suggest synthesized methods for making students into thoughtful and independent designers.

Background

To identify the competing ethos and cultural priorities in play within university game design programs, we must first focus on factors that contribute to widely reported trends described by game design educators (Keogh 2023).

Early Technical Programs and Literature

University videogame development programs emerged in the late 1990s to answer the need of game studios needing a pipeline of new employees trained in the studios' increasingly complex software tools (Keogh 2023). The popularity of these programs (Gillen 2008) led many colleges and universities to open their own game design programs with the hope of increasing enrollment and the influx of tuition money. Some early game design programs, such as the one at Abertay University in Dundee, Scotland, worked directly with established game development studios (in Abertay's case, DMA Designs — original creators of the *Grand Theft Auto* franchise). Other early programs, however, offered "industry skills" with no clear pathway for students to enter the industry (Keogh 2023). This trend is embodied for many in an ad from the late 1990s/early 2000s for the for-profit and now-defunct Westwood College Online (Johnson 2010). In it, two young men express the need to "tighten up the graphics on level 3" while controlling development tools via PlayStation controllers: both the terminology and practices shown betray these institutions' lacking knowledge of industry standards[1].

Syllabi from these institutions and books from this era demonstrate a focus on technical training. Westwood College, for example, kept standards consistent across its many US campuses through the use of Key Graded Assignments (KGAs). The rubrics for KGAs were standardized and could not be modified by faculty, and the focus of these assignments was technical, such as building an interactive game level in a game engine, producing a game design document, and so on. Many class syllabi from these institutions are likewise formatted to teach “to the assignment” rather than introducing learning goals beyond the software. This put some instructors in difficult positions during grading: many students that met the criteria of the technically focused rubrics were creating otherwise poor work. Since the profitability for the institution was tied to enrollment fees, instructors needed significant support from their administrators to fail students for bland and uninspired work that technically met rubric requirements.

The bias toward skill-based teaching also pervaded the game development textbook market of this era. Many were focused entirely on tools, or would contextualize game development processes as tied to a specific piece of software. These books utilize language similar to that which Keogh identifies in the advertising for tech-focused game design programs, where the program or book is advertised as revealing the “secrets” of game making. This, he argues, obscures game design and development as skills that must be learned before game making may be attempted (usually on a large 3D project), rather than showing game making as something anyone can do through small personal projects or prototypes. Titles of this kind included *Game Art Complete: All-in-One: Learn Maya, 3DS Max, ZBrush, and Photoshop Winning Techniques* (Gahan 2008) and *Mastering Unreal Technology: Introduction to Level Design with Unreal Engine 3*. As with university courses, the content of these books focused on step-by-step tutorials in software with no information on how the techniques inside may be broadly applied to create games or artworks outside of the scope of the tutorial. While these books do contain some information on how to make games or art pieces that offer interest to players beyond their technical aspects, they are often relegated to brief and overly general chapters with titles like “Breathing life into your levels” (Feil and Scattergood 2005).

Game design theory and game studies

As followers of the late architect Christopher Alexander’s writings know, “life” as an element of good design can be a complex topic warranting deep investigation. While tech-focused programs flourished, games grew as a topic of interest among scholars in media studies, sociology, anthropology, education, and numerous other disciplines. A confluence of events such as Gonzalo Frasca’s popularizing the term “ludology” to describe the study of game mechanics and play (Frasca 1999), the establishment of the journal *Game Studies* in 2001, and the establishment of the Digital Games Research Association (DiGRA) in 2003 formally established the game studies field. In reality, the study of games had roots in anthropology and sociology at least as early as the 1930s with Johan Huizinga’s seminal text *Homo Ludens* (1938), on the role of games and play in human culture. Others, such as Roger Caillois (1961), and Brian Sutton-Smith (1997) likewise established perspectives and classifications on the role of play in society that were highly influential on the eventual field of game studies. Threads of game studies have emerged, such as humanities-based close readings of games, social-science approaches to how games function in society, “serious games” that develop games that seek to impact society, industry analysis, and less commonly: creative practices in game design.

There are many seminal books in this area — too many to adequately acknowledge all of them in this chapter — but tracking their topics and perspectives on game design is useful to see how game design scholarship and ethos has evolved since the early 00s. Earlier texts like *Andrew Rollings and Ernest Adams on Game Design* (Rollings & Adams 2003) or *Rules of Play: Game Design Fundamentals* (Salen & Zimmerman 2003) focus on establishing the critical discourse of game design. This early era saw games borrow aesthetic concepts from a number of other fields as well, notably film studies. Scholars argued over whether games should be understood by their rules and mechanics ("ludology") or their storytelling capabilities ("narratology"), while using media studies–derived perspectives to carve out games' unique affordances from which they could be understood. The late 00s and early 2010s would see a shift toward scholarship about utilizing games in "not-just-entertainment" applications, such as in education, workplace safety, mental health, and so on. Spurred by texts such as *Persuasive Games* (Bogost 2008), *Critical Play* (Flanagan 2009), and *Reality Is Broken* (McGonigal 2011), the area of "serious games" grew as a field with interest for both academics and funders. This led to a new wave of game design initiatives at universities consisting of labs or centers for serious games and an associated graduate or undergraduate degree program.[2] This also saw a rise in the idea of games as research output, as researchers were increasingly involved in the production of serious games, and the founding of serious game festivals such as Games for Change or Serious Play.

"Games are not special"

During the late 2000s and into the 2010s, more user-friendly game-making tools such as Unity, Twine, and Construct rose to prominence in the industry, as well as new user-friendly versions of older tools like Unreal or Game Maker. This enabled the rise of smaller and more personal design practices that challenged industry norms (Anthropy 2012). This both helped the concurrent serious games work in academia and created the possibility of scholars making works that had both academic and commercial interests. This, in turn, led to the establishment of scholarship around areas previously thought of as mere subfields of game design, such as level design (Totten 2014), and new texts and approaches blending scholarship and creative work (Salter & Moultharp 2021). In turn, approaches emerge that see games not as an isolated form of media, but as a medium contextualized within a broader landscape of art and design fields (Sharp 2015; Murray 2018; Bonser 2020).

While this brief linear narrative of game academia appears to present these trends as tidily flowing from one into the next, the mindsets of tech-focused teaching, "serious" scholarship and games, and newer creative scholarship approaches all still coexist, often in tension. This sense that "games are not special" (Lutz & Kunzelman 2020) opened doors to not only scholarship that incorporates knowledge and methods from fields outside of games, but also creative and pedagogical methods.

Games and architecture as cultural work

This brings us back to the intersections of games and architecture. Both their histories as fields for which one can be educated, and the factors influencing the content of this education, exist in parallel and should also be considered for the fields' mutual benefit. Two studies of design education — one in architecture (Stevens 1995) and the other in games (Keogh 2023) — consider each field from the standpoint of "cultural production" or as "cultural industries," which are involved in "the production of 'aesthetic' or 'symbolic' goods and services." These goods and services, "derive their function as carriers of meaning in the form of images, symbols, signs, and sounds" (Banks 2007). In his study on architectural education, Garry Stevens describes how, despite the presence of schools such as the Ecole de

Beaux Arts and others dating from the 17th century, formal education, and indeed advanced degrees, were not the norm for much of the field's history. Instead, apprenticeships were far more pervasive in architecture until into the 20th century, when the percentage of architects with formal degrees slowly rose each decade until they became required for licensure (Stevens 1995). Many of these architecture schools follow a model at least somewhat influenced by previously mentioned schools of art, as well as later institutions like the Bauhaus (Prager 2014), which incorporated intensive hands-on and studio-based coursework. In the studio courses, students must design sculptural works and pieces of architecture based on specific design briefs, or specifications on the requirements of the design. As students gain skill and knowledge in design, the projects transition from early theoretical projects, which often do not include real-world considerations, to later studios in which students produce more fully realized buildings.

Punctuating each of these semesters, and indeed periodically throughout projects, are design critiques where the student presents their work to a committee of instructors and outside guests for feedback. These critiques are a "primary method of assessment and feedback", a stage on which students may practice their presentation skills, and a forum for which faculty and guests may discuss design. Periodically, students may also participate in design competitions with a more formal critique at the end, called a jury, which will determine a winner of the competition. These competitions are often organized on short timelines that require intense labor on the part of participants — competitions of this format are called charettes, modern analogs of which are similarly short-term engineering "hackathons" or game development–focused "game jams." The rigor and traditions of architecture degrees, as well as the cultured status of architecture itself, leads Stevens to argue that they confer graduates with a lot of social capital regardless of whether they become architects.

As a much younger field, the videogame industry has only more recently had a formal education structure and indeed, in many studios there still no formal education requirement. Though less common today, the hobby of game "modding" — creating user-generated content for existing games — has been a pathway to positions in the game industry since its early history. With the skills involved in making commercial games consistently evolving, the value of these experiences can vary: at one time, mods or indeed fully published independent games could make strong portfolio pieces for students, while at others studios want highly polished examples of individual art pieces. Alternatively, through online marketplaces such as Steam, Itch, GameJolt, or even by embedding games in web pages, games can also be released without the support of a formal studio or publisher. In this way the cultural production of games can be undertaken, and indeed monetized, by a broader diversity of creators than the stereotypical "industry" in the way amateur musicians may get gigs (Keogh 2023). Though unlike architecture, game design graduates' place as cultural workers is not as widely acknowledged as it is with architecture, music, art, or theater, so they often do not feel the same social empowerment that graduates of other fields do.

Both Stevens and Keogh draw heavily from the work of French sociologist Pierre Bourdieu (1993) and are specifically concerned with how creators in these fields function within specific power structures surrounding economic and cultural capital. The struggle between the economic factors of education in these fields (having the skills to get a job) and the cultural factors (making work of cultural value or being able to identify culturally valuable works) must be balanced by educators as they work with students. To Keogh, this tension plays out as students navigate whether they should focus on technical skills that they are told will get them “into the industry” or whether they should focus on cultural concepts that let them expand what “industry” means to them. Thanks to rankings and the sometimes-shaky reputation of game design education (“tighten up the graphics!”), this balance creates a worrying environment for game design educators seeking to guide students toward stable careers where their knowledge is relevant. Stevens is much more relaxed about whether students get jobs in “the industry.” In his observations, those with architecture degrees who do not become architects still find work in other fields of cultural production due to architecture’s social capital. Indeed, the social capital that Stevens refers to is even given a name by Bourdieu, the habitus (1993).

As fields of cultural work, both games and architecture deal with many of the same issues of technical skill, creativity, and design. However, their unequal cultural capital and the perceived mobility of their graduates is worth noting. While all degree programs in either field balance their creative and technical aspects in different ways, there are shared processes that we can compare to discover how ideas from one may help the other balance some of these factors within pedagogy.

Balancing the Creative and Technical

Comparing specific pedagogical methods will uncover areas in which the two disciplines are directly comparable and others where one may inform the other. These factors were chosen both because they are pervasive factors of one or both fields’ educational traditions and because they contribute to the cultural or economic capital of each field. These factors are:

1. The role of precedents (previous works) to inspire design in educational settings
2. The use of constraints, play, and iteration in training new designers
3. The relationship between the designer and design software in education.

In this section, we will discuss how each factor impacts the design education of each field and what may be gleaned from each use based on each field's histories and traditions.

The role of precedents to inspire design

The first of these pedagogical factors is the use of precedents, or previous works in the field, as a means of inspiring design. As a field with a long history — both the long history of the built environment and the history of educational traditions since the 17th century — architecture has developed a fruitful relationship with its past. Game design, on the other hand, comes from a tradition as old as civilization itself, but is much younger as an industrialized field. To investigate how these relationships bear out in university curricula, I selected 50 university architecture programs and 50 game design programs listed in the *Princeton Review* and searched their curricula for history and culture courses specifically about their field. Of the 50 architecture programs, every single one had at least one course on the history of architecture, with many having two or three, and some even having concentrations in architectural history (Princeton Review 2023a).

In architectural education, the field's history is an important part of learning design, as it gives students a common language from which they can incorporate ideas from the past into their own work, or see how previous designers solved problems they may be encountering. In design, this process of understanding previous works to gain insight into current projects is known as precedent, and is a necessary part of education for many classical design fields (Klein 2012). In architecture studio classes, precedent study is a common assignment for students, where they must carefully analyze and create diagrams of their analysis to be presented to faculty. These analyses inform their eventual design projects. Early in an architect's education, these are codified in course requirements, with the goal of this skill becoming a habit throughout the student's career. Also worth noting is the role of sketchbooks in this precedent study. In many architecture programs, student designers are tasked with keeping a design sketchbook to record observations and visualize design ideas (Simmons III 2021). In some programs, keeping a professional sketchbook is an assignment for the early portion of a student's education, with some of these even having courses devoted to sketching (Jenkins 2012).

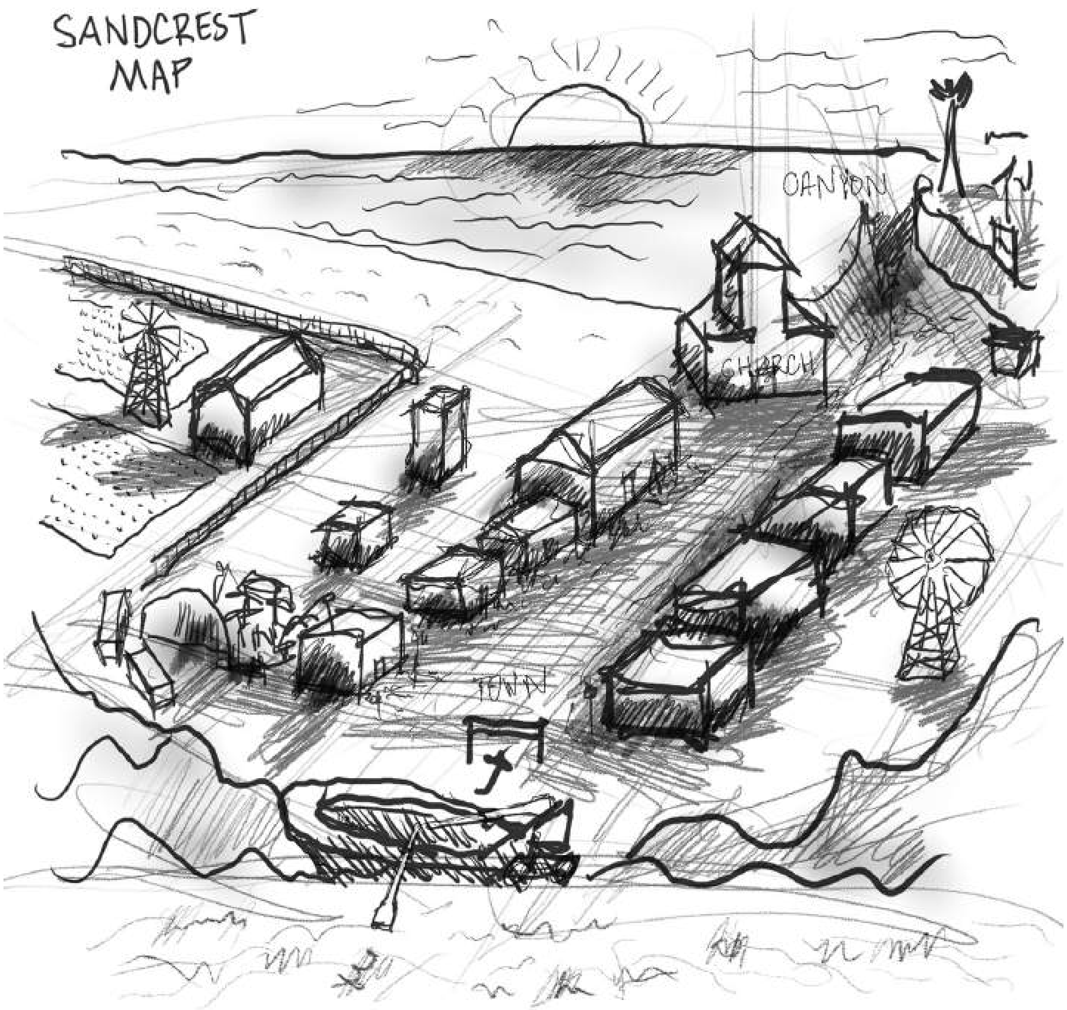

Figure 4.4.1 Example of student sketchbook.

Figure 4.4.2 A 3D model of a generic castle model as an amalgam of architectural influences.

On the games side, the results are a bit more mixed: 20 of the 50 assessed game design programs have courses on game design history or some other course with topics in the evolution of games and the social contexts in which they are made.[3] Many did, however, include art or world history in their course requirements, often as part of the university's core. The reason for this disparity between the fields has something to do with tradition, but a firmer answer may be accreditation, where university programs are acknowledged as qualified to offer the degrees they do by external accrediting bodies. Most of the architecture curricula pulled for the survey were from schools accredited by the National Architectural Accrediting Board (NAAB), which requires schools to "ensure that students understand the histories and theories of architecture and urbanism" (National Architectural Accrediting Board 2020). At the time of this writing, game design programs lack an overarching accrediting body. This has led to more general, but related, accrediting bodies, such as the National Association of Schools of Art and Design (NASAD)[4], adding game design to their list of accredited programs (National Association of Schools of Art and Design 2022). NASAD, in particular, requires schools carrying their accreditation to include history as a component of their degrees: nine of the game design schools shown to have history courses are from institutions that carry NASAD accreditation. This leads to curricular elements like history to be an irregular part of a game designer's education, despite its value.

Figure 4.4.3 Example of student sketchbook.

Game design instructors wishing to increase the precedent study and history that their students utilize may also find solutions in sketchbook assignments. Having designers and students keep track of design decisions is a known issue throughout game education and the game industry at large. The typical answer is the game design document, large linear documents or wikis produced by a game's production staff which contain specifications for a project (Rogers 2010). Other attempts include computer science–derived development logs or game design logs (Cook 2011) that document design decisions in a much briefer, but still text-based and computerized way.

In my own AGD 23030 Game Prototyping and AGD 33030 Games for Education courses in Kent State's Animation Game Design program, I adopted sketchbook assignments. Students were asked to fill one page of their sketchbook per week, but were allowed to determine the content of the pages — they could be precedent study, planning sketches for their ongoing projects, freehand drawings, and so on. Though the students had very loose stipulations on what to put in the sketchbook, I immediately noticed an increase in the quality of design ideas and attention to how previous works factor into their game designs. Curious about documenting these trends more thoroughly, I gained approval to collect student samples from this sketchbook assignment to assess how students used them. This study is ongoing at the time of this writing, and two semesters' sketchbooks have been collected, with 45 students giving approval to have their sketchbooks used in these two semesters' iterations of the study. So far, a majority of students (26 out of 45) incorporated precedent or demonstrated the link between a precedent and an ongoing game design idea directly in their books. These projects tended to have a more developed design language and articulated how they arrived at their design decisions more thoroughly, such that I am excited to see what future iterations of the study will show.

Another effort by game designer and scholar Chris Barney adapts architect Christopher Alexander's methodologies, particularly the pattern language (Alexander, Ishikawa, & Silverstein 1977), into a method for students to define their own vernacular. While Barney is not the first to work from Alexander's pattern language concepts in the games industry, his efforts to create tools for others to create their own patterns — repeatable solutions to observable problems — rather than making a language itself, are notable. Barney's toolset, available in his book *Pattern Language for Game Design* and the accompanying website (https://patternlanguageforgamedesign.com/), has designers define the parameters of patterns they have used or observed in games, then rates their strength via a scoring system which includes how many games the pattern can be observed in (Barney 2020). This allows designers to build a language suited to their own game based on close study and evidence from previous works of design.

Constraints, play, and iteration

Hands-on tools like sketchbooks have an element not often discussed in architectural study: play. Game designers Katie Salen Tekinbaş and Eric Zimmerman describe play as the human experience of rule-based systems like games, often open and undirected, apart from any rules defining its boundaries (2003). The work of designer Bernard DeKoven, in his work as part of the New Games Movement of the 1960s and 70s, shows how even simple game rules can result in complex social contexts. Many of his games and other playful activities produce rich interaction between participants (DeKoven & Gramazio 2020).

Outside of the restrictions of classroom environments, sketchbooks can be quite playful. Architects' sketchbooks frequently have a loose and freewheeling style, with multiple images overlapping one another. Architect and educator Eric Jenkins even recommends that designers draw lines with an intentional "squiggle": this, he argues, allows designers to draw straighter lines since their mind is concentrating on making the line squiggle rather than making the line straight[5] (2012). In my class' sketchbook exercises, students regularly used their sketchbooks to experiment with different versions of characters from their project or other original characters.

These methods all have roots in the concept of iteration, a trial-and-error approach to making where the designer creates quick and disposable prototypes to try design ideas before synthesizing what worked from these prototypes into a final, polished version. Game developer and head of the games program at the University of Southern California, Tracy Fullerton, advocates for game design methods centered on rapid prototyping, including prototyping digital game ideas on paper (2018). This "playcentric" approach is supported by designer Richard Lemarchand in his own writings on game project management, where he advocates for frequent prototyping and iteration to hone game ideas as one develops commercial projects (2021). Frequent playtesting, especially among independent developers that gather user feedback at festivals and game-making meet-up events, is a key part of creating engaging games and interactive art.

Figure 4.4.4 Example of student sketchbook.

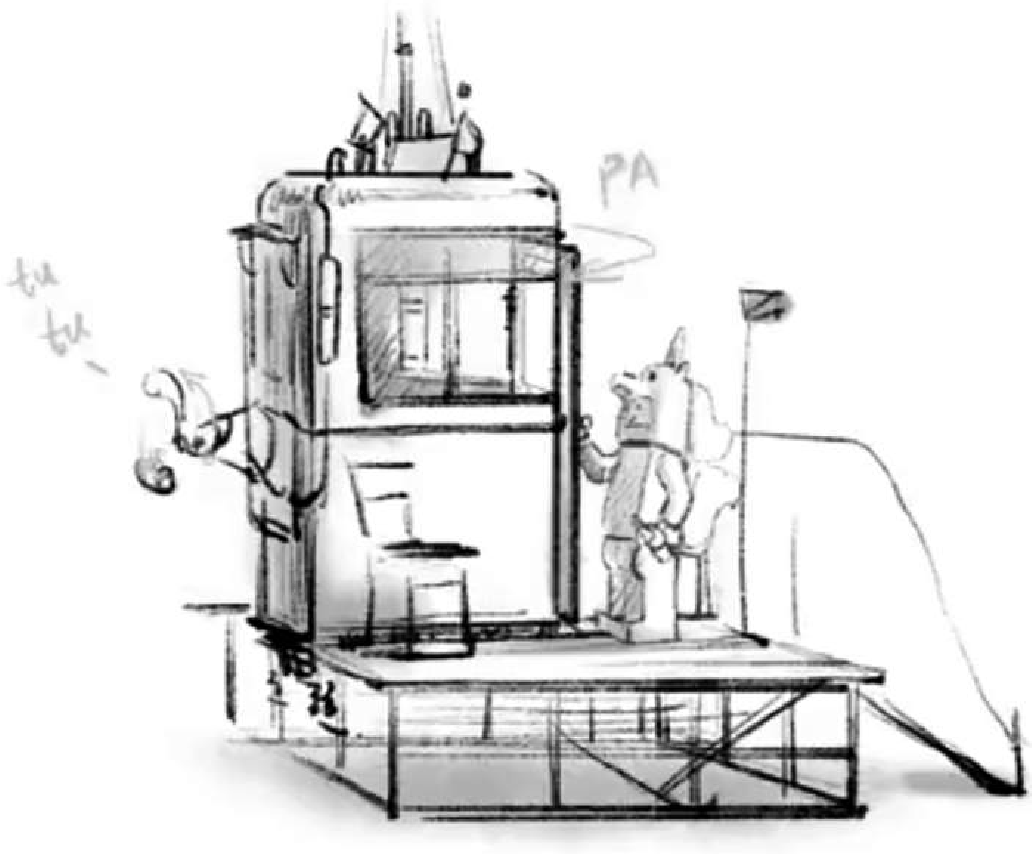

Figure 4.4.5 An initial sketch of a virtual scene.

Figure 4.4.6 An greyscale rendering for initial visualization of a scene concept.

Figure 4.4.7 A fully rendered iteration of a scene concept.

This may seem to indicate that games fare better in terms of play during design, but architecture also has playful exercises embedded in its educational traditions that game designers should take note of. The studio courses in the early part of many curricula are ones in which students design space, but via more abstract exercises designed to teach them how various forms and materials work. These exercises are themselves derived from the introductory course, or vorkurs, at the famous Bauhaus design school in Germany, active in the early part of the 20th century (Prager 2014). A common architectural exercise is the parti, which are abstract formal explorations in two or three dimensions — usually in the form of sketches or quickly assembled models. Parti assignments are frequently included in lower-division studio courses, where students must create several parti models then present them to their instructor and classmates in a mini-critique called a "pin-up." Assignments with this make → feedback → repeat structure are rooted in principles of iteration and indeed represent educational methodologies of Constructionism (Kolb 1984). Constructivism centers pedagogy on kinesthetic experiments, collecting feedback, and reflecting on the experiment before producing another iteration. It is not uncommon during architectural parti presentations, for example, for an instructor to pick up a student's model and turn it upside down, exposing a superior formal concept than what was being presented: the idea existed the whole time, but needed to be revealed through play.

Game design instructors can make the best use of iteration and prototyping in their classrooms with a similar approach. I have taken over courses where the previous syllabus directed students to "make a game" as their semester project with no structured feedback time. In this model, students would spend their semester slowly chipping away at a single prototype, resulting in often "undercooked" final projects. I embraced prototyping by instead setting aside one day of each week for mandatory group playtesting, treating these sessions like a mix of an architectural pin-up and a game development meet-up. In these exercises, students are asked to select a group member to stay with their game to present it to classmates, while the rest of the group walks around and tries out the other students' games. The students who stay with their own game are responsible for taking playtesting notes as new players try their game. Testers are encouraged to give open feedback, though some development teams eventually implement questionnaires as a means of gathering specific data. At first, this process can be intimidating for students (as it is for new architecture students encountering critique culture for the first time), but eventually produces better outcomes.

Designer vs. design software

The balancing of technical skill and the soft skills of design are often the most perilous to game design educators. Early manifestations of game design in higher education utilized the rhetoric of "learning the secrets of game making" which often meant courses dedicated to game-making software. At the end of such a course of study, students were told they would have the knowledge to make a game or work for a studio that made games (Keogh 2023). Through Keogh's polling of game design instructors, he found that many students still expect this to be the case, and that a common struggle for game design educators remains managing these expectations.

In his survey of educators and programs, Keogh found that universities' marketing of game design programs had a role in this trend. Many, he found, utilized language focusing on skills and the aforementioned "secrets of game development," placing their university program as the arbiter of such skills (Keogh 2023). In some cases, Keogh found that universities even used "gamer language" — slang and linguistic forms utilized by the stereotypically young, white, cisgender, male consumers of games — in their marketing. One such university even utilized the slogan "Pwn the competition," evoking traditionally competitive attitudes of eSports and professional gaming, rather than the collaborative attitudes more conducive to design work or language that would speak to wider audiences (Ruberg 2020). In my own previously mentioned survey of game design program curricula, I found similar patterns on programs' websites: promises to help students "level up" their skills or careers — evoking progression systems in various styles of games. Each of these sites also featured pictures of students on computers or utilizing some form of contemporary gaming-related technology, such as virtual reality goggles. These messages frame what students expect from their college experience and can affect which demographic groups even apply to programs. By marketing to traditional "gamer" audiences, universities tell students outside those demographics, particularly women, minority, queer, and other marginalized prospective students, that the program is not for them (Anthropy 2012; Ruberg 2020).

While the gamer-centric marketing messages may seem disentangled from pedagogical issues, it can reveal how technological stereotypes persist within game design education. Videogames have been marketed both for male-identifying consumers and according to their technological capabilities since the beginnings of the industry. Early examples include toy manufacturer Mattel's marketing for their Intellivision console, which compared the technological capabilities of its console with that of the less-powerful Atari 2600 (Bunch 2022). Ads for the Sega Genesis game console likewise famously invented phrases like "blast processing" to give Sega's system an air of superiority over the competing Super Nintendo.[6] Technological showmanship is an inherent part of advertising to traditional "gamer" audiences today: having an advanced gaming rig with the latest graphics card imbues a habitus of macho achievement, supported by various confrontational slogans like "but can it run Crysis?" (Leather 2009).

Game design instructors, especially those not housed in technology-related departments, therefore have an extra lift of guiding students away from being technologically minded consumers to more broadly thinking creators. This is exacerbated in regions where education is equated to training for trades and students assume that gaining software training will automatically qualify them for positions in the industry. Architecture makes a good precedent for sorting through these issues not only because it is an older industrialized field than games, but also since it wrestles with balancing these very same technology vs. creativity issues. While architecture does carry a habitus of cultural value as an art, the necessary proximity to engineering and the technical aspects of computer aided frafting (CAD) or building information management (BIM) software allow for more technical readings. Indeed, architecture schools themselves vary in whether the flavor of their curriculum skews more on the technical or artistic aspects of the field.[7] Beyond struggles between these often-competing factors, games can learn from architecture in this regard thanks to how architectural educators codify both creative and tech learning goals in assignments.

As stated previously, most architecture school semesters are built around the Studio course, where students are given a set of conditions (social, theoretical, environmental, etc.) within which they have to design a built object — more abstract works in early courses, and eventually full buildings. A key aspect of Studio courses is that they are often fully devoted to facilitating these projects, while other courses contain the lecture material that students are expected to integrate into their designs. This lecture material may include practical elements like the structural capabilities of materials, or may include building students' technical skills with software. Short of completely restructuring existing programs to adopt such a model, game design instructors can still look to the studio assignment as a guide for how to balance technology and design. Studio assignments work in this way because they ask students for solutions that show the students' creativity, expressed via technological means. In architecture, such a prompt may be to design a "private retreat on which a scholar may do their academic work," situated on a particular piece of land, and shown via a specific set of drawings.[8] The focus is more on the needs of the client, the site, and artistic interpretations of what it means to study and dwell in such a space, with the software codified in the assignment as a means to produce the visualizations of these ideas (models, plan, section, elevation drawings, etc.).

Game design instructors can utilize this format as well, blending creative and technological aspects, and possibly modeling good industry behaviors as well. In my own courses, I format my assignments in what I call a “three layer” system, giving each assignment a technological (surface, easiest for an uninitiated observer to see) and creative (the aspect of game design theory the assignment hinges on) element. The third, and “deepest” layer, is the layer of habits, where the design and formatting of the assignment is designed to instill workflows or community behaviors that students will encounter in their professional life.

An example of this style of assignment can be found in my AGD 23030 Game Prototyping course at Kent State, where the third assignment of the semester is that students are organized into random groups and each group given a random retro game console to study. Their task is to learn as much as they can about the console, its display capabilities, the games that were popular on it, and their cultural context, then make a game in a modern engine that uses the console’s graphical capabilities as an art style. On the technological layer, this is a project in which students learn a 2D game engine and pixel art. Creatively, it is a project about the process of art direction, in which visual styles are conceived and managed by a senior artist via style guides and other documentation. In the third “habits” layer, students are tasked with creating schedules for their project, managing group production processes, and organizing iterative playtests, all important “soft skills” in the industry. While this is just one instructor’s format, it has over a decade proven to be effective at balancing competing aspects of various assignments.

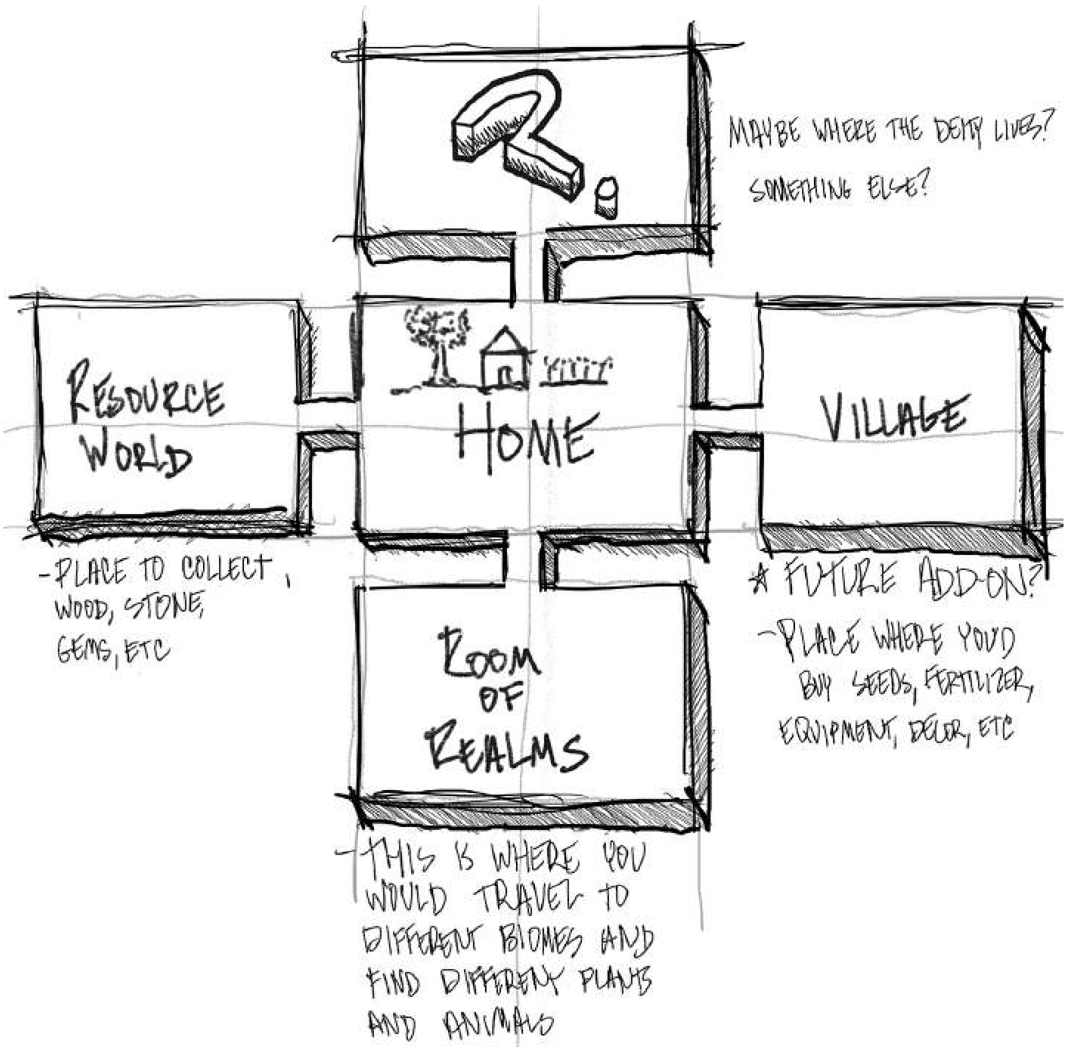

Figure 4.4.8 Example of student sketchbook.

The critique is also an important tool for communicating the values that students are expected to prioritize in assignments. A common format in technical programs, and indeed tech-centric game design programs, is an assignment where students complete a technological task, such as creating a 3D model, then submit it to the instructor via an online system. The instructor then downloads the submitted files and checks them for accuracy to an instructor-demonstrated version of the project or for technical functionality, basing the student's grade on their adherence to the example. Even though students in more arts-focused programs — including arts-focused game design and architecture schools — use technology too, their evaluations are much more critique- and presentation-centric, usually taking the form of end-of-semester program-wide critique periods (El-Latif, Al-Hagla, & Hasan 2020).

Where this model holds promise for game design is in how it balances the technical and the creative. Beyond being defenses of a student's ideas, critiques are also opportunities for students, faculty, and members of an industry to engage in discussions about issues in design. If a student's project inspires meaningful conversation about the design topics at hand, they are seen as having a successful critique — even if the project itself needs improvement (which is expected of student projects). Having the center of critique being the creative aspects of a project still allows for technical feedback, often in the context of improving drawings, graphics, effects, or animations so that the theoretical aspects of the project come through better. A risk of this model is a lack of objectivity, but having several professionals present during a critique both lightens the impact of subjectivity by allowing for competing viewpoints among the critics, and lets critics focus on their area of interest. If an instructor likewise holds periodic pin-ups throughout a project (weekly or semi-weekly) this can help students further hone their projects and increase the chances of a successful final critique.

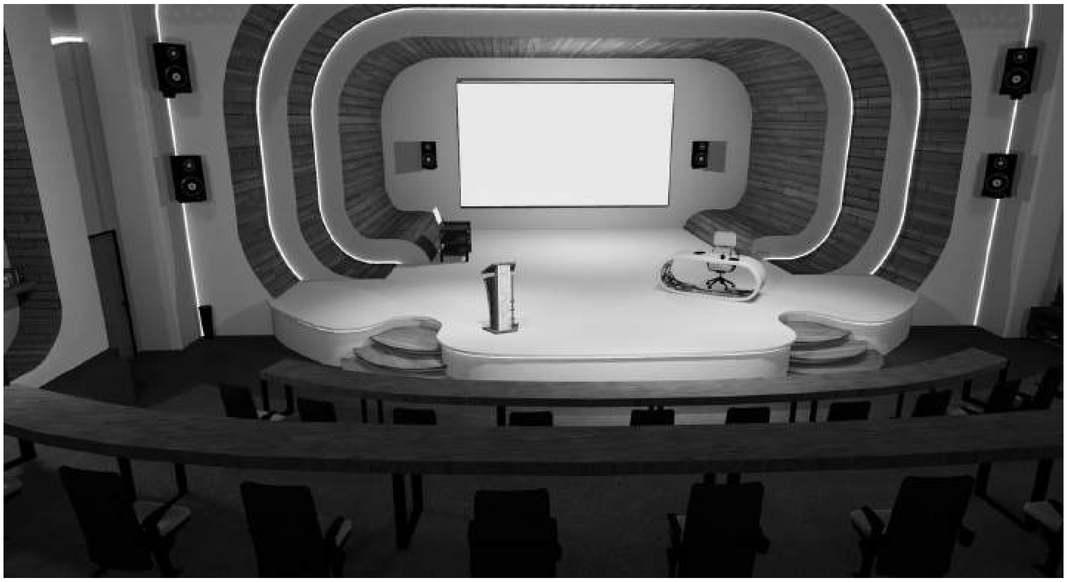

Figure 4.4.9 An example of a virtual environment used for digital collaboration and critiques (imagery courtesy of Oli Siska).

Conclusions

In one notable session of my AGD 49999 Senior Capstone course, my class was invited to be guest critics in a second-year architecture studio comparing the architecture of games and real built environments.[9] My students relished the opportunity to be on the other side of a critique, but I soon found them giving kind but substantial feedback to the architecture students, particularly in how to best present work and the many social tricks they had learned on how best to engage with feedback. I was amazed — the game design students had absorbed the pedagogy of architecture so well that they were giving architecture majors advice on, essentially, being architecture majors!

The point of this narrative is not to brag, but to illustrate how pedagogy both shapes the values that students use to engage their fields of study and invites students to be active participants in the cultural landscape of design. Game design education has a short but tumultuous history with regard to how values and priorities of the field change over time. Early programs began as a means for studios to have consistent, reliable workforces to hire from, and when those programs grew successful, others began as cash grabs to take advantage of these trends. The baggage of these technically focused first steps and early programs that needed their own pedagogical “tightening up” has hung over game design education as it matured as a field. Still, according to Keogh and observable in many classrooms, instructors struggle with guiding students away from technologically focused consumer outlooks on games and toward the view of games as creative, cultural work that applies to many fields.

Among its advocates, game design has a reputation as a new “liberal art” for the 21st century (Brown 2011; John 2018), fitting especially among creative fields in which a work of art or design may be utilized to elicit an emotional response in a viewer or occupant (Dillon 2016). In these regards, architecture and games have many areas of intersection, from the visual — many games use historical architectural styles as settings — to the fact that both deal with explorable, interactable spaces that share aesthetic considerations which affect the viewer (Lyndon & Moore 1996; Hildebrand 1999). Beyond the designs themselves and into forming a common educational toolbox, games and architecture pedagogy can form a symbiosis that enables exciting new opportunities in the broader landscape of design.

Notes

1. My first teaching job after graduate school was at a Westwood College campus in the game development program. Despite the common perception of these programs, the teachers there were among the most dedicated I have ever worked with. The corporate entity managing the

college, however, gave these teachers few resources with which to do their jobs and prioritized the admissions staff. Their role was to bring in low-income and former military students that would allow Westwood's parent company to take advantage of the government incentives through which it made a large portion of its money.

2. During this period, there is little discernible regularity on whether labs or degree programs came first. Many programs began with the program first to build a faculty and student body who would work in the eventual lab, while others used the income from the lab or center to fund a program.
3. For the sake of disclosure: my own institution of Kent State University is one of the programs featuring a history and culture course in our AGD 23020 Gaming and Culture course.
4. As another disclosure: my institution of Kent State includes one of the NASAD–accredited programs listed in this survey.
5. In my experience, this does work.
6. The Sega Genesis did have greater computing power than the Super Nintendo, and could therefore display scenes with lots of action happening on-screen better than its competitor. However, the Super Nintendo was graphically superior to the Genesis and used that power for both visually impressive narrative-focused games and games with sprite graphics rendered from movie-production grade workstations ("pre-rendered" graphics.).
7. When I entered architecture school in the early 00s, my program was transitioning between deans. The previous dean believed strongly in continuing to teach hand-drafting and students were not allowed to use CAD drawings for their studio projects until well into their sophomore year. The newer dean brought more computer-based courses, including

3D visualization courses, and eventually transitioned the program to one in which students used CAD earlier in their sequence.

8. This was the design prompt for a studio I had during the fall of my junior year. This studio project is personally noteworthy, as our site contained a large field of what my group later learned was invasive kudzu. No one in the group knew this, assuming that it was a very interesting type of ivy, and we all designed our projects to include it. At the final presentation, I was first to present and was informed of the plant's actual identity, to which the external critic asked, "if you're basing your design on something that kills the other plants around it, is murder important to you?", prompting our studio instructor to step in and ask for an exception to be made since nearly everyone had included the kudzu in their project. This episode inspired my Game Boy game *Kudzu*, where a gardener battles an evil invasive plant and encounters an architecture student who respects the kudzu for its aggressive tendencies.
9. The studio was one on games and architecture run by this book's co-editor, Ryan Skavnicky, Kent State University's College of Architecture and Environment Design.

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4.5
Various Design Pedagogy Projects

Ryan Scavnicky and Vincent Hui

DOI: 10.4324/9781003408970-25

Videogame technologies have revolutionized architectural pedagogy by offering immersive, interactive learning experiences. Through parametric controls, high-fidelity simulations, and mixed-reality technologies, students can explore architectural concepts in a dynamic way, enhancing their understanding of spatial relationships, design principles, and construction techniques. Advanced graphics and simulation engines provide realistic representations of architectural projects, allowing students to experiment with designs and observe their implications in real time. Additionally, collaborative multiuser features enable teamwork, communication skills, and critical design development. These innovations empower educators to engage students more effectively and foster creativity and critical thinking in architectural education.

Figure 4.5.1 High fidelity rendering, procedural and parametric controls, and complex modelers are all within the toolset of contemporary architeture students in creating conjectured realities (imagery courtesy of Alvin Huang).

Figure 4.5.2 Use of videogame engines are increasingly accessible and empower students to design and simulate design work, experiences, and variable climatic conditions through mixed reality tools (imagery courtesy of Ariel Weiss).

Figure 4.5.3 Mixed reality technologies from videogame environments are now uquibituous tools bridging digital design to built reality (imagery courtesy of Ariel Weiss).

Figure 4.5.4 Students using increasingly ubiquitous VR and immersion facilities in order to develop their designs (imagery courtesy of Jake Levy).

Figure 4.5.5 Twitch Chat Final Review, studio Learning from Los Santos, Spring 2022.

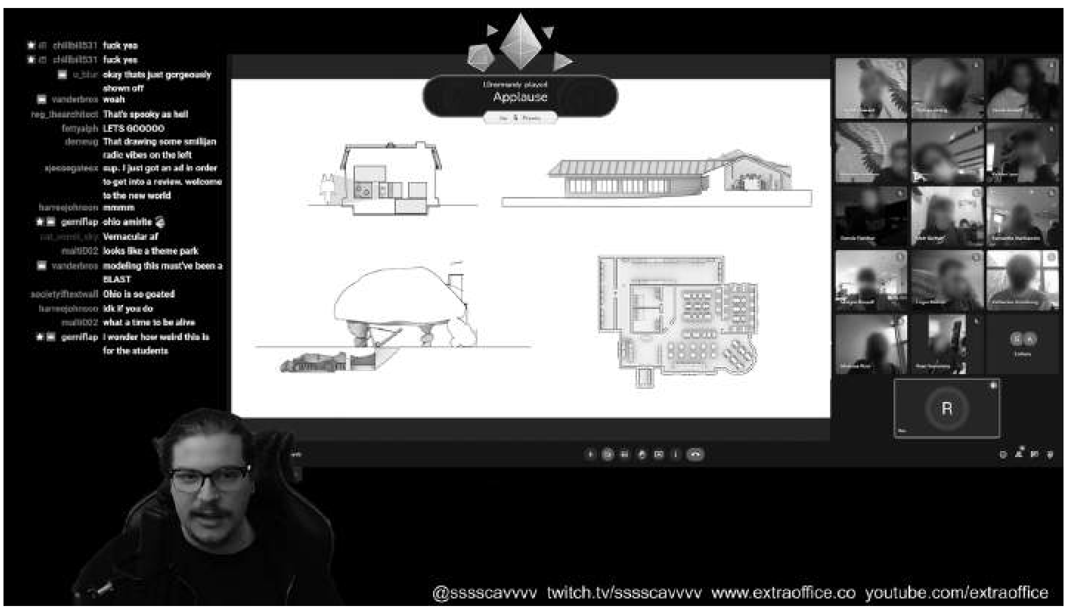

Figure 4.5.6 Twitch Chat Final Review, studio Learning from Los Santos, Spring 2022.

Figure 4.5.7 Desk crit inside of the virtual space of Sansar. Audrey Lemon on the left, turtle. Author Ryan Scavnicky on the right, broccoli.

Figure 4.5.8 Photograph of a student presentation in the Virtual Architecture program at Marywood University School of Architecture, 2024.

Figure 4.5.9 Image from Walaid Sehwail studio using voxels as design material. Student: Marcus Morgan.

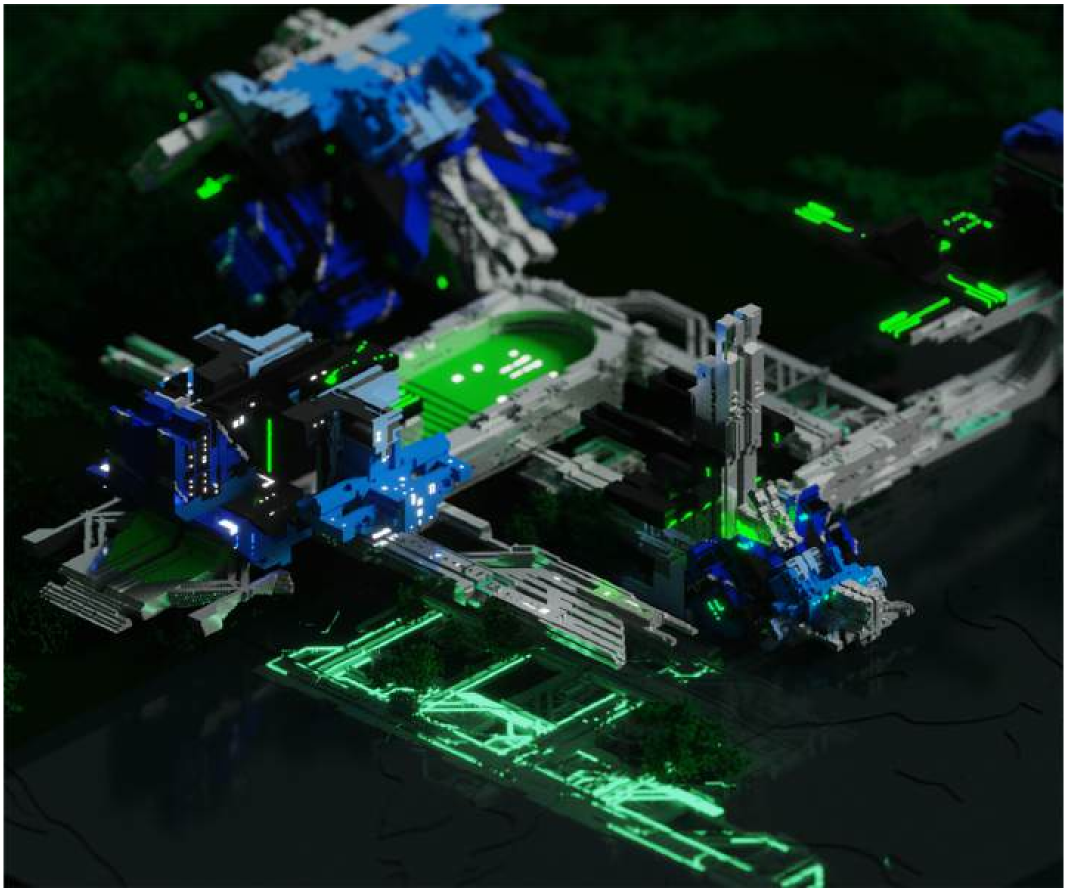

Figure 4.5.10 Image from Walaid Sehwail studio using voxels as design material. Student: Moe Kawakami.

Chapter 5
Proxies and Representation

This chapter speculates on how architectural knowledge can be deployed to understand the implications of virtual worlds and their reflective critiques. By doing so, digital space opens itself up to the potential for specific architectural responses, as these virtual worlds are sites to be studied like any other. This can lead to changes in the way architecture is taught and practiced. The main proxy in a virtual space, the digital avatar of oneself, becomes a fulcrum for understanding an additional layer of complications which our society's racial biases make legible through a virtual environment. Lastly, this chapter details the steps and struggles of creating a historically accurate virtual representation and the nuances therein, ultimately showcasing how architecture and videogames are tethered together in their heavy reliance on shared disciplinary knowledge as they respond to various critiques and societal desires in the decades to come.

5.1
Game Worlds as Real Worlds

Sandra Youkhana and Luke Caspar Pearson

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The Virtual Real

In 2021, Epic Games, developer of the Unreal game engine, released the tech demo *The Matrix Awakens* as a showcase of all the advanced rendering, lighting, and geometry processing techniques that would allow designers to realize photorealistic real-time gaming environments. At first glance, the resemblance to a real American city is startling, continuing a trend in the visual verisimilitude of virtual urbanism that was well-established by Rockstar Games' 2013 *Grand Theft Auto V*, built around a lifelike, yet deviant, twin of Los Angeles. However, as the Epic Games' developers explain, *Awakens* represents not one city, but rather an amalgamation of architectural reference points from San Francisco, Chicago, and New York. This produces a composite city composed of iconographic American urban forms.

Eight years earlier, Rockstar were manipulating the geography of Los Angeles to form Los Santos, making it clear that new forms of spatial meaning could be created by stitching urban elements together, rather than recreating real-world geography in its entirety. As we fly around the world of *The Matrix Awakens*, we can peer into the numerous windows of the buildings and see interior spaces depicted — yet these interiors remain strangely unoccupied. These spaces are generated through a novel shader effect — code that regulates how materials are applied to geometry and rendered by the camera — to create the illusion of an interior; a dynamic *trompe l'oeil* of spaces beyond our reach. Back in Los Santos, we can see how the relative scarcity of transparent windows and interior spaces come to denote buildings that are significant to the gameplay cycles — buildings that the player could find themselves exploring in detail. Less important buildings have neither transparent openings nor interiors. Much like forced perspective techniques that have been used for centuries to extend space, virtual worlds use techniques such as this because otherwise it is simply too computationally expensive to simulate an entire city and everything in it.

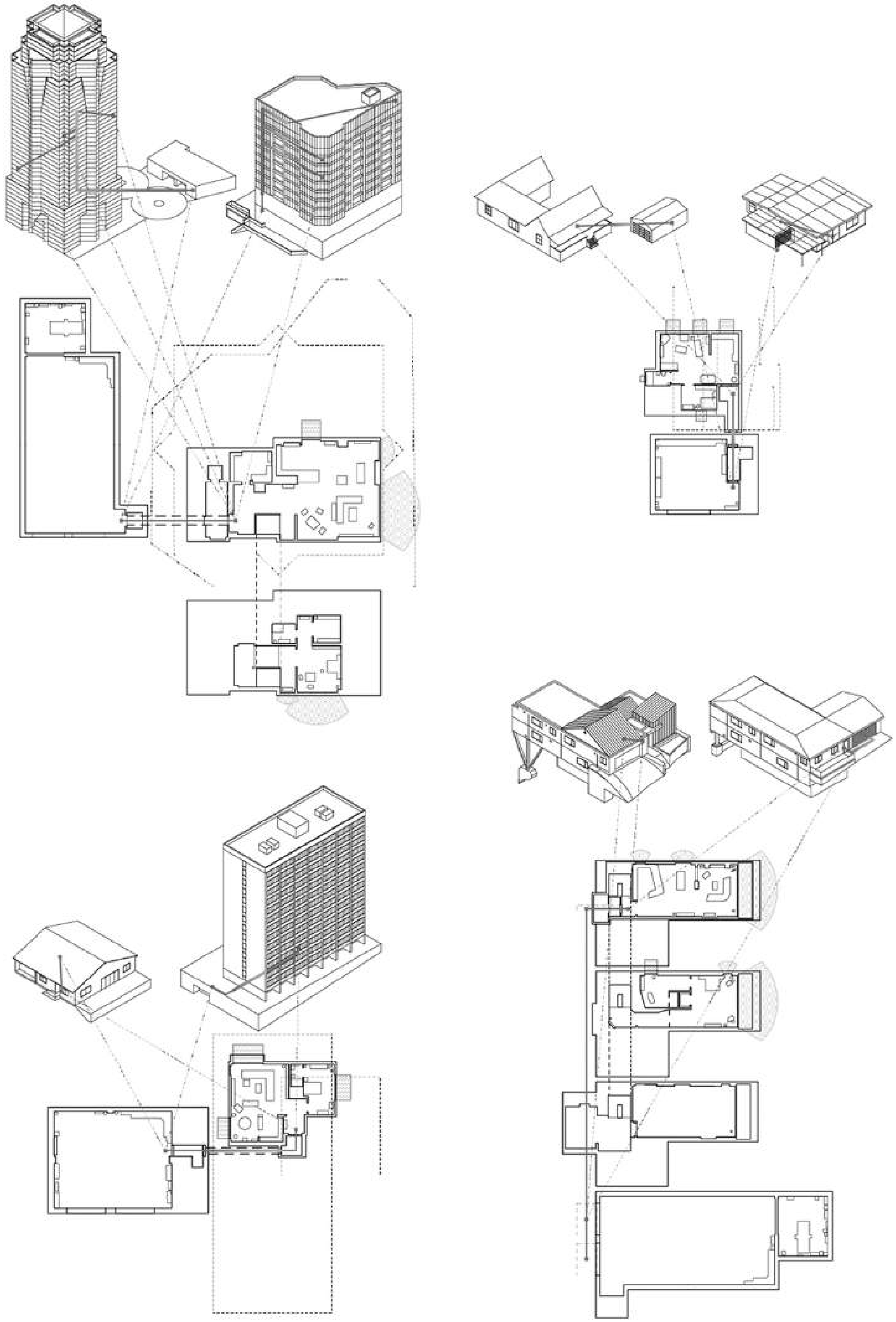

Figure 5.1.1 Studies of apartments in Los Santos demonstrating the spatial dislocation between generic interiors and contextual exteriors. Digital drawing, 2021, You+Pea.

While both of these games are striking in their visual similarity to real-world architecture and cities, the true reality of their worlds is in the types of "discrepant" (Kirkpatrick 2011) experience that Graeme Kirkpatrick argues is key to the aesthetic experience of videogames. In other words, the discrepancies — all that is twisted, erased, or magnified in the translation from physical place to virtual game world — are what defines that world as an architectural domain. Examining this reality has formed a key part of our own research, and this is best exemplified in our book *Videogame Atlas: Mapping Interactive Worlds* (Pearson and Youkhana 2022), where we use a combination of "traditional" and contemporary methods of architectural analysis to explore the synthetic reality of 12 popular game worlds. In this context, we see game worlds as "extraordinary sites for evaluation, as each game holds its own idiosyncratic logic to be exposed" (Pearson and Youkhana 2022, 8). It is through regarding these diverging realities as truthful settings that we can "discover what capacity we have to affect the environment within its given constraints" (Pearson and Youkhana 2022) and ultimately unpick the complex relationship between environmental design and player agency that underpins the ontology of virtual worlds.

While deviating from (physical) reality can be interpreted as incoherent, or untruthful, Richard Bartle argues that videogame worlds "tokenize the unknown" (Bartle 2003, 428) by playing with our expectations, and for our work we take this as their formal truth; their reality. Bartle describes how many games interpret the "cause and effect rules that govern the way reality works," arguing that "anything that interferes with these rules acts as an out-of-context interrupt; anything that adheres to them implicitly supports the illusion that the virtual is real" (Bartle 2003, 422). Yet if we play a game such as *Super Mario Galaxy*, we can find a world subjected to levels of miniature planetary gravity that is impossible in physical reality yet fundamental to the game's reality (i.e. sticky digital balls and normal calculations). What Bartle frames as illusion might simply be a formal property — subverting existing norms by proposing new and alternative possibilities through the spatial structuring of the environment. The discrepant becomes the formal reality of game worlds. As David Chalmers argues, the virtual is not illusion — simply another form of reality: "virtual chairs are quite different to physical chairs. Still, they're perfectly real objects" (2022, 199).

Chalmers also explores virtual objects as real objects by virtue of their "causal powers" (2022, 197) — the ability to affect something else — and all game worlds rely on digital objects with logic-driven causal powers to function. For McKenzie Wark, this is an intrinsic quality of a game world's algorithmic design: "all that matters is the quantitative relations" (2007). With the recent emergence of research using the ChatGPT large language model to create virtual "generative agents" in a *Stardew Valley*-esque world — game NPCs are able to not only perceive their surroundings but reflect on their experiences and plan actions accordingly (Park et al. 2023). As such, these causal relations stand to become increasingly complex.

Consequently, every given game world establishes its own reality through the synthetic design of its spaces and systems, and while this may deviate from the reality of our physical world, it is a spatial reality nonetheless. The "discrepancy" *is* the reality. Seen in this way, our research seeks to unpick those spatial realities through architectural means, while also using comparative analysis of the interplay between game-reality and physical-reality as a way of understanding the power and positioning of these discrepancies as an aesthetic of virtual world design.

There are, of course, innumerable different game types and experiences and by association game worlds. Each of these realities works by employing different types of discrepancy — and we could see these discrepancies as formal differences between the representation of the world (and any illusion of reality it may present) and the agencies that world affords. The reality of each game world is inextricably tied to the agency given to the player, and this relationship is usually extremely direct.

For C. Thi Nguyen, this submersion of the player into a new and temporary agency, established within a game world, is the key facet of gaming as an art form (2020). While in the physical world we may be constrained by social norms, legal structures or physical ability, all that is possible within a game world is derived from its code. Game worlds play with sign and signifier relationships, as well as affordances, in ways that are quite different to the physical world, but which may be considered correct in the logic of a game object (Pearson 2019, 267). Instead of drinking from a bottle to hydrate, we throw it to distract an enemy. Rather than sitting at a desk to write, we use it to hide behind. What appears to be discrepant is actually a unique, and real, agency within a game world. This agency is in relation to the rules of the game, what Jesper Juul terms the "immaterial support" (2005, loc. 526) of the world. Of course, immaterial structures are not limited to game worlds — within architecture, we might find them in building codes or construction laws that do ultimately shape the physical form of the built environment. As such, the inconsistent or strange meanings of game objects compared to their physical-world counterparts does not signal them as "wrong" recreations or illusions of reality, but rather as different realities.

Challenging Reality

Yet although game worlds retain their own reality, they can also act as powerful transmission mediums for our "real world," placing importance on their authorship and design decisions. Much of the work we both do as designers is concerned with revealing what game worlds transmit to the player and how they do it from an architectural perspective. However, by looking beyond their spatial aesthetics, we can see examples of how games often inherit existing biases from our society, as exposed through *FeministFrequency's* seminal Tropes vs. Women in Video Games project. In this work, Anita Sarkeesian highlights how identifying certain tropes in game worlds helps us recognize larger and recurring patterns in society, amplified through popular culture and its powerful influence in our lives (Feminist Frequency 2017). By challenging these rather than transferring them, we can establish new forms of reality by resetting the misgivings of our own.

Sampling the real world can also be used as a critical tool to rethink reality; to reframe and challenge existing power structures, and this has often been a key part of our research and teaching practices. Legacy Russell sees potential in using "culture, society, and by extension, gender as material to remix" (2020), acknowledging them as "original recordings" that were not created to liberate us.

Still, they are materials that can be "reclaimed, rearranged, repurposed, and rebirthed in the virtual world toward an emancipatory enterprise, creating new 'records' through radical action" (Russell 2020). This reinforces notions that suggest games can relay what Shira Chess calls "narratives that surpass the expectations" (Chess 2020), subverting existing socio-cultural norms by proposing new and alternative possibilities that can speak back to physical reality. In this regard, the synthetic properties that game objects possess make them ideal for such work because their reality can be twisted in new ways, even beyond the intentions of their original designers.

Alenda Chang writes, “even if some games do rely on claims of especial realism for their appeal, many aim less for total fidelity than just enough realism to produce play that is both familiar and relevant” (2019). The reality of discrepant game worlds often resides in the *just enough*. And yet, through the games we have examined in projects such as *Videogame Atlas*, we can see that each game’s reality is often more complex and nuanced than even their developers could have predicted. Exploring these nuances is something that underpins both our own interests as researchers and our approach to teaching in our Cinematic and Videogame Architecture course — as a way to demonstrate the importance and influence of game worlds on all forms of contemporary spatial design.

In order to do this, we employ a range of analytical methods that primarily derive from architectural design, such as mapping, survey drawings, organizational diagramming, and path analysis. We also utilize camera modifications to take high-resolution screenshots beyond the bounds of the game world and to explore different angles and viewpoints that reveal the artifice of the world. In addition, data mining allows us to understand more of the logic, and temporal agency, that shapes the world. Finally, community resources are key to understanding the ways in which these individual realities develop — many times it is a game’s community who push the world’s reality to its logical extents. The folksonomies that reside in Discord servers, Reddit threads, and wikis are important sources for outlining and understanding the lived reality of any given game world. Together, these techniques have provided a framework for us to explore the realities of game worlds and understand the ways in which these virtual environments engage with our physical world.

Mapping Game Realities

Our practice and teaching involve both the design of games and game worlds, as well as the use of analytical methods to study existing commercial game worlds in order to outline their architectural agency. This analysis provides a set of critical principles that we explore in many of our own research projects and helps to form the initial stages of our teaching studios. We take virtual site visits, voyaging as far as the game world allows us, and often breaking beyond this space, to understand them as entire entities. Game worlds become a form of "precedent" to analyze similar to how one might use the buildings of a famous architect as a case study, or the morphology of a city as the underpinnings of a project.

As our work in *Videogame Atlas* demonstrates, we can see this on a macro-scale through the world of *Persona 5*, where "likeness" is challenged in ways which are less obvious at first — reordering characters on a shop sign; the insertion of a café on a terraced street; and the mirroring of a doorway to a batting center. Tokyo is sampled in ways that evoke its intrinsic qualities while remaining faithfully inaccurate, instilling a feeling in players that encourages them to seek out these subtle differences through play. This sparks a unique dialogue between *Persona 5*'s in-game neighbourhood, Sangenjaya, and its physical counterpart, Yongenjaya, which is a real area in the Setagaya district of Tokyo.

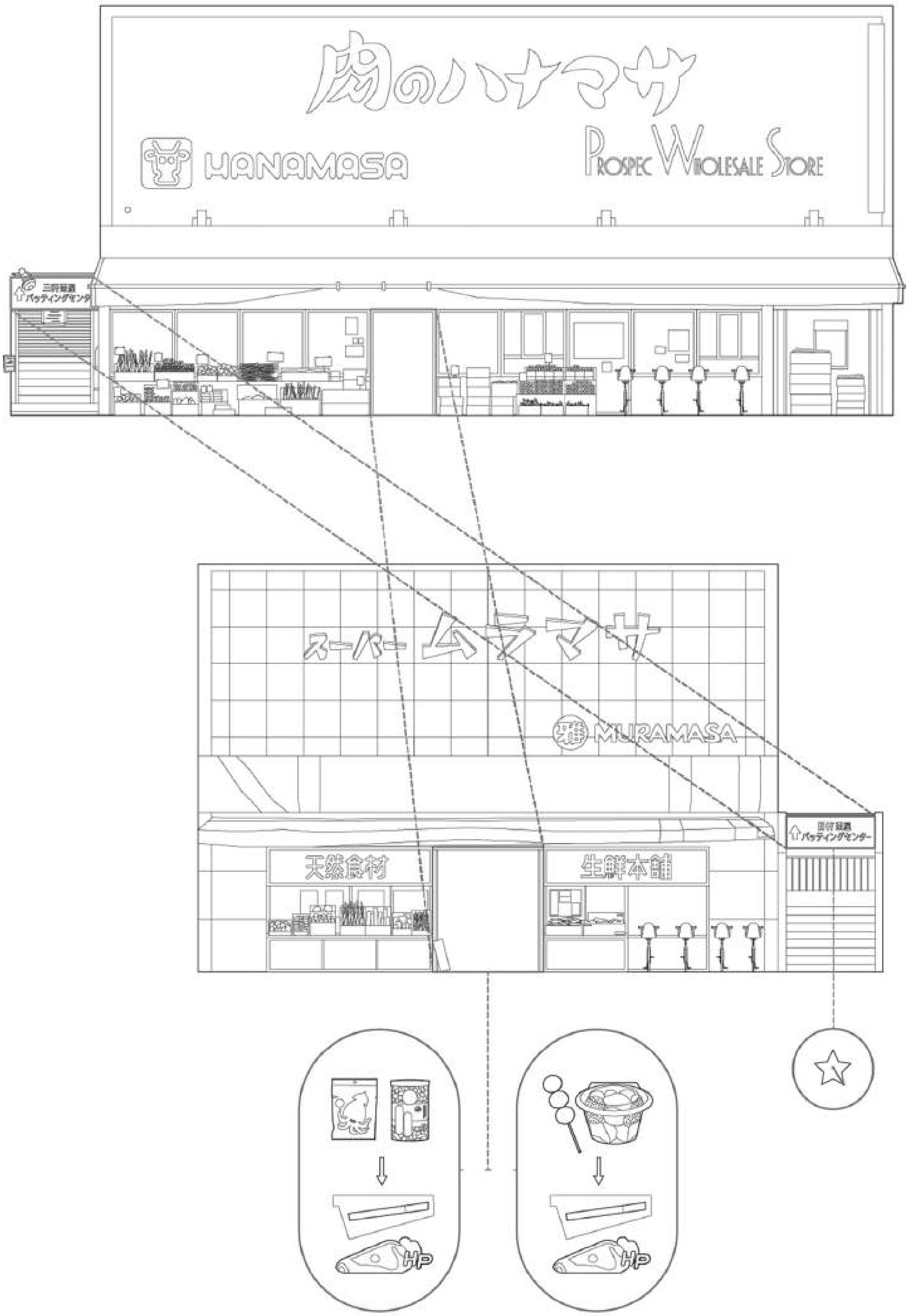

Figure 5.1.2 Elevational studies of Sangenjaya streetscapes showing compositional changes from reality. Digital drawing, 2022, You+Pea.

Since the game's release in 2016, Sangengenjaya has become a pilgrimage site for fans of the game, who retrace Joker's (the game's main protagonist) steps to seek out parallel locations. It demonstrates how the game's reality reframes fragments of Sangenjaya that were previously nondescript — a traditional bathhouse, a grocery store, and one of many millions of vending machines in Japan. This synergy between the game world and the real world echoes Elizabeth Grosz's argument that "the virtual is not a pure, self-sufficient realm with its own fixed features and characteristics. Rather, it is a relative or differential concept whose status as virtual requires an actual relative to which its virtuality can be marked as such" (2001, 76). While this may be true in regard to its world design, the power of the game's own reality and subsequent influence on its *relative* can hardly be overlooked.

Persona 5 is particularly interesting because it thematically concerns itself with transferrals between the game's physical world and a virtual "metaverse" that affects people's cognition, accessed through a smartphone app. This produces layers that can be seen in our drawings of a level where players battle Shido, the game's main antagonist. In Shido's "palace" we find the game world collapsing multiple realities into one space.

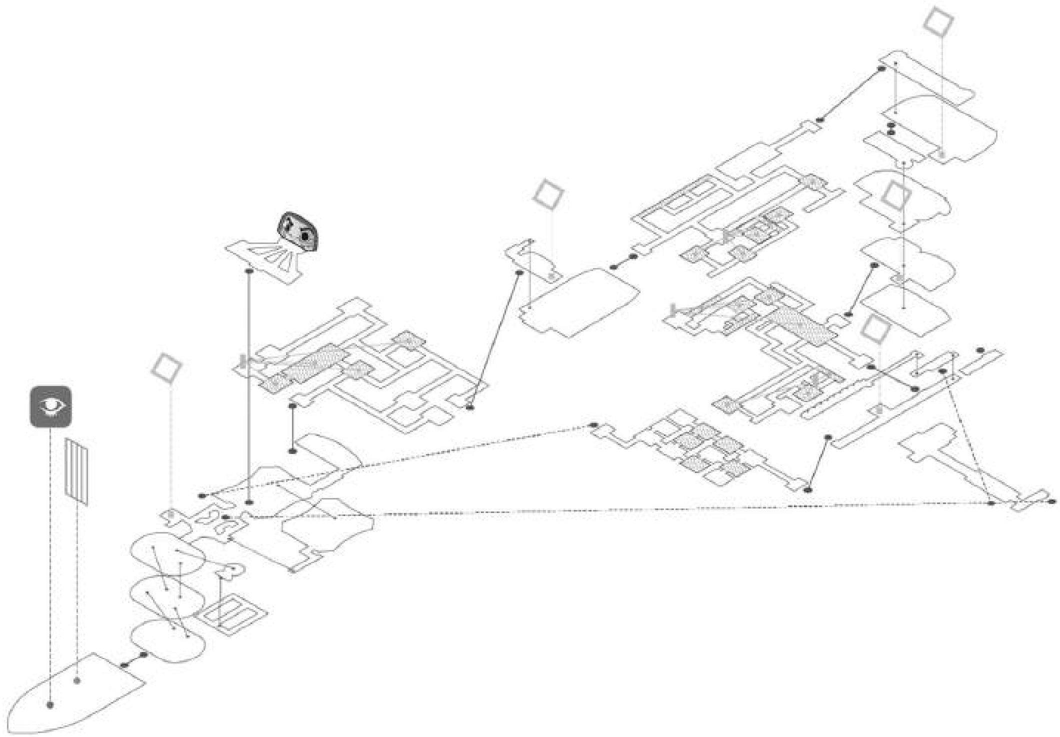

Figure 5.1.3 Isometric study of Shido's Palace in Persona 5, demonstrating spatial connections. Digital drawing, 2022, You+Pea.

This incorporates not only real-world references to a cruise liner and the architecture of the Japanese National Diet, but also a set of maze-like dungeon spaces whose pure space planning contradicts these references. Both realms act as a third layer symbolizing the way the villain sees himself and others in the real world. In many respects, *Persona 5* is a game about the reality of virtual worlds — emphasized through the decision to link them back to the physical world through "too mundane" (Personacentral.com) interfaces like the type of app or game we might absent-mindedly play on our phone.

On a larger scale, we have explored how *Dark Souls'* (FromSoftware, 2011) world of Lordran calls upon contrasting architectural styles from different time periods to evoke certain feelings in players, through disjunction and surprise. Both hostile and tranquil settings are enabled through the architecture and the environment, displacing them from their original contexts and into their new virtual habitats. Yet rather than being “wrong” here they become embodied into the game’s ecosystem under a new set of logics, performing to alternative criteria — to thrill, sacrifice, amuse and protect. Lordran is a particularly good example of a game world built to emphasise C. Thi Nguyen’s idea of “striving play,” where players adopt “disposable ends” (goals that are established only to facilitate the pleasurable struggle of play) (2020). While the halls and arenas of the boss areas do provide meaningful spatial goals that draw the player toward them, our mapping exercises demonstrate the intricate and often overbearing twists and turns of the spaces. These pathways, along with the fact the player needs to retrace their steps after dying — emphasizes that this is a game world designed around a pleasurably unpleasant struggle: with enemies, with the environment, and, in some cases (such as the Great Hollow area), even the physics of the world.

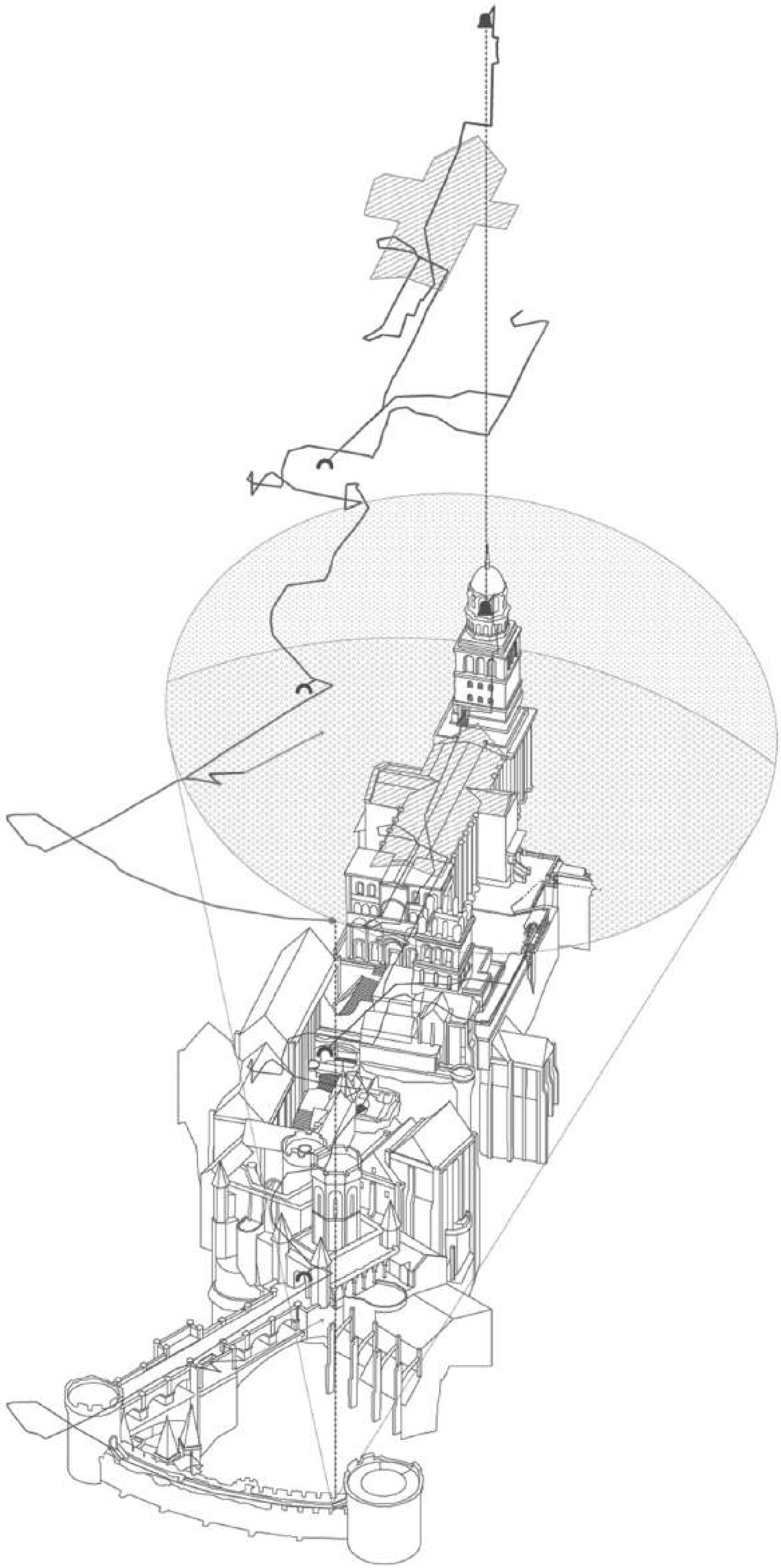

Figure 5.1.4 Isometric drawing demonstrating the pathways through the Undead Burg area of Dark Souls. Digital drawing, 2022, You+Pea.

The struggle of the notoriously difficult *Souls* games works in parallel with the architectural and landscape design, which often opens up into beautiful vistas and scenic viewpoints. As our research has explored, these often resonate with historical principles in the design of Japanese gardens and landscapes, where careful “trimming” (Itō Teiji 1973, 31) of views can be seen at multiple points across the map, giving players insights into spatial connections that are often entirely unexpected.

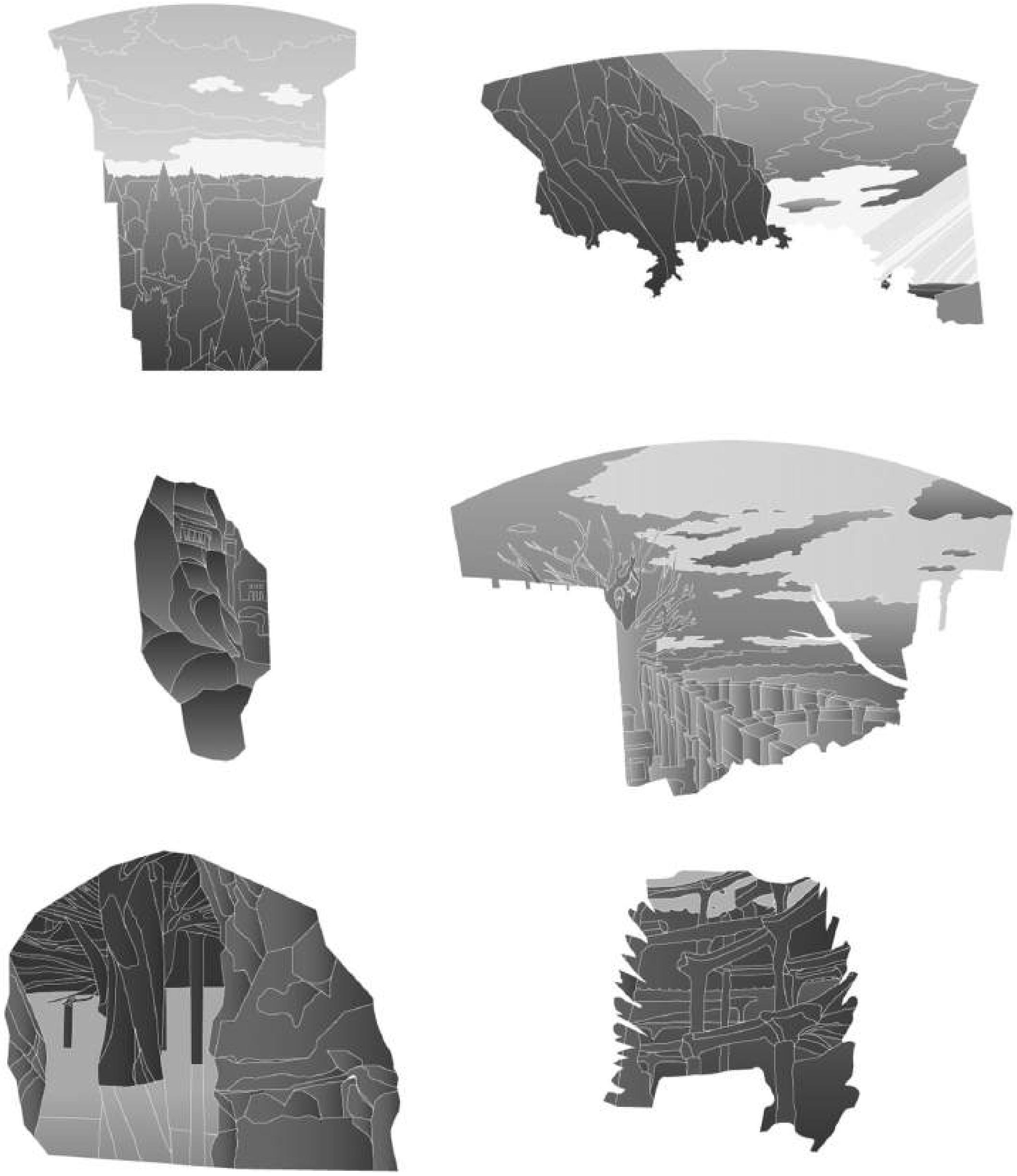

Figure 5.1.5 ‘Trimmed’ views through Lordran that draw players through the map. Digital drawing, 2022, You+Pea.

The game also combines multiple architectural styles together in ways that recall both traditional Western “capriccio” paintings and Japanese gardens from the Heian period (794–1185 AD) that drew in “distant lands” from other parts of Japan and even other countries as part of a spatial tour for the viewer (Itō Teiji 1973, 17).

A game world's chosen reality produces consequences that can often go far beyond the basic mechanisms of gameplay and develop into complex social and architectural relationships that mirror the design concerns we engage with in the physical world. Our studies of *Dwarf Fortress* (Bay 12 Games, 2006), for example, demonstrate the ways in which the simulation environment of the game fundamentally affects the way that players plan and create architecture, urban designs, and social structures within the world. *Dwarf Fortress* is an example of a simulation so detailed and complex that small, coded behaviors can have a global impact (such as the much-shared case of the drunken cat populations (Fenlon, n.d.). As our research into the game's community — and the principles of *Fortress* design they share — shows, the game's reality produces new forms of "vernacular" architecture and guiding principles for design that reflect the mobility and social and personal tendencies of dwarves.

This can be seen in *Dwarf Fortress'* movement mechanics, based on the game's grid system. Dwarves can move along the cardinal axes per "tick" of the game, but crucially, they can also move diagonally in that one frame. As the diagonal is a greater distance but covered in the exact same time, it makes diagonal movement highly efficient, and this is compounded by the fact that dwarves can slip through the diagonal meeting point of two walls. The reality of dwarf movement has resulted in players generating new forms of architectural planning. We can see this in designs for housing units shared on the game's wiki (Dwarf Fortress Wiki) — presented as "best practices" for achieving optimum residential density while still aligning with the preferences of dwarven inhabitants. One design for a bedroom block shows players creating a checkerboard of living spaces, accessible without a door, which avoid some of the dwarves' unhappiness penalties (dwarves don't like doors).

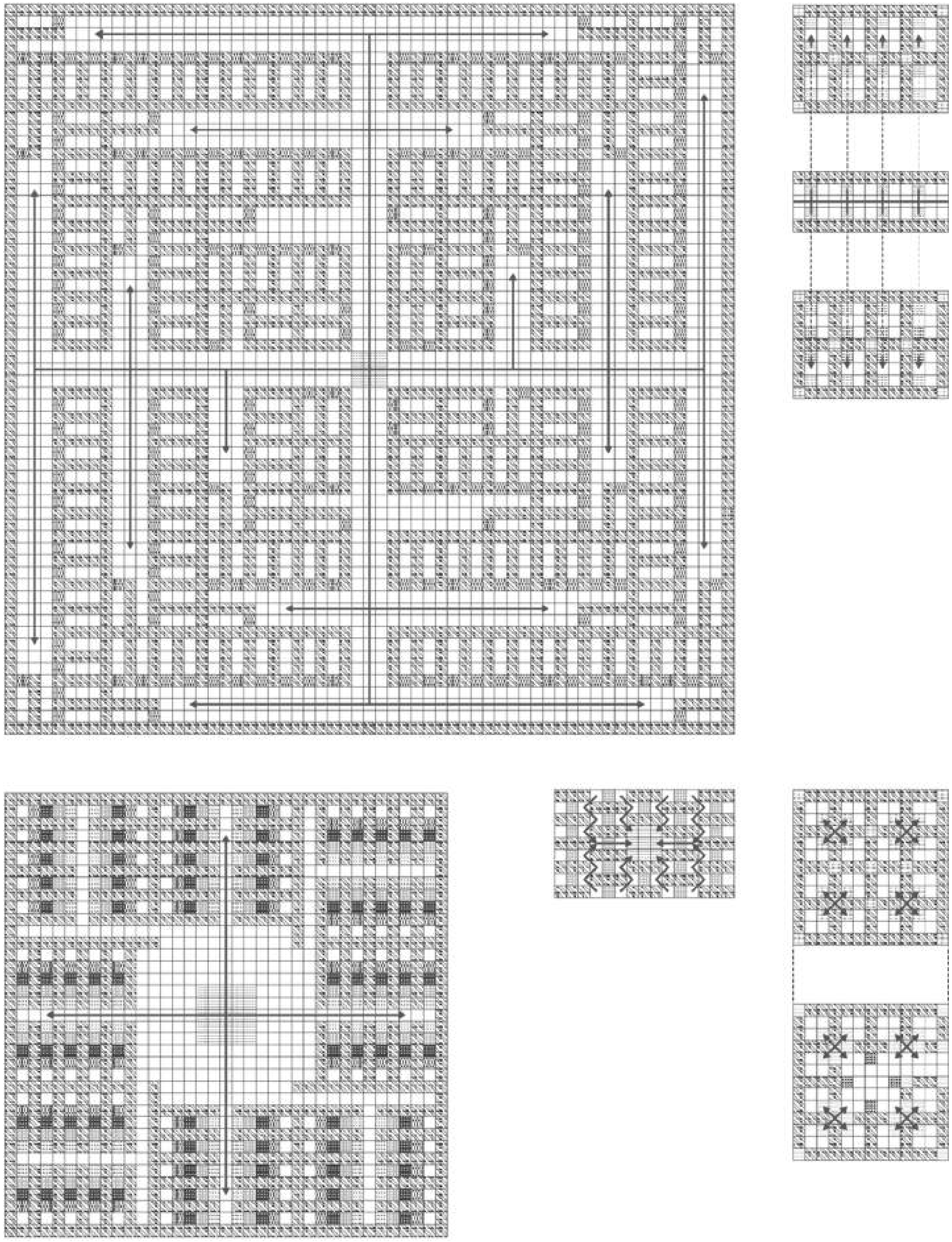

Figure 5.1.6 Floor plan studies of dwarven bedroom units, as detailed on Dwarf Fortress Wiki. Digital drawing, 2022, You+Pea.

As our mappings of community-built structures shows, this logic extends out to a planetary scale, affecting the architecture at every level (Pearson and Youkhana 2022, 121). While players are free to imitate physical-world realities in their designs, following the reality of *Dwarf Fortress'* world produces weird new architectural vernaculars.

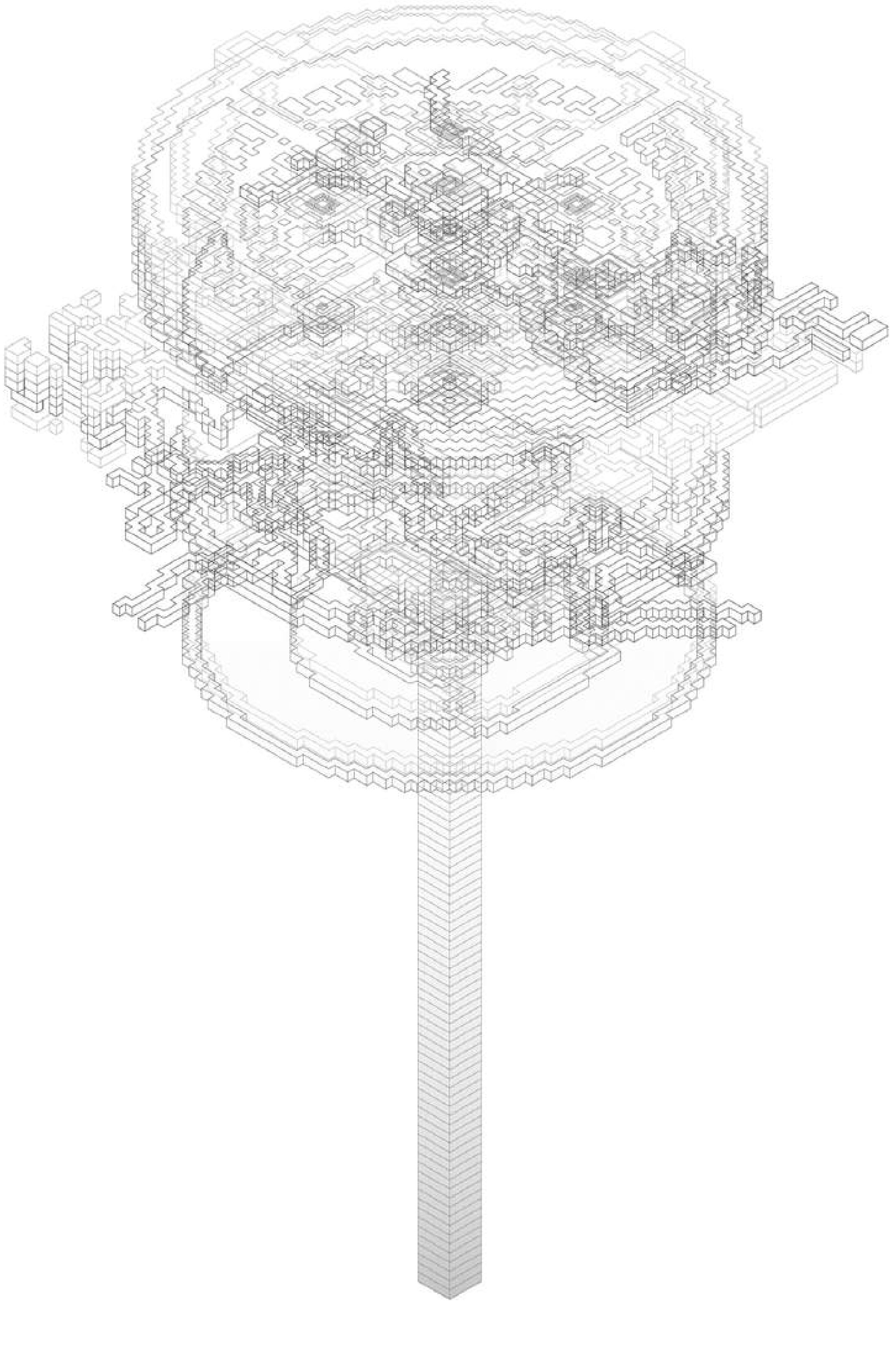

Figure 5.1.7 Isometric study of Dwarf Fortress ‘megabuild’ showing a construction guided by dwarven movement principles. Digital drawing, 2022, You+Pea.

Our explorations of these games reveal the close link between the design of the game world and the agency afforded the player within that world: their reality. We also encourage students to use this type of analytical work in the early stages of their Videogame Urbanism projects. This becomes a means of better understanding the unique realities of game worlds, to critically unpack the relationship between spatial representations and coded logic that they find within games, and to establish models for agency that they might pursue (or challenge) in their own design work.

Designing New Realities

While our analytical works are research projects in our own right, they have also affected how we approach design within our studio, You+Pea. By establishing the critical agency of game spaces and the reality of virtual objects, we are interested in how this affects the notion of designing architecture in, and for, the “real world.”

Our project *Everyone Is Architecture* proposes that real people acting as real game objects could be a new form of collective, live-site design environment. By leveraging the causal power of the game object by connecting them to participants through a tracking and geofencing interface, this concept proposes to establish a direct line of translation between the virtual and the physical for prototyping socially driven spaces at a 1:1 scale. The reality of a game environment can become clear when its movements and changes are recorded back into the physical world in real time, yet users are able to exploit the synthetically encoded behavior of the game object, switching physics on or off to test designs in expressive ways.

Figure 5.1.8 Render of Everyone is Architecture, produced for Architects x Epic Games. Digital rendering, 2021, You+Pea.

If *Everyone Is Architecture* represents an idea to integrate games into architectural design practices, then our satirical project *London Developers Toolkit* shows how we can use deliberately simple, random, or obtuse systems to discuss the agency of designers in the physical world. The game explores "real-life" London's rampant development explosion, documented by sites such as Development Aesthetics (Bennes), which has produced a swathe of non-contextual and politically questionable projects across the city. Players act as an architect working on behalf of two London property developers, designing a luxury residential skyscraper and then producing "glossy" promotional images of the structure (which can be printed out by players, or posted to a twitter bot).

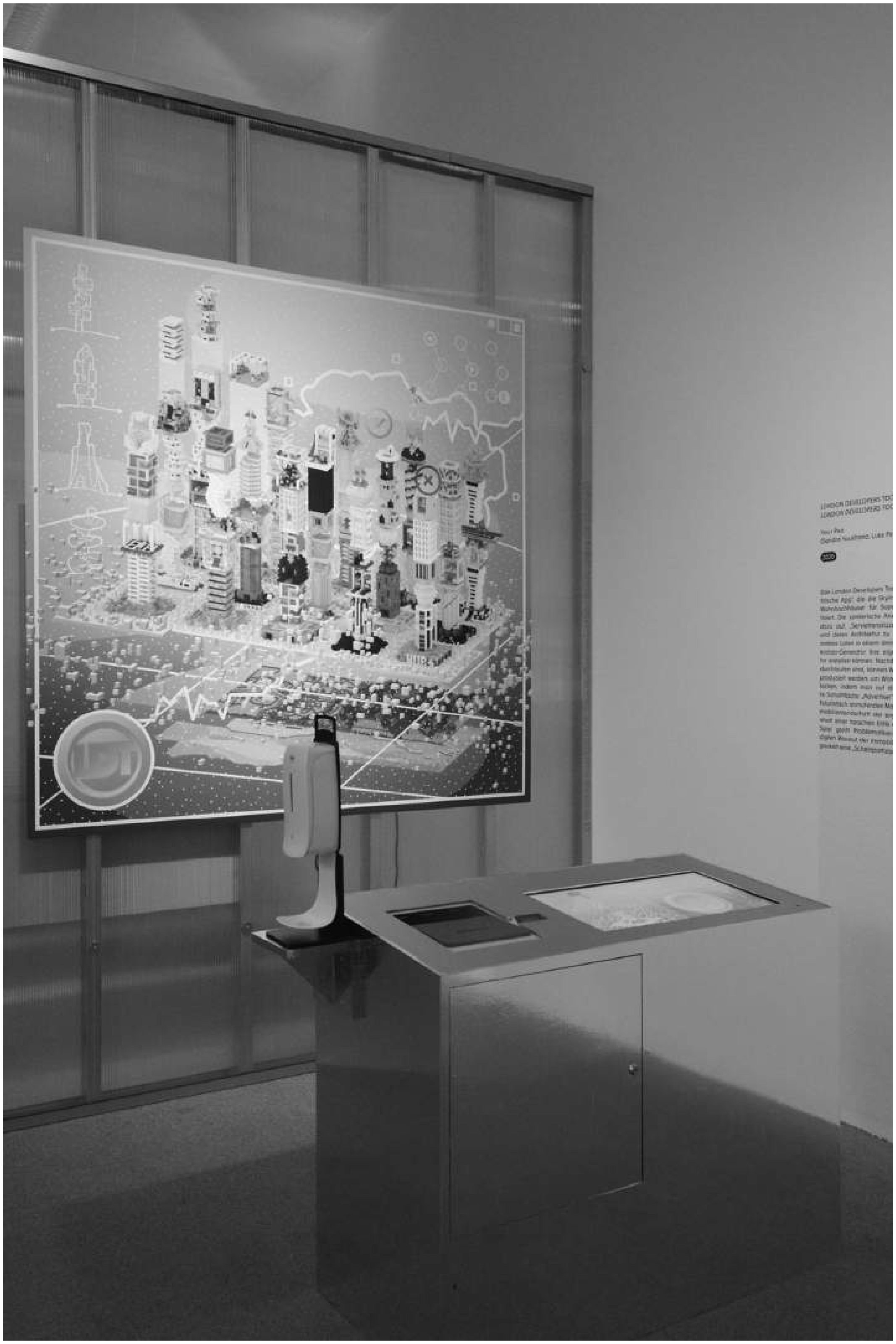

Figure 5.1.9 Photograph of London Developers Toolkit installed at Architekturmuseum der TUM, Munich, Germany. Photograph

© Laura Trumpp. Digital game, 2019, You+Pea.

Beneath the veneer of a design game, the agency of the player is strictly limited to performing rote tasks. While players may appear to be participating in the design process through the interfaces presented to them, their interactions merely progress the game rather than having any impact on the design of the tower itself. The tower is generated randomly each time, and as such the "architect" player can do nothing to shape its form, even if it appears they are doing so. With this deficit of agency, players follow the inevitable path of capital through to its end.

Within our Videogame Urbanism studio and the Cinematic and Videogame Architecture course at the Bartlett School of Architecture, we have also worked with students on over 60 (and counting) videogames across the past 8 years that seek to use the reality of game space as a way of reflecting, critiquing, or redesigning our physical reality. In *Symbiocity* (by students Siming Chen, Yetong Jin, Yuxin Liu, Xinyue Shou, 2021), players use a series of brushes to paint and rewild the city, taking part in a multiplayer game that encourages multispecies coexistence within contemporary cities. Another project, *Carbon Neutral* (from students Yun Tie, Li Zhu, Zhaowei Zhu, 2018), adopts RPG mechanics as a way of quantifying an individual's carbon footprint during the course of their everyday life in the game, leveraging the fact that reality in an RPG game typically has a strong and visible relationship to data. In this way, popular game modes and mechanics are utilized in ways that ask players to push past their expectations and participate in new, novel forms of design dialogue.

Game objects and worlds can thrive in the discrepant meanings they afford, and this is something our students have also found productive as an area of study. *OddWorld* (by students Yuting Pu, Zichun Yang, 2020) drew from postmodern theory on the semiotics of architecture and the fluid agency of game objects in games to propose a multiplayer game world where players can alter the scale, appearance, and behavior of any object in the world. As a multiplayer game, the meaning and function of the world and the objects within it are established between each user across the network. If this synchronization does not happen, the different realities of the virtual world that is generated by each player will diverge from one another.

Finally, in *DeFi City* (from students Wenbo Di, Angyi Li, Yutong Wi, Kerun Yu, 2022), a new financial district for London is proposed through a game that challenges the city's relationship to crypto markets where every coin is represented as a skyscraper. Acting as a virtual manifestation of financial markets, the game explores a virtual urbanism defined by the volatility of crypto speculation. As such the world could easily oscillate between careful investment and a degenerate world of memes and cryptobros. In this context, the game asks — which is really more real, the game or the system it draws from?

Back in *Matrix Awakens'* American city prototype, we are reminded that the demo is based on a popular series of films that question the nature of our reality and whether we are truly living in a digital simulation. While *Awakens* is not there yet, its visual fidelity shows that architecture must prepare for a future where our practice becomes even more embedded in the borderline between physical reality and game reality, collapsing the space between the two. Our expectations for both are not the same, and nor should they be, but the gaps and discrepancies between them can be highly productive sites for design. This type of practice is what we are developing in our research and teaching, both for today and tomorrow, to reframe the realities of games and architecture.

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5.2

Building Black Joy in a SIMulated Realm

Kristen Mimms Scavnicky

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Within the game system of *The Sims* there are two modes: build and live[1]. The build mode is where time is paused indefinitely and all of a player's creative juices flow freely, making make-believe life decisions with a simulated person's environment. The live mode reengages time and allows a player to nobly pursue knowledge and skills or naively seek out unspeakable debauchery or everything all at once. Some players spend the majority of their playing time within build mode — they prioritize the creative process of building a customized space and may not start playing in live mode for days or weeks after starting to design their Sim's new home — sometimes never starting live mode at all.

The Sims creator, Will Wright, initially thought of the game as a virtual dollhouse where the player controls the dolls; however, the game evolved into an open-ended sandbox-style simulation, mimicking real life with seemingly endless social possibilities and an extreme focus on architectural space (History.com, 2023). But the social life it mimicked, and those possibilities, were still a far-flung fantasy for me and others who look like me. The game's presets present a choose-your-own-adventure scenario: the player chooses from a variety of provided options to design the life of a Sim individual or family. While the options are abundant and supposedly endless, this heavily designed kit-of-parts has limited qualities and possibilities, allowing the player to have authorship over the game's trajectory and destination but only so much. While the Sims' popularity has led to countless expansion packs and updates, solidifying its status as a cultural icon for millennials and remaining one of the best-selling computer games since its launch in 2000, the proprietary content continues prioritizing white-centric spaces and social normative practices (Stanford, 2008).

In this original Sims game of 2000, players are referred to as Simmers, and begin the game with a small house located at the address 7 Sim Lane. The house is an especially modest, pre-built box that serves as a starter home in the game, symbolizing a humble beginning, hopeful for a bountiful future — the so-called American Dream. Unlike the disproportionately large first house a Simmer will ever build from scratch, 7 Sim Lane consists of a kitchen, a bathroom, and one bedroom — all big enough to fit basic, minimal furniture. This starter home is designed to offer players the basic living areas they need, while also leaving space for customization and growth as their Sims' requirements and financial resources increase. It reads suspiciously like a postwar bungalow, the small houses built and predominantly purchased by white veterans after World War II. These houses are widely seen as the most pivotal moment of the racial homeownership gap, a potentially major contributing factor to the racial wealth gap.

Figure 5.2.1 A portrayal of 7 Sim Lane.

Wright studied architecture in college, advancing his initial virtual dollhouse idea into a simulator game for architectural design whose quality would be evaluated by the dolls who inhabited the houses. Growing up, I felt frighteningly close to being a puppeteered doll in a house that I was meant to critique. While some people use simulation games to merely explore otherworldly realms or alternative societies, my immediate and naive childhood aspiration, like that of many navigating a racially biased society, was to chase misguided notions of social acceptance — envisioning a life with lighter skin, a flawless complexion, endless wealth, and a sprawling McMansion in an idyllic cul-de-sac. In the simulated world I held all the cards, a stark contrast to the limitations of my real-life experience of living in the lowest-valued house on my street, in one of the wealthiest suburbs outside of Cincinnati.

The click of my parents' bedroom door latch echoed through our house, signaling the beginning of my nightly liberation from reality. With the soft glow of my laptop illuminating my young, blemished, caramel face, I embarked on a journey into an altered simulation of my life, where endless possibilities awaited. The *Maxis* logo reflected in my eyes, as a mischievous smile adorned my face. These were the nights that would prime me for the arduous hours spent perfecting diagrammatic section drawings and crafting physical chipboard models for my undergraduate design studio reviews. The joy I first discovered as a world-building 13-year-old gradually morphed into a cherished memory, resurfacing each time I dive into a project as a designer in my 20s and 30s. As I worked on projects at firms where I had to build real-world buildings in a virtual realm, the joy I cultivated through the Sims was maintained with light hits of dopamine even though I was doing work I didn't love. It was like my fantasy life was coming true — but not quite.

I was introduced to *The Sims* life-simulating game by a classmate. After playing hide and seek in the most complex residential building I'd ever set foot in, my friend and I sat down at her family computer to investigate the ins and outs of Sim worldbuilding. I was in complete awe of what I saw — jaw-dropping awe. At the age of 12, I had begun to have a rudimentary understanding that the virtual architecture within *The Sims* could not only provide a blank slate for my personal expression but also serve as a preparation tool for a design career. Through the game, players are exposed to diverse architectural styles and creative layout possibilities, sparking an interest in design that may have seemed previously inaccessible/[2] After this experience, I became adamant that I would one day become an architect. Years later, developing construction documents using Revit, I had a deja vu moment while editing an isometric drawing — an eerily similar perspective to *The Sims*' iconically framed world. It was simply meant to be. If only cheat codes like rosebud and motherlode[3] could transcend the virtual world too!

Perhaps you are reading this having come from a similar background as myself but maybe you and I have markedly different cultural experiences. Either way, let's situate ourselves in the same societal perspective. Many would agree that the common Black experience within predominantly white-populated built environments mirrors the layered complexity of a first-person shooter videogame interface that we will refer to as the Bias Battleground. In the Bias Battleground, players navigate a world filled with hidden dangers and constant caution alerts flashing on their internal screen, like their mind's eye in real life. Can you imagine wearing a virtual reality headset that you can never take off? In this lived reality, far too many of a person's steps are fraught with fear, and far too many interactions come with the weight of historical biases and systemic barriers. It's akin to being immersed in a virtual landscape where the rules are constantly changing, and the odds are stacked against you solely because your skin and/or cultural association is intimately linked to a specific community of color. Each day becomes a new level in the game of life, with challenges and obstacles seemingly tailored to hinder the progress of those who do not conform to the dominant narrative. Despite its inherent unfairness, this reality has been and continues to be the norm for non-white-presenting individuals navigating a built environment shaped by generations of whiteness.[4] It's a game that demands constant vigilance, resilience, and adaptability. Survival itself depends on one's ability to navigate a maze filled with enticing traps laid by its game makers.

In 1963, James Baldwin stated in his book *The Fire Next Time* that "To be a Negro in this country and to be relatively conscious, is to be in a rage almost all the time." His quote reflects the immense psychological toll of racism on Black mental health as they endure their obligatory daily shift in the Bias Battleground. The rest of the book expresses how constant exposure to racism, microaggressions, and systemic oppression can lead to feelings of powerlessness, frustration, and despair. Despite this, Black people find a way to dream of something better through culturally specific and historically situated playstyles like *The Sims*. In these scenarios, community-driven responses to supposedly endless possibilities create space for marginalized players who cannot otherwise see themselves in the space.

Before there were Black Simmers, people were make-believing hopeful escapes in other ways. One of these dreamers was Sun Ra, an avant-garde jazz musician, composer, bandleader, and philosopher. He played a significant role in shaping the concept of Black futurism. This cultural and artistic movement imagines alternative futures for Black communities free from the constraints of racism and oppression. Through his creative expressions, Sun Ra explored themes of space, time travel, and intergalactic liberation, envisioning a future where Black people could transcend earthly limitations and achieve spiritual and creative freedom.

> The music is different here, the vibrations are different … not like planet earth … planet earth sound of guns, anger, frustration … there is no one to talk to on planet earth to understand … it would affect their vibrations, for the better of course … equation wise, the first thing to do is consider internal linktime as officially ended … we'll work on the other side of time … we'll bring them here through either isotope, internal linkteleportation, transmolecularzation … or better still, teleport the whole planet here through music…

— Sun Ra in *Space is the Place* (Coney, 1974)

In a less fantastical but equally hopeful way, bell hooks' book *Belonging: A Culture of Place* delves into the concept of homeplace, which she defines as a site of belonging, love, and connection — a space where individuals feel rooted and affirmed in their identities. In *Belonging*, hooks examines how Black communities have historically cultivated homeplaces as a means of resistance against the forces of oppression and displacement. She emphasizes the importance of reclaiming and nurturing these spaces as a source of empowerment and healing (2008). Maintaining these sentiments in a trajectory adjacent to the Black community's real timeline, one can see how a familiar domestic simulation might be far more comfortable than that of a one-way ticket to outer space. Presented with a fantasy game that simulates human life, it is evident, just as it is in reality, that Black people must either compromise the way they experience the world by embracing white-centric culture as the game curates it or innovate past the unfairly unfinished kit-of-parts to include cultural artifacts that they can relate to.

Building Black Joy in a Simulated Realm requires custom add-ons. Black Simmers do not want to escape from the entirety of their life in the Bias Battleground, so custom content is essential to them. In defiance of the supposedly endless possibilities presented by the original version of *The Sims*, Black Simmers continue to create and visualize themselves in the game by learning the skills to develop custom content. Black Simmers will customize the simulated realm to include rituals and amenities that hold a special space in the hearts of those within the Bias Battleground's Black community constituents. My absolute favorite instance of this is the Hair Supply Store[5] building typology. While Black hair maintenance has a complex history,[6] the present-day relationship of Black people with their hair is uplifting. A player custom creating a culturally specific locale for

Black Sims to shop for their hair care products is a prime example of how Black people must innovate in the white-centric, default world that does not accommodate their needs or desires. Custom creation hacks like this can be downloaded and installed into the game for those who need them, typically through a process that involves placing the new files into specific directories within the game's installation folders.

Many Black Simmers meet their first obstacle with the game as they begin customizing their Sim — before any architectural space is introduced. Often a Simmer will base their Sims on themselves and people they know, embellishing on the odds and ends of their appearance. Scrolling through the provided hairstyles, Black Simmers are met with the frustration of exclusion or straight-up erasure — where is my hairstyle? No kinky, curly fros? No locs? No wash n go, nor twist out? Most definitely no laid edges — how am I supposed to identify with my Sim if I can't even customize the virtual me to wear the correct hairstyle? That's where custom content comes in to save the day for Black Joy.

Figure 5.2.2 An image of a Black Simmer Hair Supply Store.

When given the power to make a new reality with open-ended options of bodily physicality, home design, relationships, and ideal socio-political circumstances, people will take it, even if it's only for a few hours a day. In my personal experience, it was through the immersion of play that I was able to visualize, measure, and escape from my own domestic environment's failings. As children, many people turn to *The Sims* as a means of constructing and simulating healthy examples of domesticity that are presented to them in the media — allowing them to personally experience that perspective for a change in pace. This sanctuary of experience diverges from the inadequacies and societal pressures associated with their real-life living spaces, and such a respite provides the time and space to face another day inside the Bias Battleground.

Building Black Joy in a Simulated Realm requires exploration as well as innovation. The young Simmers of 2000 are now adult Millennial Simmers of 2024, continuing their cathartic escape when facing ongoing struggles and limitations. In the virtual realm of *The Sims*, Simmers aren't just players but controllers and manifesters, wielding power and agency over their environment, building joyful spaces that reflect their desires and aspirations. This empowerment fosters a sense of autonomy and self-confidence, offering a reprieve from the challenges of their everyday shifts in the Bias Battleground that they are unable to wholly act on, correct, or change.

I often recount my specific journey as a Simmer to address dwelling frustrations and find joy in the virtual architectural realm. It was during the visit to a friend's home discussed earlier that I realized my house was unlike those of my peers. My home was obviously small from the exterior but upon further exploration and analysis of the interior of my home, one could see that the architectural organization left much to be desired. Why did my parents have to walk through my bedroom to arrive at their own? Why didn't we have a hallway with individual entrances? These are questions that I asked myself over and over for years, thoughtfully taking my frustrations up with a pen and paper countless times and presenting them to my father for consideration and implementation. When those build requests did not come to fruition, I took my desires to the Sims' world, starting with solutions to the situation at hand and then ignoring the problem altogether by building a 14-room mansion for me to daydream about instead.

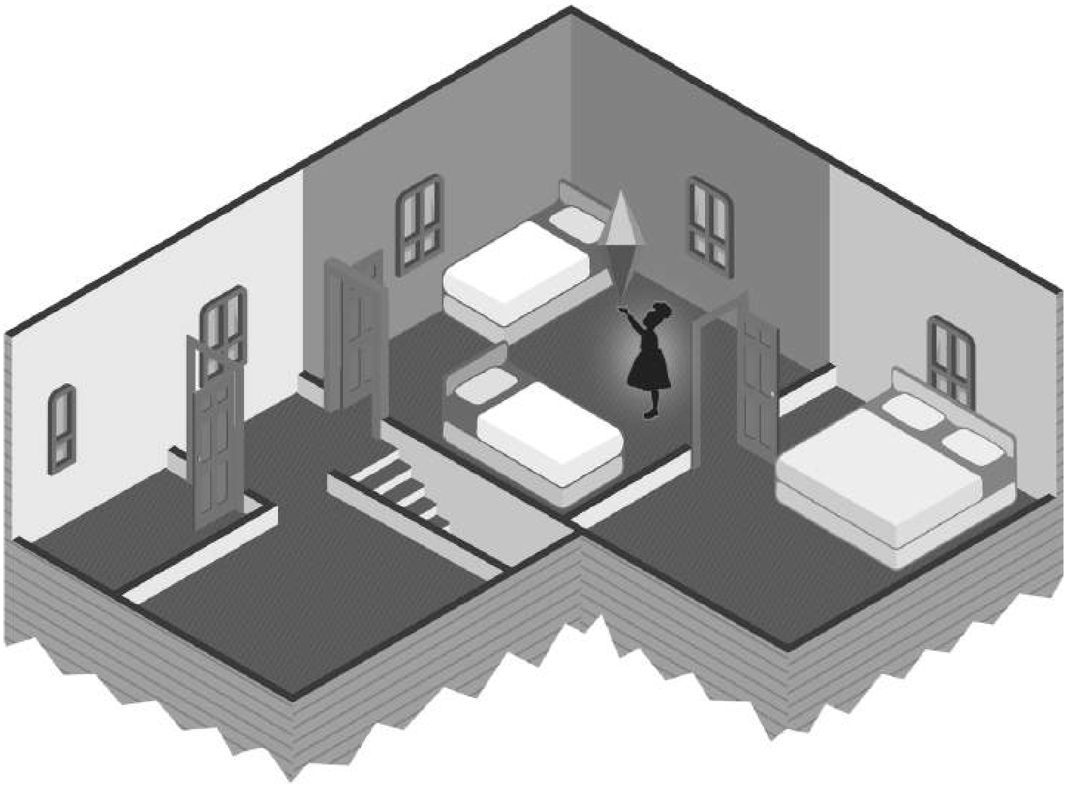
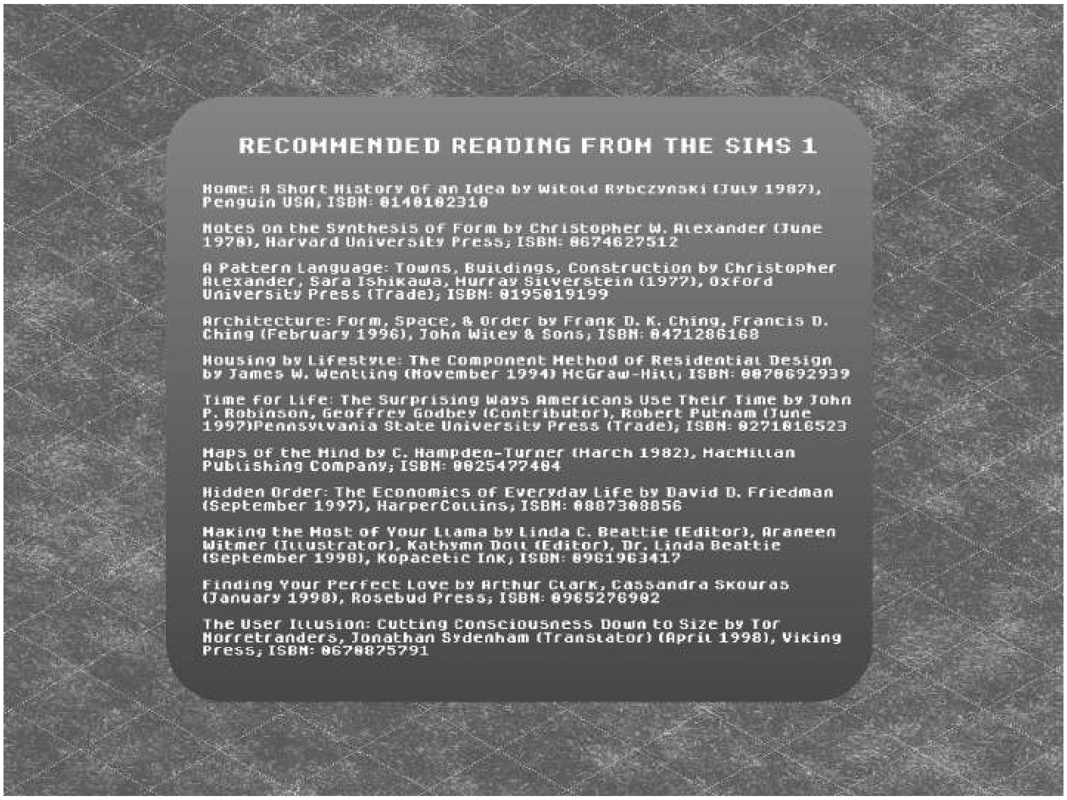


Figure 5.2.3 My childhood home as a SIM house.

One Black Simmer, and self-proclaimed nerd who goes by the name Faerie Tempest on social media, utilizes *The Sims* platform to represent, reimagine, and explore historic periods with Black Sims as protagonists instead of backgrounded, enslaved people. Upon visiting Faerie Tempest's YouTube Channel, you're free to explore in-depth video introductions and tours of custom-hacked neighborhoods spanning the decades from 1870 to 1900. This virtual LARPing[7] allows this specific player to experience an alternative past and share that positive image with other Black Simmers.

Building Black Joy in a Simulated Realm requires community and collective knowledge. By connecting with other Black Simmers online through forums and social media groups they can share culturally specific tips, tricks, and custom content to enhance their Sims worldbuilding experience. Additionally, the collective can engage in critical analysis and discussion of their cultural representation and fight against the stereotypes present in *The Sims* default kit. By considering how race, ethnicity, gender, and other identity factors are portrayed within the default game, the community can challenge those problematic narratives and portrayals through constructive dialogue and creative expressions that are not native to the game.



RECOMMENDED READING FROM THE SIMS 1

Home: A Short History of an Idea by Witold Rybczynski (July 1987), Penguin USA, ISBN: 0140102310

Notes on the Synthesis of Form by Christopher W. Alexander (June 1970), Harvard University Press; ISBN: 0674627512

A Pattern Language: Towns, Buildings, Construction by Christopher Alexander, Sara Ishikawa, Murray Silverstein (1977), Oxford University Press (Trade); ISBN: 0195019199

Architecture: Form, Space, & Order by Frank D. K. Ching, Francis D. Ching (February 1996), John Wiley & Sons; ISBN: 0471286168

Housing by Lifestyle: The Component Method of Residential Design by James W. Wentling (November 1994) McGraw-Hill; ISBN: 0070692939

Time for Life: The Surprising Ways Americans Use Their Time by John P. Robinson, Geoffrey Godbey (Contributor), Robert Putnam (June 1997)Pennsylvania State University Press (Trade); ISBN: 0271016523

Maps of the Mind by C. Hampden-Turner (March 1982), MacMillan Publishing Company; ISBN: 0025477404

Hidden Order: The Economics of Everyday Life by David D. Friedman (September 1997), HarperCollins; ISBN: 0887308856

Making the Most of Your Llama by Linda C. Beattie (Editor), Araneen Witmer (Illustrator), Kathymn Doll (Editor), Dr. Linda Beattie (September 1998), Kopacetic Ink; ISBN: 0961963417

Finding Your Perfect Love by Arthur Clark, Cassandra Skouras (January 1998), Rosebud Press; ISBN: 0965276902

The User Illusion: Cutting Consciousness Down to Size by Tor Norretranders, Jonathan Sydenham (Translator) (April 1998), Viking Press; ISBN: 0670875791

Figure 5.2.4 Reading list offered by the original SIMS 1 computer game manual.

The Sims 1 package sold to consumers not only contained a CD to insert into your PC but also a printed manual. Within the pages of the printed manual, Wright included recommended readings one could find on a college syllabus during their stint through an architectural program at the time. This might give us a glimpse into how the catalog of architectural discourse provided with *The Sims* was considered a standard of universal desire — the white ideal. Perhaps Wright had hoped that if players were provided an opportunity to learn about architecture, they might take the first leap into the academic discourse by checking one of the books out of the library — further reinforcing subliminal agreement with the status quo of design ideals of the time. The curated bundles of design elements, readings, and cultural notions excluded the voice of Black designers and communities.

Through acts of creative resistance and community-driven innovation, Black Simmers have transformed *The Sims* into a platform for their own cultural celebration, historical exploration, and social advocacy by their own hands. From customizing in-game content to representing their unique experiences and traditions to reclaiming and nurturing virtual homeplaces as sites of empowerment and healing, Black Simmers have asserted their presence and agency in a virtual world that also marginalizes their voices. As we look to the future of *The Sims* and beyond, let us pointedly aim to amplify the voices and experiences of Black Simmers and Simmers of Color, challenge the status quo of white-centric gaming spaces, and strive to create virtual worlds that reflect the real-life diversity and cultural richness of our shared humanity. In doing so, we can harness the transformative power of play to not only transcend the Bias Battleground but also imagine and enact a more inclusive and equitable reality for all.

Notes

1. *The Sims* game of 2000 included three modes: 1) build 2) buy 3) live. The more recent version of *The Sims* has been updated to be 1) build 2) live, which folds the buy mode into the build mode as one.
2. Per the NCARB's records reported in 2022, there were a total of 121,603 licensed architects in the United States. Approximately 2% of

those architects were Black — 0.2% were Black women.

3. Input of either “rosebud” or “motherlode” allow a Simmer to bypass the gradual process of earning money to gain access to a desired outcome quicker. Without cheat codes, a Sim earns money or simoleons through activities like getting a job or selling already acquired home entourage. The rosebud cheat deposits 1,000 simoleons into your Sim’s bank account while the motherlode cheat deposits 50,000 simoleons.
4. Whiteness is a central component of the hierarchical social structure that perpetuates inequality and injustice. Whiteness is not merely about skin color but encompasses a complex system of power dynamics, social hierarchies, and cultural norms that privilege those identified as white while marginalizing and subjugating others (Wilkerson, 2020). It often involves implicit and explicit biases, systemic advantages, and societal expectations that reinforce the dominance of white individuals and institutions.
5. A hair supply store is a retail establishment that specializes in selling various products related to hair care and styling. The products they carry include but are not limited to: wigs, hair extensions, shampoos, conditioners, treatments, gels, mousses, hair sprays, brushes, combs, and hair ties, as well as tools like hair dryers, flat irons, and curling irons.
6. During the transatlantic slave trade, enslaved Africans faced forced assimilation and cultural suppression, including the restriction of their traditional hair care practices. As a result, many Africans in the Americas were compelled to adopt Eurocentric beauty standards, which often involved straightening their hair with methods like hot combs or chemical relaxers. Today, black hair care continues to evolve,

reflecting a rich tapestry of cultural heritage, self-expression, and community empowerment, underscoring the resilience and creativity of black individuals in navigating and reclaiming their identities in the face of societal pressures and historical injustices.

7. Live action role play is a form of interactive storytelling and gaming where participants physically act out their characters' roles. In a LARP, players dress in costume, use props, and engage in improvised dialogue and actions to closely imitate a specific time period, immersing themselves in the story.

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5.3
Interview with Ana Miljacki
On Her Roles as Architecture Professor and Critic at MIT and Director of the Critical Broadcasting Lab

Ana Miljacki

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What kind of games do you prefer and when did you get interested in them?

It's hard not to go to memories of childhood when you ask what games or when you were exposed to them. In socialist Yugoslavia, they included things like Go, Chess, Sorry, card games. We had Monopoly that I was recently trying to recover and remake because it included locations across all Yugoslavian republics. It's curious how it didn't matter that it was a game based on landownership.

I have been using games in the Critical Broadcasting Lab for the purposes of critical or radical commentary. Games often provide a collective format through which we can talk about various complexities of architecture. They allow us to broadcast criticality through the act of playing while also enabling a camaraderie, maybe even a comradeship, as a result of both playing and broadcasting together. In the CBL, the game functions as a medium of broadcasting and as a prompt for collectivizing, which is how I think of exhibitions as well. I like this dimension of exhibitions, that fact that we can experience something together in space and time, and thus end up sharing that experience. Games often require more commitment than exhibition viewing. Generally, we tend to go to an exhibition, view and judge it fairly quickly on the basis of that ocular experience. But if you engage through a set of topics when playing a game, you're engaging them in a very different way. There is a personal investment in those topics alongside the investment in the mechanics of the game.

What are your thoughts on videogames?

We made *Super Tall Tetris* recently, which borrows the logic of *Tetris* and offers tetraminos based on Super Tall buildings in New York. *Tetris* is one of the videogames on the videogame front that I found late in life and really like. In the videogame world, I gravitate to the super simple games, the ones whose goals is to survive as long as possible, given the obstacles. These games require you to put time and effort into producing results or even pleasure, and the latter usually involves a certain amount of commitment to the game playing. The kinds of complexities that we've been trying to discuss or describe in the games we have been making in the context of the Critical Broadcasting Lab require a collective to engage them. If we had the skill set to find a way to produce a videogame in which we could have multiple people playing, we might opt for that as well. Right now, my sense of the videogame intersecting with our world has been a fairly individualized experience. My hope is that games produce, or enable further conversation on the topics that we are placing at their centers.

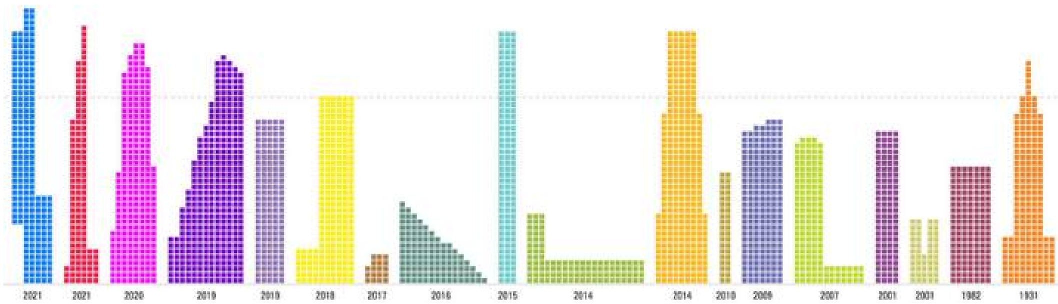

Figure 5.3.1 Supertall tetris.

I see a virtual world as a frontier with lots of possibilities in which we can all be together. But at the moment we care about their physicality and thus gravitate to board games and games that engage bodies in space. Conceived this way, they help us in managing bodies and ideas in space, choreographing engagement.

How do your life experiences influence your work?

Depending on where we start, origin stories can be quite different. I left Yugoslavia in 1991 when it was falling apart. Then I traveled through the US academic system to study architecture. I went to an architectural high school in Serbia and entered university in Belgrade, but that intersected with historical events in my country. I am a statistic of the Yugoslavian war. I have only recently begun to understand the way that I have been disoriented in this world as a result of carrying the values and interests that I was imbued with as a youth in the Yugoslavia context. Eventually I arrived to MIT. I was producing architecture as well as history theory. It’s only after I arrived at MIT that I understood that I had to decide where my energies would have to go for the sake of my academic career. In that space the curatorial work became a key way of operating which allowed me to combine different facets of architecture and to think critically, but also to output things that I thought had to be crafted and designed well on the topic of architecture, but in a much faster way than one would produce a building. So ultimately that medium of both storytelling and teaching, or exhibition as a medium in which those things can be done while also producing aesthetic effects and experiences became my primary mode of pedagogical work and research output.

Do you feel like games have the ability to change the way that architecture is performed or thought about? In what ways do you think that can happen?

I definitely think that the game is a medium through which we can seriously communicate about certain topics in architecture, even as (and because) we are having fun. What we've been able to do in the Critical Broadcasting Lab with students from different pedagogical contexts who intersect with MIT is arrive at games that are imminently playable and actually enjoyable to take part in. That seems like a really key dimension of it. Otherwise, there are many other media we could use to speak about some of the same topics. Games are able to transmit values and we are certainly producing games that are radical. There is a history of radical games. You might go to Duchamp and think about the way in which some of the surrealist work was produced in games. We can think of games in the context of the contemporary, but we can also see them as part of the larger art historical world in which games were not meant to be commercially viable but were primarily a medium through which cultural statements were produced. In the Critical Broadcasting Lab, among others, we produced a game in the genre of the *Monopoly* games that was called *HighlineOpoly*, using all the logics of *Monopoly*, but including an important critique on gentrification. The original Monopoly game comes out of the same urges, but we talked about the way in which the persona of the starchitect emerges and how it influences gentrification. How the persona of that starchitect is implicated with the persona of the developer. What air rights in New York do and how they are transferred in order to enable buildings. Some of the theorists and the topics that we studied in terms of the thickness or the thinness of the design space available to architects is given in the context in which architecture is driven by the bottom line which is square footage. Highlinopoly is absolutely playable. The idea was to play it not only at MIT, but in a variety of different places and then the pandemic intersected with that. We were for a moment thinking that we could package the *Highlineopoly* game and send it to some of the architects involved in the development around the High Line as an attempt to initiate private conversations with them about their work and participation in these processes.

Figure 5.3.2 Highlinopoly gameplay.

With Highlineopoly, we hoped to highlight how some of these processes of gentrification work and complicate the architect's decision to accept the, so that there's more friction as a result of understanding the levers that are involved in urban development.

Do you feel young architects are affected by videogames?

Creating self-awareness about the complex systems in which we participate as architects is super important. Highlinopoly does not describe all of the systems and intricacies we examined, but understanding some of them and having a sense of what to do with the knowledge we gained through research is important. For a very long time we used to simplify what we do and why we do it as architects. We're complicating that now. I think the new generations are ever more aware of the complexities in which we operate. Yet you still have to figure out what your priorities are to navigate that. It is a lot harder to navigate contemporary complexities than before, not because it's actually harder, but because we are more aware of the complexities. Which means that it's harder to come up with those priorities in some automatic way. When it comes to contemporary videogames and their impact on young architects, it has been most fascinating when the design of the virtual world of the games is understood as *real*, and I have a very hard time agreeing. I see that it is understood as at least one among many realities by my students, and maybe that means that we are pushing against the brink of another way of existing, between the virtual and tangible, and I may yet call them both real.

What are your thoughts on our collective understanding of space as it becomes

increasingly tied to the way that it's portrayed in the media?

I do think that all of us in the contemporary moment are consuming so much more architecture as a two-dimensional expression than we're experiencing three-dimensionally, and in real time. So that influences the way that architecture is understood by all of us. Maybe there is a way to claim that that one could have a more intimate relationship with some architecture because it's durational and one has been able to allow their curiosity to unfold in the context of a game, and around something that we may still want to call architecture. Of course, this kind of experience may influence the way that one also perceives the material world.

What do you think that game designers should know about architecture?

Having a sense of certain dimensions of reality and logic in which the game works is going to make reality more apparent in the game, but that doesn't mean that that is what one "should" know more about for a game. So this is where having more experience playing a game would be more beneficial. My son has been playing *Zelda* lately, and there is such a rich description of the world in it, with some clearly fantastical possibilities, but also some things that seem like representations of reality. If the game designer cares about approximating various logics of the real world, then there's lots of things that one should know about architecture.

What imminent innovations in architecture do you think will influence

games or vice versa? What things in games do you see that you feel will influence architecture?

I definitely think that both videogame logics and graphics "live" in the current student body. There's no question that the graphic outputs and the modeling ability in the game world and in architecture are tightly linked. Because the game world is part of our cultural experience, it becomes a reference in design. It becomes a point of cultural negotiation and communication. That's what I see from the particular positions that I occupy in the School of Architecture.

Do you believe there are any detrimental impacts of videogames on architecture?

Detrimental. I would like to complicate this idea that the reality we experience in the realm of videogames and our diet of two-dimensional images is interchangeable with the tangible reality. The kinds of things that you do to produce effects in one are enough to produce effects in the other. In order to produce a particular building with a certain kind of material presence and spatial presence, there are lots of very specific dimensions of disciplinary and professional knowledge that one has to learn. And yet it is fairly simple to produce the image, and even a three-dimensional digital model. But those do not ensure the material effects of the imagined building. Perhaps it has become harder to differentiate between these worlds because one can occupy both. You can spend time in both realms, you can arrive at producing effects in one a lot faster than you arrive at producing effects in the other…

5.4

Unraveling the Challenges of Reimagining Historical Virtual 3D Game Environments

Nansy Khanano

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Balancing Imagination and Authenticity: Reimagining Historical Game Settings

The world of virtual environment design is a realm of boundless creativity and imagination, where developers have the power to construct entire universes, whether grounded in history or otherwise. This chapter embarks on a journey through the challenges and nuances of crafting settings in the realm of 3D virtual environments.

As a 3D environment artist, I've had the pleasure of working on several projects that range from stylized to realistic. Each genre comes with its own set of challenges and creative limitations. In this chapter, I will explain the process of crafting environments for games from start to finish using my Assyrian environment as the primary example. In doing so, I hope to lift the veil and provide insight into this somewhat opaque workflow.

Crafting 3D Game Environments from Start to Finish

While each studio has a slightly different approach to creating 3D environments, the basic workflow generally remains the same. It involves several stages of development from different teams, each contributing to the immersive final product.

These stages are:

1. Conceptualization — Concept Art
2. Pre-production — Planning
3. Grey boxing — Level Design
4. Modeling, Texturing, & Set Dressing
5. Lighting
6. Effects & Polish
7. Optimization

I am going to focus primarily on the first four stages as they are the foundation of 3D environment art creation. That's not to say that lighting, effects, polish, and optimization are unimportant, but only to give context on the limitations of creating a historical environment. I will illustrate the processes through images of my personal environment project, the Assyrian Courtyard.

Conceptualization

The journey begins with conceptualization, where the initial idea for the environment is formed. This involves gathering references and screenshots from other games, films, paintings, photographs, or even comic books. Anything that lends itself to depicting a general mood, theme, or aesthetic.

Once the references have been gathered and the team decides on a general aesthetic, the concept art team will begin to create digital paintings based on the reference material. These concepts for the environment will be loose and gestural at first, then develop into resolved compositions that include points of interest to define the purpose or goal of the environment.

At some studios, the concept art is compiled together into a style guide and shared with the entire team. This creates a sense of cohesion and provides a reference to anyone on the team who needs to check that their work fits with the aesthetic.

During the conceptualization stage of the creation of the Assyrian Courtyard, I scoured the internet for concept artwork from historical books such as *The Seven Great Monarchies of the Ancient Eastern World* by George Rawlinson (1889).

I wrote a narrative outlining the events that may have transpired in this environment. This gave me a strong base to work from. Outlining the character's emotional states is a hugely important part of my artistic process. Empathizing with the characters that inhabit the environment allows me to make certain artistic decisions. For example, if I give the main character a particular habit, like tapping her fingers on the arm of the chair, then that area might be more worn due to the constant friction that occurs from the tapping. Acknowledging the habits of characters is just one element of environment art. Nature is another piece of the puzzle: considering the weather and how certain materials erode over time also gives artists lots of textures and materials to work with. All of these add to the general player immersion.

This leads us into the pre-production stage of development.

Pre-Production: Planning

Once the concept art has been developed for general aesthetics, a more detailed blueprint is outlined for specific environments. Detailed schematic drawings indicating prop placement, texture and material types, as well as lighting and mood are provided to the environment art and lighting teams.

These drawings are especially important since they are a direct representation of what the environment should be translated into as a 3D environment. Of course, there's always room for interpretation; working with the concept team and art director is essential to achieving the desired look.

Though I am not a concept artist, I was able to design specific schematics of what I wanted certain elements to look like. For example, I sketched out several iterations of the mosaic tiling (Khanano 2021). This version, seen in Figure 5.4.1, is the closest to the final product that I achieved.

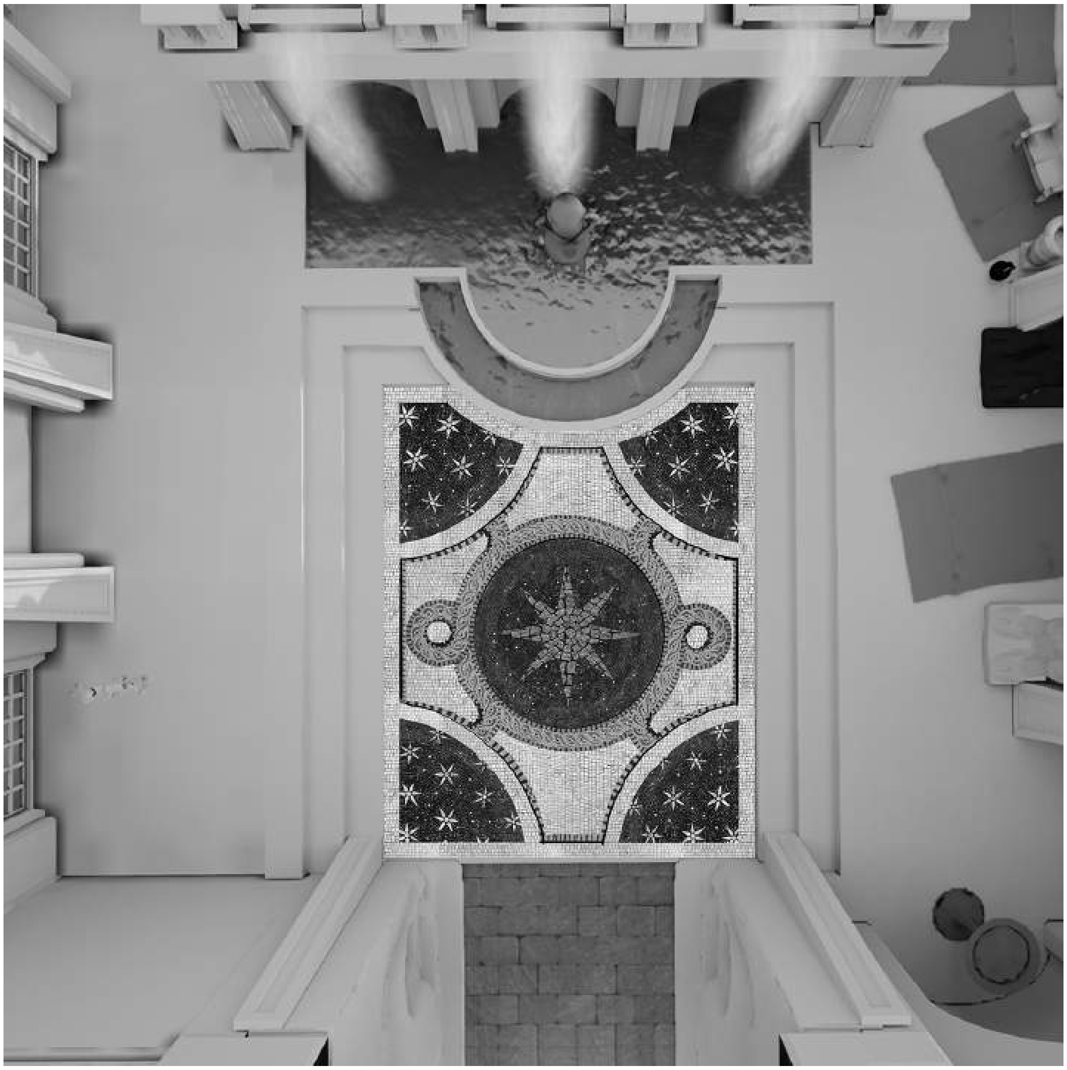

Figure 5.4.1 A sketch up of the texture overlay for planning.

Figure 5.4.2 A render of the fountain and statue.

Greyboxing: Level Design

Greyboxing often occurs concurrently with the pre-production stage. During this crucial step, level designers take the reins. The primary objective is to craft the skeletal framework of the environment, setting the stage for immersive gameplay. By strategically placing geometric shapes and structures, level designers establish the layout's foundational structure, dictating the flow of player movement, points of interest, and level interaction.

This process extends beyond layout and structure. It serves as the guideline for testing and refining fundamental mechanics that will ultimately define the player's experience. This hands-on testing of level mechanics based on the greybox layout is pivotal; it provides an avenue for designers to identify potential bottlenecks, chokepoints, or dead ends in gameplay flow. As in-house play-testers traverse this rudimentary landscape, level designers assess pacing, engagement, and overall coherence.

Furthermore, greyboxing acts as a critical bridge between the conceptual and visual realms. The initial geometry placements determine not only the spatial relationships between buildings, props, and pathways but also the scale of these elements relative to the player character. The importance of this cannot be understated, as it shapes the player's perception of the virtual world's authenticity and realism.

Beyond these practical considerations, greyboxing serves as a canvas for collaboration. Designers, artists, and programmers can visualize the environment's evolving structure, facilitating discussions and brainstorming that drive the project's evolution. This phase allows for a collective understanding of the intended gameplay elements, encouraging iterative feedback loops and a holistic development approach.

Since the Assyrian Courtyard environment was only designed for cinematic purposes, I designed the greybox with compositional elements in mind.

Figure 5.4.3 Render of the final floor mosaic.

Modeling, Texturing, and Set Dressing

Following the conceptualization and design phases, the modeling stage leads to the translation of 2D concepts into 3D assets that will populate the virtual world. In this phase, 3D artists model the visual essence of the environment. From towering skyscrapers to intricate flora, to the smallest trinkets that tell a story, this is where the world forms.

The process begins with artists creating 3D models. Whether it’s the grandeur of an ancient castle or the intricate components of a futuristic spacecraft, every detail is considered. This endeavor encompasses architecture, objects, props, and anything that contributes to the environment’s ambiance. It’s not merely about visual representation; it’s about imbuing each asset with meaning, history, and function. Details such as dents and scratches are often emphasized to give character and breathe life into each asset.

Once the models are completed, the texturing phase ensues. This stage adds the visual layer that transforms a gray, lifeless object into a vivid and believable component of the environment. Artists map textures onto the 3D models, paying attention to every nuance of color, pattern, and material.

As these assets come to life through textures, the environment starts to take shape when they are positioned in a digital realm. This assembly, within the confines of the level designer’s layout, is a pivotal crux. It’s where designers can scrutinize the interplay of elements, refine the layout’s composition, and iterate upon the spatial arrangement. This iterative process allows for the honing of details and spatial relationships that contribute to the environment’s visual and experiential cohesion.

For my Assyrian environment, I crafted textures and materials for the environment (Figure 5.4.4, Figure 5.4.5, Figure 5.4.6, Figure 5.4.7 and Figure 5.4.8).

Figure 5.4.4 A render of the entire 3D Assyrian Environment (Please ensure this is a colour image).

Figure 5.4.5 A render of the trap door and Lamassu statues.

Figure 5.4.6 A render of the statue of Ishtar.

Figure 5.4.7 3D environment with chairs.

Figure 5.4.8 Lamassu statue in scene with ambient lighting.

Reimagining Historical Environments

While crafting any game environment is a voyage into imaginative worlds, reimagining historical settings demands a unique set of considerations: historical authenticity, cultural respect, and social sensitivities. Video games have evolved into a potent tool for historical education and exploration, making it essential to navigate these complexities responsibly.

Semiramis' Courtyard: Assyrian 3D Environment

Working as a 3D environment artist on the project "Semiramis' Courtyard," I encountered a multitude of unique challenges. Firstly, recreating an ancient Assyrian setting demanded extensive research to ensure accuracy in architectural details, textures, and overall aesthetics. Sourcing references and using primary source texts to depict the imaginary courtyard belonging to Semiramis' was an exciting adventure. Balancing between recreating historical artifacts and imagining an engaging virtual environment for modern audiences was another challenge.

Finding the right blend of realism and artistic interpretation while adhering to technical constraints was an ongoing struggle. Moreover, optimizing the 3D assets for performance without compromising visual quality in an intricate environment required constant refinement. Overall, working on "Semiramis' Courtyard" was a journey filled with creative and technical obstacles, but the satisfaction of bringing this ancient marvel to life in a digital realm made it a rewarding endeavor.

Works Cited

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5.5
Be.longing XR

Yara Feghali

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Be.Longing XR is a filmic road diary seen through the eyes of Amal, an immigrant woman from Beirut who just landed in Los Angeles. We join her on a ride through a fictitious reconstructed residential streetscape as she searches for signs of her queer community on the houses' front yards, porches, and windows. *Be.Longing XR* documents over 35 residential houses in over 18 different residential neighborhoods in LA during the pandemic summer of 2019. The film is recorded from the window of a car while the radio is playing Arabic music. Get taken on this journey and start the game of looking for queer subculture symbols all around you.

Figure 5.5.1 Be.Longing XR by Folly Feast Lab shown at Re-Fest 2023 in Los Angeles curated by Culture Hub.

Figure 5.5.2 Screenshot from the game engine Unity of the streetscape designed for Be.Longing XR by Folly Feast Lab, 2023.

Figure 5.5.3 Screenshot from the game engine Unity of the streetscape designed for Be.Longing XR by Folly Feast Lab, 2023.

Figure 5.5.4 Screenshots from Be.Longing XR by Folly Feast Lab, 2023.

Figure 5.5.5 Screenshots from Be.Longing XR by Folly Feast Lab, 2023.

Figure 5.5.6 Screenshots from Be.Longing XR by Folly Feast Lab, 2023.

Figure 5.5.7 Screenshots from Be.Longing XR by Folly Feast Lab, 2023.

Chapter 6
Bridging Worlds

This chapter begins to discuss the bridging of videogames from the realm of the digital into the physical, revealing the ways in which technology can transition between previously distinct realms and impact cultural perception of urban space. Videogame technology is challenging traditional norms, advocating for inclusivity, creativity, and non-binary approaches to design of space. On topics ranging from theme parks as a means to bring interactive spaces to life to architectural designs in dialogue with the digital realms of videogames, a conversation emerges. By examining the synergies between technology and culture, this chapter invites readers to consider new possibilities for the realization and integration of videogames into everyday life in a rapidly evolving digital age.

6.1

Oh Shit I Took Both Pills, and Now Architecture is NO LONGER Frozen Music!!

Leah Wulfman

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Advancing technology performs a magic trick, in hiding its more physical side; woohoo, but what if we take the bunny out of the top hat? Arthur C. Clarke's Third Law famously states that "any sufficiently advanced technology is indistinguishable from magic." But what is it actually to create and experience magic — by and for whom? There's a point when a simulated, rendered electromagnetic world stops feeling like magic because it's both far too absent, intangible, and far too normalized, vanilla. Someone has 31 tabs open in their browser without one being of interest to them, yet a child imagining a world for her toy is a magic worthy of holding an attention forever. Imagination remains more important than knowledge, just as it's clear a supercomputer does not epitomize magic. Imagination is, rather, non-hierarchical and embodied, allowing magic to be provoked in anything.

A general point of inspiration: at age 12, Octavia Estelle Butler watched the televised version of the film *Devil Girl from Mars* (1954) and concluded that she could write a better story. Despite being told she could not be a writer as a black woman, Butler then immediately got to writing some of the most renowned science fiction. Likewise, one of the first games to include a level editor, *Lode Runner* (1983), was designed by Doug Smith. Smith originally wrote his famous 2D puzzle-platformer game while he was a young architecture student at the University of Washington. *Lode Runner* would come to popularize level design customization and modification, eventually leading to one of the most influential video games of all time, the early 3D first-person shooter *Doom* (1993)[1], which had its own in-house level editor *DoomEd* (short for Doom Editor) for custom spatial layouts and textures. It is this childlike propensity toward imaginative making, embodied play, and prototyping that has formed the basis for progressive education since the development of Kindergarten, and offers so much to the development of alternative games, spaces, and futures within our hybrid digital and physical realities of today. From writing sci-fi fantasy at age 12 to making imaginative fairytale castles and shacks from cardboard at age 5, play becomes a critical method for learning and crossing physical and digital spaces and objects and unsticking ourselves from realism and normativity.

Alongside adults, children have agency to be game and space makers in these scenarios. Such play-learning has a close history to architecture and architecture education in the form of the building toy block, which starts with Friedrich Froebel's wooden cubes, which Frank Lloyd Wright credited as foundational to his development as an architect, and bleeds into the "automatic binding bricks" that we know as LEGO. These toys, which filled college application essays of decades past, giving description for an architect's origin story, are becoming less popular now compared to the constructed digital block worlds and servers of *Minecraft*. Especially if they don't have an architect as part of their family or in proximity to it, many architecture students find their way into architecture today through gaming. When I was teaching at the former Frank Lloyd Wright Taliesin School of Architecture, one prospective student mentioned finding his way to the School via the Frank Lloyd Wright *Minecraft* server, while another mentioned learning about the School through the anonymous meme page Dank Lloyd Wright. While children's toys and games for coding have started to bridge physical and digital play-learning — with Montessori-inspired wooden logic puzzles where kids physicalize computer coding basics — the actual experiential and immersive bridges between such digital and physical spaces require further investigation, prototyping and playing with, with the leap from LEGO to *Minecraft* to *Pokémon GO* having yet to be made and experimented with broadly in design education.

To start, it is key to recognize that objects and spaces today regularly pass back and forth from physical and digital realities and do not desire to stay in one reality but intrinsically belong to both. This hybrid space of crossing realities — including collapsing and pushing beyond traditional augmented eality (AR) and virtual reality (VR) — is often referred to as extended reality (XR), mixed reality (MR), or even transreality, to hint at emergent alternate realities inherent at the crossing of realities. The world is increasingly mixed and trans — and truthfully, always has been — and yet normative ways of working, knowing, and being remain unchallenged by most designers starting to work with MR technologies and real-time game engine software. Crossing and "mixing" reality therefore also calls for undoing the default normativity, replicatory realism, and surveillant legibility inherent in the politics and given use of a technology. Play becomes a critical, embodied method to learn and experiment, equipping students to design and cross physical and digital spaces and objects.

Spatial computing and ubiquitous simulation brought about with real-time gaming technologies offer opportunities for radical, playful intervention, counteracting the tendency for so many technologies to become exclusionary tools in the service of the same realities and societies. Embodied play-learning within crossing physical-digital realities gives play-learners and designers the tools to fundamentally question and develop nonbinary, surrealist alternatives to and leaps from such closed worlds and realities. As designers, we tend to less so reimagine and more so reinstate such closed worlds and realities by taking mixed reality — commonly virtual and augmented reality — tools as givens and ourselves as end users. Instead of remixing and misusing technological tools, we use technology as we are told, without understanding how the tool itself, when taken as a given, has already been designed to progress certain agendas and realities potentially antithetical to our own.

It is helpful to frame MR technologies through tool and object affordances, which describe how anything can be used or interacted with, allowing us to flex built-in associations and definitions of what any particular object is and can be used for. In the space of mixed reality, where physical and digital cross, physical objects may be "afforded" digital twins that either match the given qualities of the object or are discordant and even surrealist leaps from their counterparts; some aspects of digital twins may be in synchrony while others are entirely discordant, and entire interactions and perceptions change accordingly. We often see this with avatars, where an individual performs and plays as, say, a pup furry in *VRChat*, a social VR application making great use of full-body motion tracking. Everything in mixed reality operates by never necessitating the replication of photorealism or the one-to-one translation of any sensory experience.

This also extends to the way we set up VR equipment in either inside-out or outside-in configuration for hybrid play and pursuits. Without much customization — while more involved to set up than the typical throw-on-your-head, inside-out VR headsets such as the Meta Quest — outside-in VR setups such as the existing Valve Index and HTC Vive Pro with their associated room-scale and object tracking systems allow for a ton of playful misuses and reassociations. In outside-in VR, at least two "base station" sensors are put on opposite corners of the room to make the space you are in fully playable and trackable. These base stations track a VR headset, two hand controllers, and any additional trackers. The headset itself here is presumably placed on a player's head as a glorified 360-degree–capable camera with accompanying audio, and as those that design and develop games in game engines already know, this requires a corresponding Camera Rig game asset, with Camera and Audio Listener components.

Yet, a camera does not actually need to go on your head, and maybe you want to place a corresponding camera asset onto the object tracker to see the world through the lens of any object your tracker is aligned with or affixed to. Or perhaps you do not want the VR hand controller in your hand but on and tracking your gamer computer chair, and if so, is there a representation of your chair in VR? What form is it, what material, does it squish under you, or what sounds does it make? But maybe the hand controller is in your hand! In which case what is in your hand virtually? Is it a digital representation of that hand controller, or is it a spray paint can? Could it be a light switch, doorknob, door, wall, or façade? Could it be a mug? How big, or what if it was two mugs? What if the mug had a smiley face on it? What sounds would the smiley face mug make by itself or when touching other surfaces? Would the smile be animated? What if the VR hand controller was a sword, or an instrument, a bird, or a chair, or, how about, a puppet? What would that puppet be rigged to and to how many points? Does it function like a traditional marionette? Do we maybe have to use both the hand controllers in both of our hands to maneuver this puppet? Or what if the hand controller was a pipe? With these example design questions and potential answers, entire imaginative worlds and ways of relating open up and leak beyond and out of the digital. These questions lead us to imagine and design queerer associations, uses, interactions, forms, materials, textures, sounds, objects, and spaces in the everyday world around us.

It's important to note that such simulation tools and spatial technologies were largely developed by the military-entertainment complex to capture and virtualize "the real" to fuel capitalist desire.[2] The goal therefore is to fundamentally question, misuse, and push such technologies beyond the realism and binary ideology they are designed to reinstate. A touchpoint juxtaposition against such goals is Mark Zuckerberg's vision of the metaverse as an extensively monitored and highly productive virtual realm. On October 28, 2021, after Facebook rebranded as Meta, the company released an overview of this metaverse vision titled "The Metaverse and How We'll Build It Together — Connect 2021." In response to the largely pre-recorded live Meta introduction, *VICE* Motherboard writer and former editor-in-chief Jason Koebler formulated "Zuckerberg Announces Fantasy World Where Facebook Is Not a Horrible Company." Koebler writes, "Zuckerberg repeatedly said Facebook alone won't build the metaverse. But the metaverse Facebook is building will be and has been built with Facebook developers to run on Facebook servers using Facebook hardware, which are connected to Facebook accounts."

Private corporations are building larger and larger proprietary media ecosystems. However, because Facebook and Instagram capitalize off of ads and unpaid user-generated content, a dark extractive undertone surrounds Zuckerberg statements like, "I believe technology can make our lives better. The future will be built by those willing to stand up and say this is the future we want." An apt rephrasing of the company launch keynote would be something along the lines of, "The Metaverse and How We'll Build It *Alone* Together." Meta's actual vision is highlighted in chapters on "Social Interactions," where Zuckerberg is asked by a friend to join a "Space Room" in the Metaverse. At this moment, Zuckerberg is overlooking a digital vista from his real-life Hawaii home, which has been condemned in a 1-million signature petition as the Zuckerbergs added 600 acres to their controversial Hawaii estate. The added acreage brought the Zuckerbergs to a new total of more than 1,300 acres of land in Hawaii's northern island of Kauai, including land near the public beach of Lepeuli. His colonizing tendencies again carried over into digital space are followed by the painfully obvious and normative choice to — after swiping through some other also boring options — select an avatar that matches his exact physical appearance and outfit in that moment.

Another chapter of the pre-recorded Meta keynote, "What will it take to make the metaverse feel real?" launches a conversation surrounding avatars with a technologist stating "photorealistic avatars will be a huge breakthrough, but they are only part of the picture." Zuckerberg responds, "yeah, because you are not always wanting to look exactly like yourself. That's why people shave their beards, dress up, style their hair, put on makeup or get tattoos." The lack of imagination for people's actual experiences, interests, and ways of being in the world here is deafening. It is also foregrounded by Meta requiring Facebook to enter the metaverse. For a number of years, Oculus headsets famously require Facebook logins, requiring us to carry ideas of normative authenticity into virtual space.

Facebook's "Authentic Self" Policy is actually centered around an "Authentic Name," which is a legal name matching documents that would need to be provided to Facebook for authentication, and because of such a policy, many trans and gender nonconforming people are unable to access their accounts when changing their names.

Ideas of passing in regards to name, appearance, race, sexuality, and gender, and what passes as human (contemporarily highlighted in tools like reCAPTCHA and AIs like GPT-3, and historically situated by The Mechanical Turk[3], or with the dark connotation when applied to Alan Turing's own biography and resulting suicide) has an obviously twisted history within the history of the human race. Even the idea of passing today when applied to transgender bodies is a normative experience of gender where one "passes" as male or female, and we use that as a way to see and engender ourselves in typical Male/Female, A to B or B to A-type form, which only takes into account ways the world interprets our bodies as merely pertaining to binaries and constructed social ideologies. The world around us is rigid and politically and socially constructed through white supremacy, capitalism, heteronormativity, and patriarchy, but digital avatars and identities do not need to regurgitate and replicate such systems of oppression and rigidity. This is mirrored by the perceived anonymity and early utopian desires of the internet crystalized by Peter Steiner's 1993 *New Yorker* cartoon stating, "On the Internet, nobody knows you're a dog." So, while we could be part dog, part subject, part object, part technology, part nature, part male, part female, and part beyond all gender and species binaries and hierarchies that parted us, we remain continuously tracked, verified, authenticated, and asked to adhere to experiences which duplicate, rather than liberate and emancipate, daily life.

Zuckerberg caps the “What will it take to make the metaverse feel real?” chapter with a discussion about the design of spaces, saying “now, to use your avatar in order to teleport to a meeting or sit down for a chat in the metaverse, you’ll also need realistic virtual spaces to be with people in.” At this point, Zuckerberg leads us into a showcase of a photorealistic 3D-mockup of an apartment, where a salad bowl and mixing utensils randomly move from the kitchen island to the kitchen table to show off real-time object tracking capabilities — in this case, using motion capture (MoCap) — where everything from the wooden salad bowl, a plain white mug, and a small playhouse are all rendered photorealistically in the most mind-numbing diffuse light and dullest space imaginable. So, it is no fluke that Meta’s metaverse vision honestly looks like the most boring game we’ve ever played. While it was recently announced that Meta’s Reality Labs division, which houses its efforts to break into the metaverse, has lost around $46.5 billion since 2019, they have made some interesting VR hardware advances allowing for improved tracking capabilities. However, these advances have a long history that is anything but new, and are rather heavily techno-optimist rebrandings of existing software and hardware by an extractive social media company to develop interactions and spaces grounded in white heteronormativity and capitalist conditions of property and inventory.

Today, in the virtual production space, real-time game engines are being productively combined with VR trackers, MoCap and green screens or LED-wall backdrops. While these techniques have historically been used for videogame production, frequently for character creation and animation, they are now being applied to movies and tv series, such as Jon Favreau’s *The Lion King*, *The Jungle Book*, and *The Mandelorian*, as well as *The Dark Crystal: Age of Resistance* from The Jim Henson Company. Virtual production workflows started to be employed as early as the mid-1980s, with examples such as Jim Henson's *The Muppets* and George Lucas's *Star Wars*. Remarkably similar in practice to the physical puppet stand-ins and green-screen work as seen today on the set of Favreau's *The Jungle Book*, Jim Henson started experimenting with creating digital characters and mixed reality puppets in the 1980s. Created by the Muppet Labs and making his first television debut in 1989 on *The Jim Henson Hour*, an early mixed reality puppet, referred to as "the first ever living 3D effect", Waldo C. Graphic emerged from experiments to create a computer generated version of Kermit the Frog. Waldo was controlled in real time by the puppeteer Steve Whitmire, who physically maneuvered the computer generated (CG) puppet with his hand to operate and converse in concert with conventional physical puppets — many of them also hand puppets. Waldo was named after the hand rig used to control him in real time, a glove-like electronic telemetric input device connected to a computer interface, an early hand motion capture system called a "waldo." The term "waldo" comes from a 1942 novella written by science-fiction author Robert A. Heinlein, in which a disabled scientist named Waldo builds a robot to amplify his abilities.

The amplification, imagining, rendering, and collaging of bodies, objects, and spaces through mixed and extended reality techniques highlights their potential when applied toward political, material alternatives, experimental pursuits and alternative worlds. Using a video feed, the digital puppet representation of Waldo was live mixed and rendered onto a scene of physical puppets, so that all of the puppeteers could interact and perform together. In post-production, Waldo C. Graphic was later re-rendered in full resolution, with the addition of a few dynamic elements. While graphics generally exist at a much higher resolution today, this entire process directly mirrors the mixed reality, collage-like game workflows employed everywhere from individuals and creative studios working with spatial and object tracking or motion capture at a total equipment budget that can be less than $2,000 (such as, South Korean-American Twitch Streamer and YouTuber Youna Kang, known by her online 3D Virtual persona CodeMiko or Team Rolfes, a digital performance and image studio specializing in figurative animation, VR and mixed-reality collage, run by Sam and Andy Rolfes) all the way to the high-production cost sets and effects of Jon Favreau's *The Jungle Book*.

These tools and techniques, which were first experimented with as early as the 1960s, are accessible today to the point that an individual can use store-bought hardware and open-source software and nearly match the production quality of major videogame and Hollywood studios. Without the sanitized erasing and retelling of media and technological history delivered by tech corporations continuously hyping proprietary products and futures, we can recognize the political, material, spatial, surrealist, experimental, and playful grounds that all this work stands on. It is this tradition of adventurous work that we value and carry as we continue to work beyond givens. To remain unquestioning and to continue using such technologies and tools as you are told, you are underlining status quos and doing the actual work of tech companies in promoting the ready-made futures they have designed, rather than promoting different and alternative futures.

One of the earliest pioneers of digital puppetry and mixed reality animation was Lee Harrison III, who developed analog methods for real-time computer animations in the early 1960s. In 1962, Harrison built ANIMAC, a hybrid graphic animation computer, which utilized analog circuits and a cathode ray tube to animate figures and graphics. Harrison rigged up a bodysuit with potentiometers and created the first working motion capture rig, using the human body and its movements to animate 2D and 3D figures in real time on his CRT screen. The CRT screen was then live filmed with a video camera, actively picking up the bloom of lights and laser effects now stylistically copied in many contemporary game visualizations and pointedly by the *Stranger Things* opening title sequence. Lee Harrison III made several short films with this system, which served as the precursor to the later analog computer animation system Scanimate. Designed and built by Harrison and the Computer Image Corporation in Denver, from 1969 to the mid-1980s, Scanimates created animations in real time and were utilized to produce many of the video-based animations seen on television in commercials, show titles, and other graphics — think of all those early HBO and other TV series title sequences and NFL Super Bowl opening sequences, combining the animation of both text and graphics. Altogether, eight Scanimate systems were built, and with its turning of analog knobs into different animation effects for video, the Scanimate system superseded the film-based animation techniques for television, movie, and music video graphics. From ANIMAC to Waldo C. Graphic and forward, digital puppetry — the manipulation and performance of digitally animated 2D or 3D figures and objects in a virtual environment, the rigging and animating of virtual bodies and objects — begins with physical puppetry and is based in principals carried over for how one rigs and how one (or more) performs a traditional marionette.

This material history of digital animation and interactivity ties back to historical relationships with physical puppets, materials, spaces, storytelling, and animation, all of which exist in but draw from and operate far beyond Western logics, stories, and production. In its form of invention, this developmental history is tied to the reinvention of everyday objects, spaces, and technologies to envision and build worlds (e.g. the body suit portion of the ANIMAC system was made from potentiometers and *TinkerToys*). This ethos and bricolage method of working from, combining and reinterpreting existing materials, tools, and technologies is key for mixing mixed reality and is also an applicable description for prolific computer scientist and widely regarded pioneer of computer graphics Ivan Sutherland, who always had access to top equipment and yet made a practice of imagining new creative and technical affordances and opportunities with these technologies. Known largely in design and architecture for his 1963 PhD thesis resulting in the *Sketchpad* computer program — which led to modern computer-aided design (CAD) programs[4] — Ivan Sutherland two years later in 1965 attempted to more greatly merge the digital with the physical and began working toward what he termed "the ultimate display." The first virtual reality head-mounted display system, the *Sword of Damocles*, was created in 1968 by Sutherland, with the help of his then-students Bob Sproull, Quintin Foster, and Danny Cohen. Sutherland's system displayed output from a computer program in the stereoscopic display, with the graphics of the virtual space capable of showing wireframe rooms and objects and the first display application consisting of a wireframe cube suspended in the air near the user.

Exactly as we see with VR headsets today, the perspective that the software rendered out would depend on the position and angle of the user's gaze, so as to offer the user the agency to move and look around and fully explore the space, making headtracking a necessary part of the display system. The system itself consisted of six subsystems: a clipping divider, matrix multiplier, vector generator, headset, head-position sensor — similar in concept to the outside-in tracking of today's headsets — and a general-purpose computer, the Digital Equipment Corporation (DEC) PDP-1 (Programmed Data Processor-1). The PDP-1 happens to be the same computer on which computer scientist Steve Russell created the first digital videogame and first widely distributed videogame *Spacewar!* (1962)[5], for which the first joysticks were also made. Beyond being the first interactive VR headset, the system is also a precursor to augmented reality and mixed reality with its partially see-through stereoscopic displays, so users were not completely cut off from their surroundings, mirroring the passthrough mixed reality capabilities hyped on many new VR headsets. Mixed reality hardware continues to improve, but many of the features promoted in VR headsets and MR spatial technologies today rehash these early developments in computer graphics and interfaces.

Mixed reality returns us to the space of *Total Theatre*, where space becomes an expanded stage set, where actors, objects, and agents again transform as mime, puppet, and prop — none of which need to be represented, rigged, and rendered one-to-one. My practice is an evolving pursuit of physical-digital play meant to challenge normative uses of technology, as well as normative ideologies that are reinforced by technology and architecture. I'm trained as an architect, but I make videogames that are overtly physical, material, and spatial. My work involves sets, props, playful collaboration, and the purposeful misuse of "state-of-art" spatial technologies to push out of the screen and out of the headset and into physical space. These sets and props are spatial prototypes for technological realities beyond isolation and disembodiment, beyond something which is flat, without feeling, without fun and without funk. My ongoing research is centered around play and performativity, and pairs game engine interactions and digital twins with their most physical, material, and ludic counterparts — dirt, weeds, trash, plastics, and foam. These mixed reality ecologies and interactions find their foundations in disability, trans, and queer embodied practice and politics, and operate as lenses to reconfigure and recontextualize space and time orientations in architectural discourse beyond the normative.

My research and pedagogical practice is predominantly directed toward experiments in MR, through which I address and bridge the current, vast gaps existing between design methodologies used in physical and digital space. The world is increasingly mixed and trans, and while an architect's process and procedures are equally mixed, common architectural products remain blank models on a podium and CG renders on a wall. Still, the outcomes of such processes seldom reflect this hybrid physical, digital state of spaces, bodies and objects. I address this multifaceted discrepancy outright, through what I refer to as "Puppet Pedagogies," an agile framework that instrumentalizes digital puppetry and digital twinning to recontextualize the design of digital spaces and objects in ways that are overtly embodied and geared toward immersive physicality. With my work and teaching, I pursue and push mixed embodiment, mixed presence, and mixed reality by collapsing and conflating definitions, techniques, and histories from puppetry and theater (especially object theater, as well as contemporary immersive theater and virtual production) — rigging, animation, stagecraft, sets, acts, scenes — with videogame scenes, levels, and spaces.

Figure 6.1.1 GAYMING ARCHITECTURES, Lauren Leuenberger's PYRGOS mixed reality game. The game expands on simple stacking and tower building games, as the furniture and lighting within the buildings and rooms move around within their interior volume and are interactive as you move the buildings around in your hands. Additionally, when two or more building blocks come into contact with each other, lights turn on within the blocks, and other events can be triggered in the environment.

In the MR architecture and design courses that I have been teaching since 2019, we actively experiment with scale, representation, roles, materiality, interactivity, play, and performativity. Through active playtesting during interactive desk crits, group critiques, midterms, and final review conversations, we provoke, mix up, and play through bodies, spaces, and objects. In these design-build prototyping studios, we utilize spatial computing technologies to interweave the digital and the physical and imagine new ways of creating architecture with mixed reality. Students learn to make and design video games and game-ready assets, as well as design and fabricate both digital and physical objects and spaces. Students design and prototype these material, spatial scenarios at various scales in direct conversation with the spatial and aesthetic possibilities of real-time game engines. No prior knowledge of game design or AR/VR is ever necessary, and instead, the only requirement for the studio was openness, curiosity, and willingness to play around and mess things up.

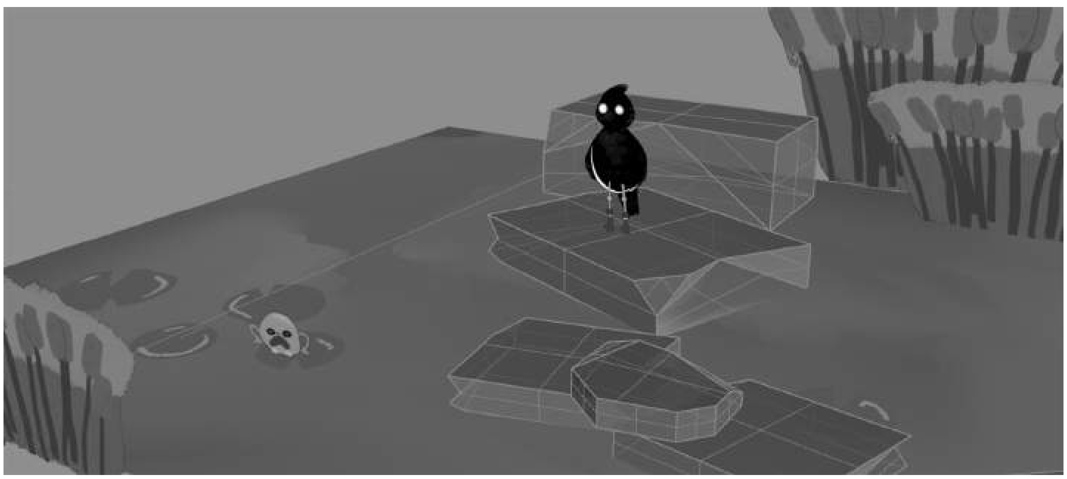

Figure 6.1.2 GAYMING ARCHITECTURES, Early concept sketches and Rhino models from student Claire Jiang for her Desktop Game.

The student work illustrated here comes out of a MR design-build prototyping studio “GAYMING ARCHITECTURES,” which I taught for two years at the University of Michigan Ann Arbor Taubman School of Architecture and Urban Planning. “Gaming the system” refers to certain methods used to manipulate the rules for a certain system to one’s advantage. Gayming is a way of playing and experiencing games that’s fundamentally gay, nonnormative, anti-ableist, messy, and out-of-step, non-binary, embodied, pessimistic yet joyful. When we “gayme architectures,” we disrupt architecture’s own tendencies toward normatively abstracted, virtual proposals — the hypothetical building, the speculative future — and instead develop generative alternative spaces, objects, and applications for our hybrid present. Utilizing spatial computing and real-time gaming technologies, this design-build prototyping studio “GAYMING ARCHITECTURES” focused on spaces existing and fantastical, to promote increasingly hybridized working methods between physical and digital spaces, Bodies, and objects. Through hands-on experimentation, live user testing, and iterative refinement, we use MR as a new design medium.

In these mixed reality studios, we investigate architecture and design models, space, representation, and experience at multiple scales. The main focus is on the scale of architectural models, and then full room-scale — as it’s referred to in virtual reality, where room-scale tracking is utilized — and full 1:1 architecture scale, which is also full body scale, when we speak to embodied experience. Using these reference scales as our base, many other scales in between and beyond are considered and provoked through the student projects, from toy scales, object scales, building scales and planetary scales. From LEGO, TinkerToys, Lincoln Logs, Jenga blocks, and scale model sprue kits, to Twister playmats and playground designs, we instrumentalize and play through toys, games, and other play objects and spaces from throughout history to build our understanding and think through the work. Digital, physical, and handheld play objects and spaces become measures for creating and experiencing with mixed reality.

In the “GAYMING ARCHITECTURES” Studio we spend the first month reading graphic novels and manga and playing video games. None of aesthetics are photoreal, and therefore, we end up playing a good amount of indie video games and discuss how cartoons, animations, non-photorealistic aesthetics, and drawing techniques can build out our imaginative capacities and build into imaginative play. The choice to go beyond photoreal aesthetics, styles, clichés, and politics in using game engines by designers and architects is driven by a trend toward hyperrealism and photoreal rendering. This trend occurs when utilizing platforms like Unreal Engine, which offer features like real-time ray tracing and photoreal game assets. However, this approach tends to reproduce familiar visual tropes and dystopian effects without exploring alternatives or considering accessibility and historical contexts.

With the first project, students use the graphic novels, manga, and video games we read and played through as both aesthetic and architectural precedents. This practice of extending such play-oriented aesthetics, objects, and textures into architecture and architectural models runs antithetical to the most often white and wood, frequently blank, aesthetically sterilized architectural scale model we see throughout practice and academia. Such traditions of sanitized models less often trigger imagination than hinder it. This is matched by the ways in which students entering into architecture are often still treated as blanks to be molded and taught about "Architecture" rather than people with diverse backgrounds, diverse material, aesthetic, and cultural understandings, and diverse ways of knowing and being in the world that often have different orientations and directions and reach beyond the material, embodied experiences and conceptual, intellectual capacities of professors. I am interested in caring for and bringing students' experiences, interests, expertise, and obsessions in, rather than bleaching and negating them. In spring 2023, when we took a Studio trip to Universal Studios and visited Hogwarts and the newly opened Super Nintendo World, the students looked around and suddenly exclaimed "we are inside our architectural models." They understood then that the aesthetic and game-oriented detailing and texturing of the architecture surrounding us fit into a repertoire of queer and whimsical ways of imagining architecture — taking from vibes, styles, video games, digital spaces and simulations, cosplay, imperfection, and material failure, among so much more — but which they had previously not conceived of in their architecture education.

This first project is called *DeskTop Games*, for it is a game to be played on the top of student's studio desks. Their architectural models form the gameplay, and it's played from their computer's desktop. With the project, we launch into a series of exercises designed to walk students through key concepts and techniques for game engine and mixed reality work. With an understanding of imagining, drawing, and physicalizing spaces, these exercises work from an architect's and an architecture student's expertise. I showcase many different methods and softwares for texturing 3D models and game assets, but the texturing workshop primarily focuses on utilizing Rhinoceros 3D software and commands like Picture, Split, Extrude, and so on. Through rigorous hands-on experimentation and prototypes, their desk space is used as a miniaturized first site and videogame space to exercise creative ideas, mixed reality architectural proposals, and newly learned skill sets.

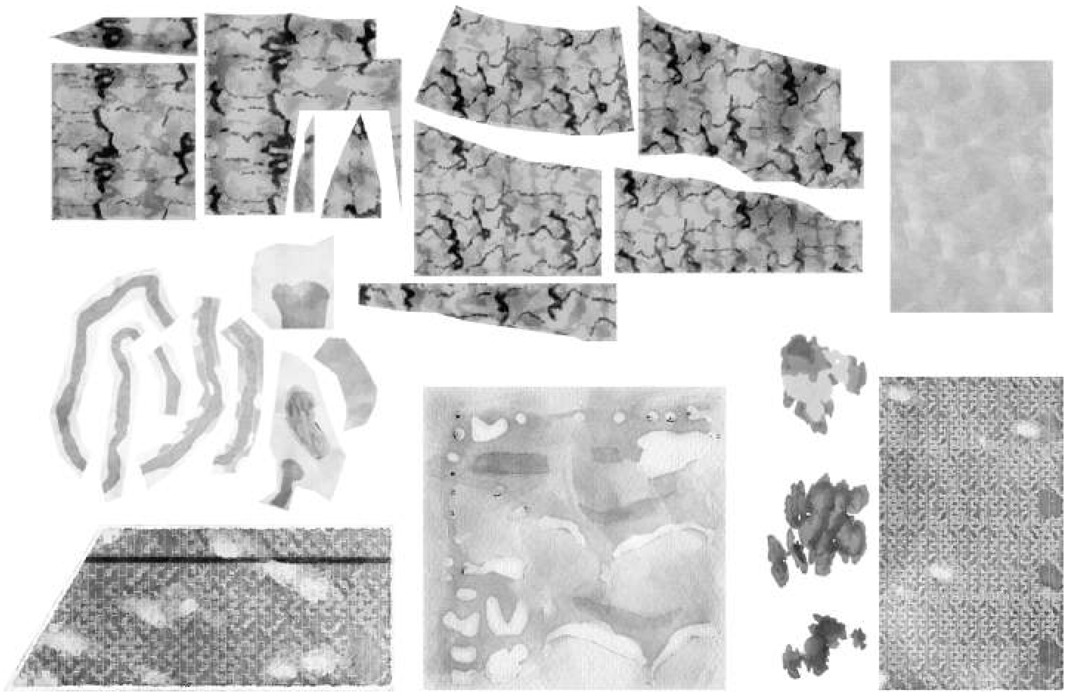

Figure 6.1.3 GAYMING ARCHITECTURES, Unrolled watercolor sketches for texturing in Rhino from student Tam Nguyen for his Desktop Game.

All *DeskTop Games* are designed and played through a single perspective camera view, where the physical webcam view is matched exactly by a digital camera output. To allow for this, in the course, every student receives a 1080p webcam for which they specify camera placement and viewing angle in relation to the mixed reality architectural models. They then measure and match this web camera’s physical location, angle, focal length, field of view, and sensor size with a camera GameObject in Unity Game Engine. In her *DeskTop Game*, Claire Jiang’s architectural models and game were informed by isometric views typically used for architectural drawing, as well as an established point of view in some video games. She made all of her physical model and game assets out of cardboard, and brought this sensibility into the digital game interactions, where you played as Crow and knocked over spring-jointed cardboard-like trees and grasses to locate a feather and move onto the next platform and new biome.

Advancing beyond the typical camera requirements, a student, Natalie Brown, once used two webcams, estimating an elevation view with one and an isometric view with the other, and implemented camera switching, which was triggered as her main character moved from one space into another. This allowed the game player to see and move between different views once hidden or obstructed and employ different ways of playing through her model. This type of physical-digital camera matching is the most basic principle and technique used in contemporary virtual production.

Figure 6.1.4 GAYMING ARCHITECTURES, Game views from student's Tam Nguyen Desktop Game titled Churro, in which you play as a Corgi dog. Even though the camera views match and blend seamlessly, it is evident from the lighting differences in the physical and digital spaces which parts are physically and digitally built.

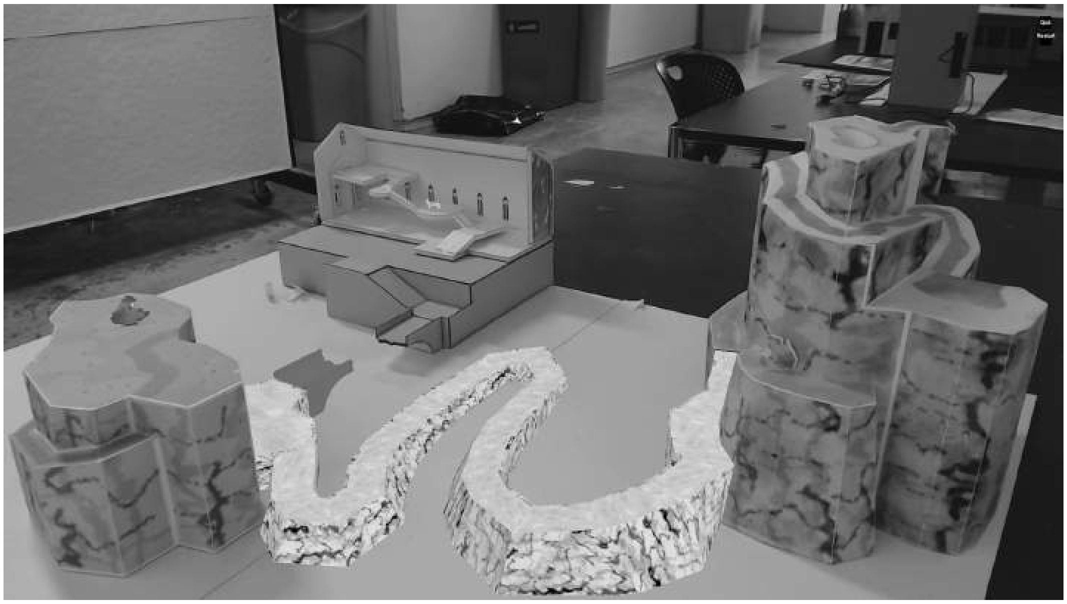

Figure 6.1.5 GAYMING ARCHITECTURES, Game views from student's Tam Nguyen Desktop Game titled Churro, in which you play as a Corgi dog. Even though the camera views match and blend seamlessly, it is evident from the lighting differences in the physical and digital spaces which parts are physically and digitally built.

In the process of conceiving, making, and collapsing the mixed reality models and gameplay, students discovered a host of various affordances working in between physical and digital models, interactions, materials, and aesthetics. For his *DeskTop Game*, Tam Nguyen wanted to learn how to rig and interactively animate a corgi dog running and jumping through the landscape of his game. To highlight the capabilities of his proud, animated corgi named Churro, Tam conceived of architectural elements for which Churro was to navigate through and over. One such element was a broken bridge that you needed to run and jump over, with another being an old temple that was built half physically and half digitally. When the corgi moved through the temple entrance, the front digital façade would turn off, revealing the interior section, platforms, and stairwells, and upon exiting the space, the façade would turn back on. Tam and others' work speaks to the sense of incompleteness and imaginative fill-in-the-blank-type methods that are afforded and can be creatively progressed and worked upon through mixed reality design.

Figure 6.1.6 GAYMING ARCHITECTURES, Yalan Zhang's documentation of her Desktop Game process titled Cabinet Adventure.

For their *DeskTop Games*, students Yalan Zhang and Yikai Su worked with effects and aesthetic overlays that changed the way we formulate, build, and visualize mixed reality architecture models. Yalan conceived her model as a bookshelf and building section that your character plays through. Your character shrinks upon climbing up the ladder and entering into the space of the bookshelf, navigating through the shelf's buildings, stairs, elevator shafts, and other nooks and crannies. As you make your way to the bottom shelf, your character comes upon a mountain that operates as a crank, causing the water to rise as it rotates. As the water rises, your character can move freely upwards and between the inside and outside of the shelf. Similar to the merging of the interior and exterior of the shelf, when the water rises, the physical and digital surfaces also become less distinguishable and completely merged by the additional overlay of the water. In Yikai's *DeskTop Game*, he uses pixelization and post processing to merge his physical model with the digital assets and interactions. Yikai built out his model to be physically pixelated, with a colorful, pixelated backdrop tying the scene together. Between the pixelization already existing in the physical model and the pixelated post processing within Unity game engine, the resulting effect caused everyone to be awestruck when they began casting hand shadows into the real-time pixelated space of the model and game.

In their final project of the semester, students extended their *DeskTop Games* into room-scale VR and MR. The Final Project *Gayming Architectures* is a site-specific VR/MR installation and game for at least one player, for which physical objects, armatures, and building features are prototyped and built to directly support the digital game scenarios. Through this room-scale interactive game and installation, students are asked to creatively address mixed reality POV, embodiment, roleplaying, materiality, aesthetics, space, and scale.

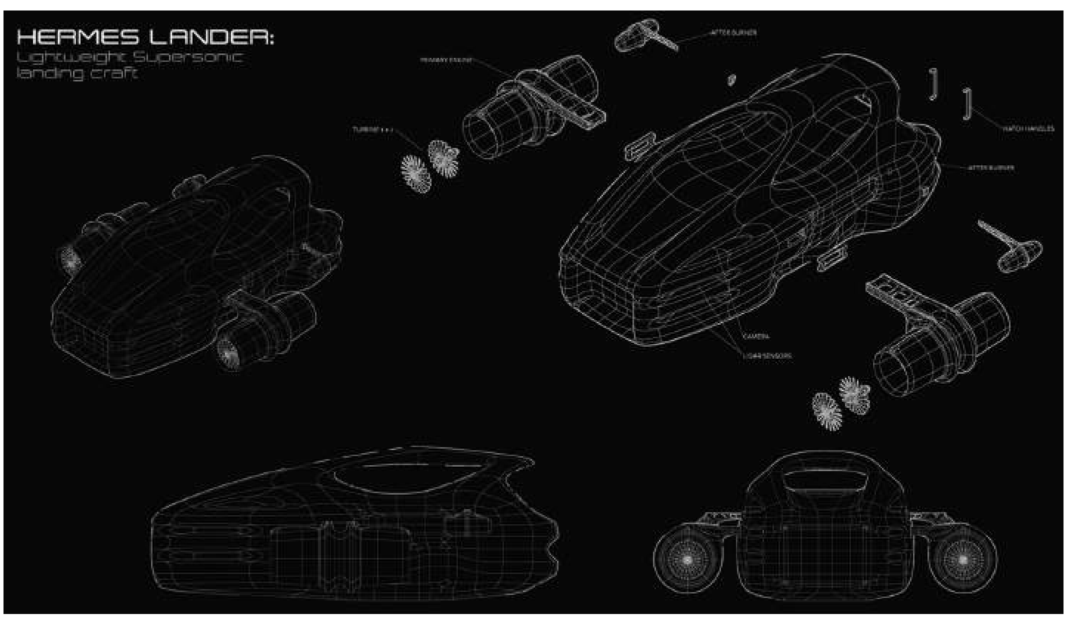

Figure 6.1.7 GAYMING ARCHITECTURES, Presentation of process from Jake Brown's Little Lost Planet mixed reality game.

Little Lost Planet is an MR game made by Jake Brown. An impressive exercise in worldbuilding and hybrid making, the game contextualizes the physical room as a part of a small planet that you have crash landed onto, and on which you have to search and locate the parts of your ship and rebuild it. Using the small planet as the game setting allowed Jake to leverage the available physical room space, while also creatively extending it visually. Small planet also means small days, so the rotation of the sky and sunlight also mimicked the pace of planetary rotation. For the game, Jake designed interactive planet fauna and flora, landscapes and landscape features, as well as the spaceship itself. The parts of the ship were built physically as well as digitally, and Jake exploited the difference of how each of these were designed and articulated. His approach can be likened to a children's imagination, where stories and their details are easily imagined from simple found objects and materials, from cardboard castles to spaceships made from wheelbarrows. Jake conceived the physical parts as pieces that would be accessible and easily found, like ship engines made of plastic buckets from Menards home improvement store. Jake brought his young cousins in to play his game, and they were obsessed, wanting to sit within the spaceship Jake had designed for as long as they could. As a guitarist, Jake also scored the game with his own riffs, creating the instrumental soundscape of the fully immersive, mixed reality VR game.

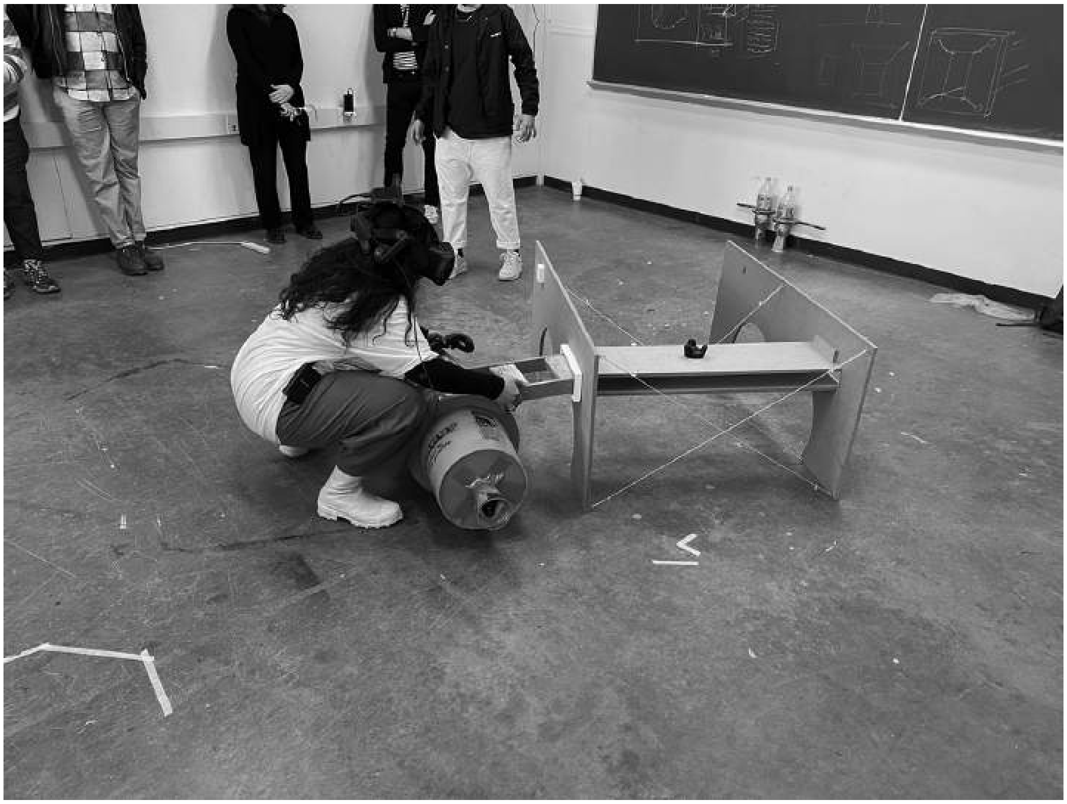

Figure 6.1.8 GAYMING ARCHITECTURES, Architectural designer Deborah Garcia playing Jake Brown's Little Lost Planet mixed reality game.

"Who ever heard of a beaver that can't swim?" Spencer Reay and Claire Jiang began the final review and play-through of their *Crossings* game. The game centers around the story of a beaver, Ezekiel Jr, who can't swim. It is a collaborative two-player game, played at two different scales, where Ezekiel Jr and a big human collaborator work to get him across the river to his swim teacher on the other side. To do this, building pieces get placed on a playmat, which is similar in size to a Twister playmat, and the beaver Ezekiel Jr — who is the VR player, with beaver paws for hands — can move within those buildings to make his way across the water.

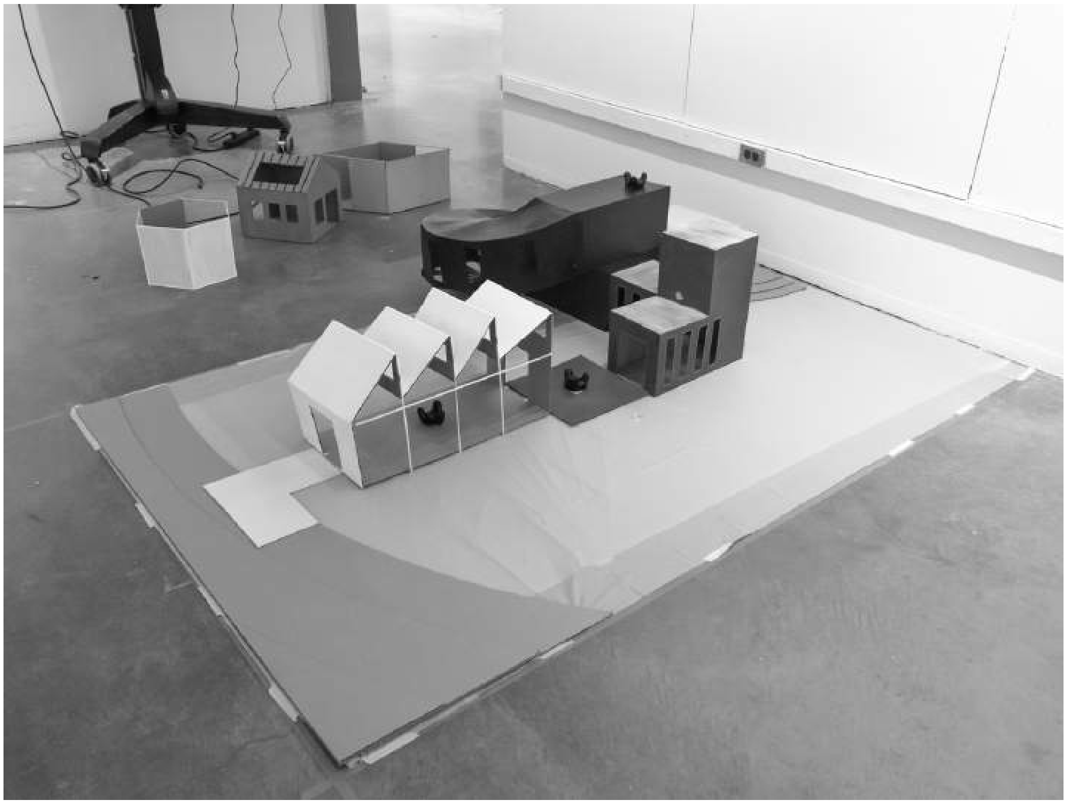

Figure 6.1.9 GAYMING ARCHITECTURES, Kit of parts building blocks and playmat for Spencer Reay and Claire Jiang's Crossings mixed reality game.

As Claire and Spencer put it, the game is intended to invigorate the joy of building, and the game itself evokes a number of building and physical games, from Jenga to Twister. They produced a building kit of parts, which was tracked in VR using HTC VIVE object trackers, allowing one or more players to place these buildings onto the physical playmat and have them placed across the river in the game. During one live playtesting with Xavi Aguirre and Ray Majewski, Xavi played as the beaver player in the VR headset, with Ray utilizing and placing the building pieces to help get beaver Ezekiel Jr across the water. After some trial and error, the two collaborated in getting Ezekiel Jr into a building, then dumped the beaver across the river by lifting and angling the building piece. Playing the game requires communication and collaboration and always provokes tons of joy and laughter amongst all players and onlookers.

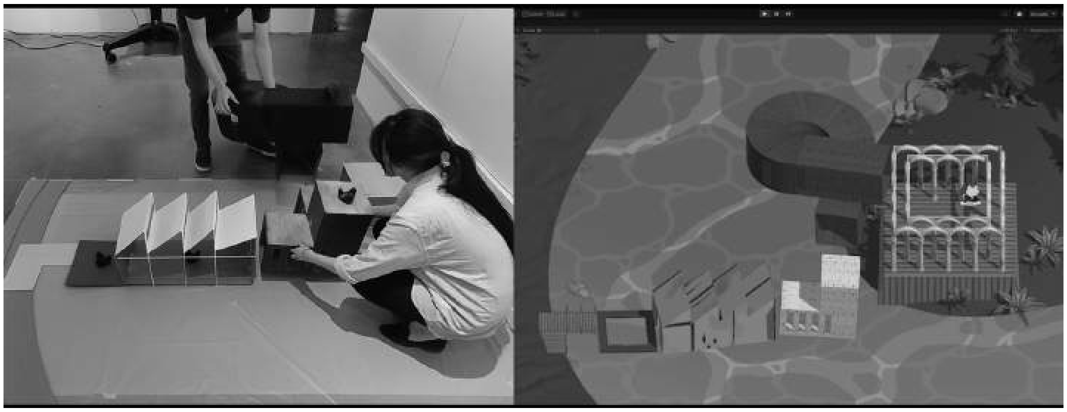

Figure 6.1.10 GAYMING ARCHITECTURES, Spencer Reay and Claire Jiang showing the real-time isometric views created in game from the physical gameplay of their Crossings mixed reality game.

Mixed reality describes a spectrum — often drawn as a one-dimensional spectrum, between physical and digital — that opens up new territory for design and experience. First introduced by Paul Milgram and Fumio Kishino in 1994, the Mixed Reality Spectrum (or Reality-Virtuality continuum diagram) also reveals how our current tools are actually limited and conventional if we use them as we are told to, as end users. A mixed reality approach starts by dispelling the notion that the physical and digital are a binary opposition; we acknowledge that they exist on a spectrum. If we are to create projects that do not purely exist on either end, but fall within the spectrum of mixed reality, then a space that we design never exists as solely physical or solely virtual: a physical space is coupled with digital objects, a digital space also has physical objects. As shown in the student work in the “GAYMING ARCHITECTURES” Studio, the design of mixed reality games, spaces, and objects propose alternative methods for playing and building.

Computers and VR headsets offer the ability to download and play digital games, which has been true for the past 40–50 years of “interactive media” and videogames; and while the *Drop Dead: The Cabin Home Invasion* VR game for the Meta Quest 3 allows for zombies to come through the windows of your home and “Hyper Reality” games from The Void at Disney theme parks created immersive VR rooms as “stages” with interactive props and haptic feedback starting in 2017, there still is little imagination and invention toward actual mixed reality approaches for gameplay. “GAYMING ARCHITECTURES” students prototype the design of such hybrid objects, spaces, and armatures for gameplay, suggesting another model for game purchase, build-out and download. Equipped with VR headsets and object trackers, players would alternatively purchase and play a digital videogame alongside the physical portion of the game build. The digital and physical game portions could be separated (e.g., download the game from a digital distribution service, such as Steam, and purchase the physical game components in store, or download a unity.exe videogame file along with instructions and cut files for how to build the physical game components from cardboard or plywood readily available at your local hardware store) or come packaged together (akin to purchasing a videogame, toy or board game from the store, yet, here, the digital and physical components are all in the same box). Offering a range of physical toys, table-top games, room-scale games, and more, the model for mixed reality games and architecture applications could be better described through the Milton Bradley Company, Parker Brothers, and Hasbro — all now sold under Hasbro, Inc.[6], Hasbro Toys and Games — but set for the Mixed Reality “Meta” Era.

Figure 6.1.11 GAYMING ARCHITECTURES, Artist, designer Merel Noorlander and architectural designer Adrienne Economos Miller live playtesting of Natalie Brown and Sierra Shibuta's mixed reality game. The game is a collaborative visual-audio playlist down memory lane, where a VR tracked, handheld chipboard car traverses a 3d physical landscape board, controlling and navigating the player in the full-scale VR car.

With my work and teaching, we push our creativity and agency as spatial designers and storytellers, and push technologies beyond their presumed uses. So, how might we experiment with these new digital affordances, tactility, spatial interactions, and materiality to enhance or disrupt the design process that you wouldn't have considered before? In the "GAYMING ARCHITECTURES" Studio, students prototyped hybrid games, objects, spaces, futures and realities, which cut across age, species, scales, space, and time and developed new degrees of playfulness and openness for architecture representation and experience. In the context of the Studio, a designer's imagination actively engages and is actively deployed in space, starting with the scale of the architectural model and leading to the full scale of a room and building. Being undivorced from physical space and the imagination that surrounds it allows narrative inspiration for these gaming experiences to come from a variety of places: from children's books to science fiction inventions.

In student Zariah Hernandez's final project *Dooing the Doodle*, using their giant crayon and dipping it into different paint bucket colors, the VR player actively doodles with different colors onto and across a physical and digital world of buildings and props. Reminiscent of the children's story *Harold and the Purple Crayon*, where the protagonist Harold creates a world simply by drawing it with his magic purple crayon, Zariah's game and all the other mixed reality games of the Studio — many of which have gone unmentioned here, but are no less creative and meaningful than those that were highlighted — speak to the imaginative realms and realities that can be drawn up and mutually realized and experienced. In these spaces of teaching, learning, spatial design, and gaming, people and students, children and citizens of all ages have a seat at the table and are empowered to not only imagine but realize and build both games and spaces in the here and now.

Notes

1. *Doom* (1993) sold millions of copies worldwide, while also allowing for user-generated content. Using its in-house distributed level editor *DoomEd*, players could become level designers, creating their own game level maps. WIth the advent of the internet, users were then also able to much more easily share their custom levels with both friends and strangers online. Its popularity had and continues to have a lasting impact, and the origins of many game designers and developers working today can be traced back to their designing of levels for *Doom* with *DoomEd*. It is additionally important to note that in 1995, the

game *Marine Doom* was released for a specifically military audience. In the game, the alien-themed graphics of the *Doom* game were swapped out for military-themed graphics.

2. The military-entertainment complex (MEC) highlights the formative and enduring connections between the military and the entertainment industry. This is beyond the blurring of lines between real and virtual warfare seen in films and video games, which began as early as World War 2, but also a long history of technological invention and intervention — from the Internet, to LiDAR, to photogrammetry, to spatial computing and tracking, to robotics, as well as game engine simulations and artificial intelligence — sponsored by the US Department of Defense.
3. The most famous example of a human pretending to be an automaton. The Mechanical Turk was a fraudulent chess-playing automaton, which was constructed and unveiled in 1770 by Wolfgang von Kempelen to impress Empress Maria Theresa of Austria. The mechanism played chess against human opponents, and was later revealed as an elaborate illusion, where a hidden human operator was housed within a compartment below the chess table. This hidden chess master could observe the position on the chessboard above, and manipulate the movements of the Turk. With a chess master operator inside, over the course of 70 plus years, the Turk won most of the games played during its tour throughout Europe and the Americas.
4. The *Sketchpad* computer program allowed users to interact directly with drawings on the screen and was a major breakthrough in computer graphics as it was the earliest program ever to utilize a complete graphical user interface.

5. Steve Russell was a 23-year-old graduate student in the MIT Artificial Intelligence Laboratory, funded by Defense Advanced Research Projects Agency within the US Department of Defense when he first wrote *Spacewar!* in 1961. *Spacewar!* served as a foundation for the entire videogame industry.
6. Hasbro even began a short-lived videogame development and publishing venture called Hasbro Interactive in 1995. The games were purely digital and did not integrate any of their preexisting physical toys and games. Hasbro Interactive disbanded in 2001.

6.2

Interview with Peter Marshall and Court Sin

On Their Roles as Creative Director and Studio Director of Architecture at FORREC

Court Sin and Peter Marshall

DOI: 10.4324/9781003408970-34

Do you notice any similarities between videogame design and the designs you do?

CS

Major intellectual properties (IPs) are turned into destinations in multiple locations, becoming zones within theme parks. An archetype of this would be Universal Studios' Super Nintendo World. The incorporation of innovative technologies, such as augmented reality (AR) with props and interactives, immerse visitors completely within an experience, restricting views outward and purposely placing them physically inside something that was once only on a screen.

PM

Exactly. When you enter, it's like stepping into a terraced-leveled Super Nintendo World, complete with moving mushrooms and interactive attractions. They aim to make the experience more interactive, giving guests agency in the outcome of the ride. The Mario Kart ride pushes this envelope further, with mixed reality headsets allowing guests to steer, shoot things, and collect points during the ride.

When designing an experience, do you consider navigating through the space in a gamified way?

CS

Absolutely! Leading our architecture studio, the interpretation of our designs lean heavily towards recreation and experiential immersion. From the moment guests step through the threshold, we aim to captivate them in the experience. How do we incorporate an existing intellectual property? Our team conducts thorough research and we consult subject matter experts and tap into individual interests. We deep dive into understanding what a guest or a fan would expect from their experience to customize senses of scale, narrative and perspective. We calculate how long someone may spend observing in a queue and engage with a meticulously designed space full of detail. Are there little Easter eggs that we include to make fans smile and discover something new? Absolutely. While catering to fans, we also consider the enjoyment of the general audience actively engaged within the experience.

PM

In the past, amusement parks were about going on a ride that was unique to that location, providing an exciting experience. Now, theme parks create entire worlds for visitors to step into, like Star Wars or Harry Potter. For instance, let’s talk about John Wick: Open Contract at MOTIONGATE™ Dubai. When you step into the Continental Hotel in Manhattan, it’s like entering a chapter of a book. The ride becomes the climax of that moment, offering different experiences for guests. We’re challenging ourselves to give guests agency, similar to open-world videogames where players make decisions and have options for discovery.

CS

We invent and create physical environments to foster this sense of exploration and adventure. For example, in our project ventures in Vietnam, treasure hunts have been incorporated into the park experience to tie directly into the storyline we’ve written. Guests have tasks to accomplish or rides to go on, and they receive rewards or acknowledgments for their achievements, much like in videogames. This shift in experiencing space is not limited to theme parks; we’re integrating it into resort and mixed-use entertainment projects, combining technology and immersive experiences to enhance the guest experience.

PM

Another quick example of leveraging the smartphone in everyone’s pocket is through AR. It can provide maps and enhance the visitor’s interaction with the environment. For instance, in Star Wars: Galaxy’s Edge, visitors can scan codes with their phones and initiate a Batuu Bounty Hunter scavenger hunt experience with a MagicBand+ throughout the zone. This interaction with the environment through a smartphone creates a unique way of engaging with the space.

The protagonist in a videogame typically has superpowers or abilities that are not feasible in real-world settings and there’s a disparity in speed and detail between videogame worlds and physical spaces. How do you mitigate this difference?

CS

Let’s take the level of detail in the major theme parks across the globe, which have extensively detailed props, droids and authentic sounding character performers engaging guests with additional interactive wand/wristband upgrades. Post-play is also significant, with guests spending time customizing lightsabers or ordering at Oga’s Cantina. This level of engagement authenticates the IP and keeps visitors entertained. Additionally, active queues and themed environments create continuous engagement, making waiting in line part of the experience.

Can you elaborate on how technology is shaping both the design process and visitor

expectations in architecture and immersive experiences?

CS

Maybe the easiest one, which is actually the most conventional, is understanding geo-tracking. Anyone with a phone and privacy enabled memberships to retail franchises can get a pop-up that says, “There’s a sale at Retail X” when they are within proximity. In some cases, retailers utilize this data to improve their customer experience by understanding the browsing circulation patterns to inform where to position popular merchandise in real-time.

In our designs, we can utilize similar strategies to improve the customized guest experience. There can be simpler sensors akin to a sliding door but there can be purposely designed static storefront elements that are activated with a guest’s wand or wristband to further tie the storyline to the environment. Within Universal Studios’ Islands of Adventure, an unassuming Mystic Fountain within a plaza comedically converses and sprays guests on hot days. A remotely positioned performer is actually interacting with the guest, which is simply another interpretation of a selfie mascot in uniform but designed as a physical element. We could speak endlessly on the variety of technology, and even AI, being cross-pollinated to make things feel authentic but the takeaway is that innovative design is not restricted to brick and mortar within our environments.

PM

We are in a very thematically rich realm. The term area development is talking about how you could tell a story through garbage cans, light poles, building facades, planting boxes, and numbers on walls. Frequently, media would be used as a tool to assist with storytelling, animatronics, or robots, because it's a story that you have to tell over and over again. And then on a ride, typically there'd be a moment where you slow down a little bit and there's the media screen, it's a way of telling a whole lot of story in a short amount of time. Fundamentally it's about storytelling and engagement and helping guests understand where they are, who they are, and what they should be doing.

Does the aspect of narrative and gamification in theme parks carry any problems? How do you control where people can and cannot go?

PM

It's pretty easy to hop over a fence if you want to and get into a place that you shouldn't be. The issue is that if you do that, you could die. So this is kind of like visual tools for communication. I mean, part of the reason that people in videogames start destroying everything as soon as they can is because there are no consequences.

There's the front-of-house, back-of-house, and there's a great divide, and it's always such a compelling part to think about the underground tunnels for service staff to pop in and out of spaces. Traditionally, you never ever want to break the illusion of the space that you're in so you want to incorporate navigation into the design. However, there are traditional space planning and wayfinding techniques such as a central landmark in the middle of a park that helps guests navigate. It can be the central gathering area within the big hub of a park where everything radiates out from to other zones.

If you want to look at the cutting edge of technology being used in theme parks, it's important to look at park map app software. With tight queue times, guests can make real-time special bookings to skip the line while gaining points.

> Correlating the video gaming interface, a map is the key to the puzzle and the adventure. Take *Zelda's Breath of the Wild*, where you're given a map that looks like your Switch, which art is imitating life, imitating art! Our phone becomes the key map and a VR version of a theme park zone can be downloaded to play when you're not there IRL. This creates a new mindset about continuity of experience so that when you're unable to travel to the park, you're still experiencing the adventure online virtually via Oculus Quest.
>
> **CS**
>
> > Spatially, when we talk about the key map and save points, we are encouraging the guest to explore their environment similar to the bright beacon radar navigation of Google Maps and to discover potential hidden passages and interactives they might just walk by otherwise.

However, from an architectural and construction standpoint, we do have building code realities. We have to design for egress widths, handrail heights and lighting lumens to be universally accessible and inclusive to all our guests. We're also dealing with an assembly occupancy, so we are conscious of avoiding dead-end spaces where someone might get stuck or feel insecure. Security and operations are cleverly camouflaged into the environments so guests are comfortably focused on their experience. Anti-vandalism or avoidance of restricted area access is purposely designed to be optimized for the park operators, with themed hidden maintenance doors or props positioned out of reach from adventurous explorers.

And that's just a high-level explanation of some design thinking required to immerse a guest and minimize breaking their experience. Families spend their hard-earned money and time to escape to a park, so there's a kind of, "Hey, don't ruin it for the rest of us" mentality that keeps it focused on fun and fond memories.

Have you ever been designing a park component and then specifically thought about how a certain videogame or something could influence?

CS

We've worked on a number of projects including one on a remote mountain that required a new story to be completely invented. With our multidisciplinary team, we'll brainstorm a storyline, from the prologue all the way to the conclusion including multiple chapters of how we would engage with key characters. Our team designs the characters, with key art and backstories, motives and their personalities. Much like a game, we actually create the character interactions and design the environments that tie them and the guest to the storyline holistically.

Recently we also did an esports gaming arena concept with a developer that has a strong existing portfolio of games and intellectual property games. We took cues and components from the games and instead of a fully immersive environment, key characters or elements were featured to make it feel like they had burst through the fourth wall.

PM

There's also the part where, if we're talking about in a videogame, you can do things that you can't normally do. You're like a superhero, so you have special abilities and talents. And it's exciting and compelling. How do you get into character? How do you transition into that moment? Because the theme parks are all about that special moment that you can only experience at a theme park and nowhere else.

Videogames are really good at getting you into that, such as the game tutorial. They used to be a simple set of instructions, but now it's a moment. And that moment when you first start playing a game where you're introduced to a lot of information at once, you could sort of equate that to the pre-show before a ride. We're quickly arming you with the information that you need to know to enrich the experience that you're about to participate in. And help you contextualize that superhero moment immediately with extra meaning.

Is the architectural space that you design in these theme parks ever reminiscent of

or like inspired by videogames as opposed to in real life?

PM

When we used to make videogames, you would just have a flat wall with a single texture, and then you could add a depth map to it and insinuate that there are shadows on the wall and depth there that isn’t actually there because you don’t want to spend the geometry. A similar concept within the world of theme parks would be a thematic flat.

There’s a facade and it looks like a warehouse. In front of it, you’ve built these painted pieces of wood that have interesting profiles and are cut out in different ways to insinuate the facade of a building that’s a little bit more detailed.

CS

Another one would be a sort of a trompe-l’oeil technique where you’re using forced perspective. By creating building facades that are like show set theatrical flats to immerse the guest within the cinematic frame. Similar techniques of framing the specific views within the park are utilized to create an emotional reaction due to the physical landscape and architectural design of the built environment. These are fundamental compression, expansion, textural, audible, etc. techniques used in dramatic architecture we admire around the world.

There are also projects where we play with scale, where we make grande facades a little bit smaller in scale for environments meant for children. Everything that is above the ground floor is also a variation of scale so that it creates that foreshortening and forced perspective to make a guest feel like they are walking a substantial streetscape. In reality it is only two stories but looks like it's four and conceals a multimillion-dollar trackless dark ride attraction behind it. Similarly, in videogames what's behind 90% of the virtual facades are empty voids.

> The synergies between intricately detailed and interactive videogame environments with the variety of work that we do across multiple building typologies, beyond theme parks, will continue to diversify and evolve for our clients and guests. With the new mobile lenses and shifts in location-based entertainment, we're excited to be a part of bridging the gap between these realms and inviting everyone into them.

6.3

Virtually Reality

“Viva las [Videogame] Vegas”

Tatiana Estrina and Lena Ma

DOI: 10.4324/9781003408970-35

Getting Real

> It is said that if *“Plato… discovers, in the flash of an instant as he leans over its abyss, that the simulacrum is not simply a false copy, but that it calls into question the very notions of the copy … and of the model*
>
> (Deleuze and Krauss 1983)

Reality is becoming primordial. Humanity and technology stand at a junction where the realms of architecture and videogames are increasingly intertwined. It is evident that the convergence of digital and the real is unmistakably shaping contemporary society.

During Plato’s era, simulacra were primarily limited to analog mediums, such as paintings and literature, and were subject to only those with privileged access. Today, we inhabit a world where simulacra is accessible to all, constantly. It is treated first as a public phenomenon, particularly evident in our commonplace built world. Our image economy means that spaces are valued less for their physical purposes and much more for their ability to act as media sets for an audience. The infamous evolution of Times Square, transforming from a local commercial district to a global symbol of image economy and digital architectural fantasy, has affected poignant spaces within the world's urban canvas. Spaces challenging the definitions of reality speak to the imminent movement of architectural space in the digital age.

Baudrillard argues that technologies wield the power to reshape human behavior, perception, and interaction within the constructed environment (Baudrillard 1994). This leads to the erosion of the inherent characteristics of environments, simplifying them into singular motifs, symbols, and representations that individuals inevitably associate with the subjects. Complex spatial systems and their concepts are distilled to the flatness of appearance and stimulation. Historically, media such as photography have been regarded as harmless mimicking mediums, much of which retain the original essence of the subject. However, videogame worlds allow for full recreations and reconstructions, and are thus not mimesis, but a simulacra of the subject.

Your World Is My World … Or Is It?

At the early dawn of digital gaming, representation of space was primarily designed to enhance game mechanics. Due to restrictions of low memory cards and resolution, digital environments were more abstracted and acted as a distanced representation of the real. Generic variations of space, even those made of a handful of pixels, sufficed for simple gameplay, a caricature of reality. Yet with ever-improving technological advancements, world building within these digital games have become more interested in recreating existing built conditions to bring their narratives to life. More than places of pure purpose, architecture in modern games is highly detailed, edited, and scaled as a collection of artifacts used to enhance aesthetic, decoration, immersivity, and familiarity. These games are the ultimate simulacra; a copy of the sensual world that minimizes their authenticity.

In many ways, accessibility of reality has become a rare commodity. While the luxury of travelling may not be possible for some populations, digital travel through videogames is a more convenient medium to experience the world (Stanford and Harriss 2012). Digital representations are often the first or only impressions of notable spaces. Their distortions, exaggerations, and interpretations greatly impact expectations of reality and the collective perception of these cities. Providing a three-dimensional navigable space for players, videogames activate the senses and emotions through detailed graphics and engaging narratives. Baudrillard's theory implies that videogames remove the identity of space by reducing human agency (Orr 2006). A player's perspective of the world is hypnotized by what the technology feeds to them instead of relying on experience or personal interpretation. The simulacra, while seemingly a harmless recreation of existing realities, creates an expectation that removes the freedom of decision-making and presents a controlled, biased environment of consumerism (Orr 2006). The games merge with the players' realities, creating false beliefs which fall on the creators of the virtual.

The simulacra within game worlds carry political and cultural significance, both to the sense of oneself and the society surrounding them. As the fidelity of videogame worlds grew, cities became caricatured. The essence of the city is distilled to the likes of the handful of notable monuments, interspersed with generic filler buildings that reference no particular architecture. In this way, the character and essence of cities become lost and transformed into something entirely different.

Figure 6.3.1 In-game cities are represented as generic with a collection of a handful of landmarks, emphasized and placed on display.


Figure 6.3.2 These games glorify the primary buildings of note and reduce the rest to a caricature of the city (image courtesy of Thoreau Bakker).

Reality holds a myriad of physical realms that are influenced by videogames and fantasy that draw the human from the real. For instance, theme parks are also a distilled concept of reality, where its conditions occur artificially. The environment is controlled and does not hold the complexes of human settlement such as governance and residence, and thus, visitors are able to detect a stronger distinction between the environment of the theme park and their everyday lives. However, not all spaces of simulacrum are as obvious. Let us visit one of the most extreme urbanism-built environments that completely blur the phenomena of real and virtual: The Vegas Strip.

The Original Fake

With its endless entertainment, thrilling atmosphere, and adventurous food, one might compare Las Vegas to the likes of an amusement park. However, Las Vegas is not necessarily a single controlled environment, but rather a collection of buildings built autonomously of one another. Not only this, but the area is a part of a large city which is self-governing and self-sustaining. While the majority of other large urban centers feature a mixture of typologies, including residential work, “fantasy cities” like Las Vegas boast nearly entirely third spaces across a large swath of land.

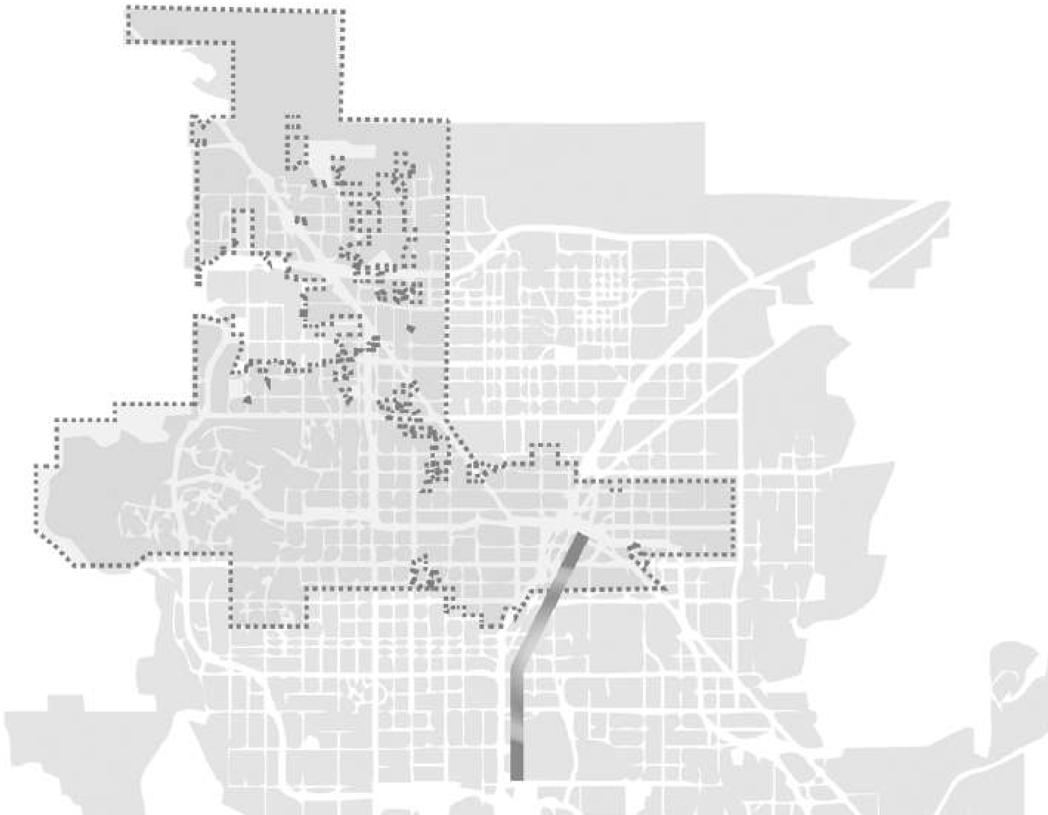

Figure 6.3.3 Map of the city of Las Vegas compared to the size of the Vegas Strip.

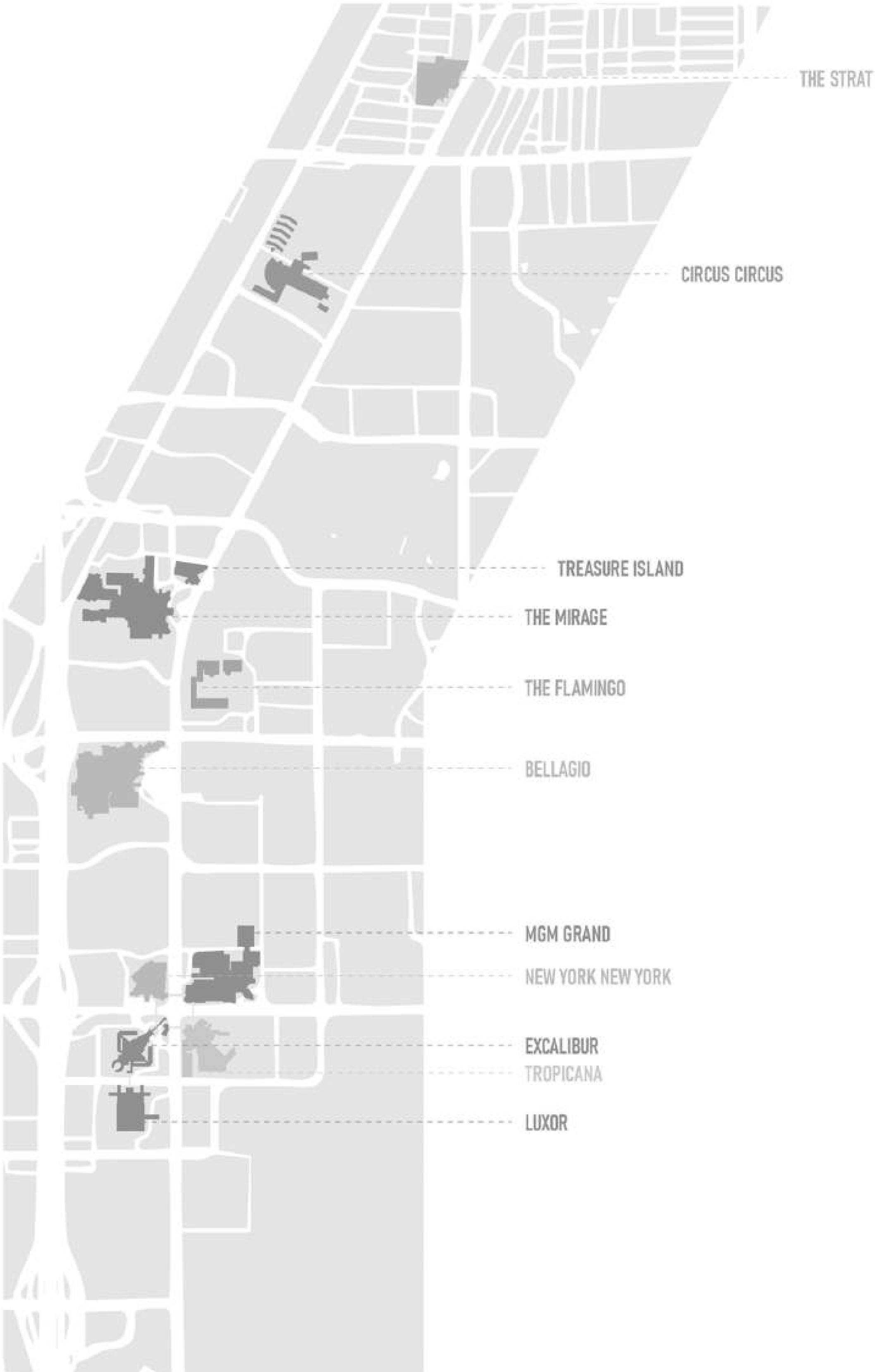
THE STRAT
CIRCUS CIRCUS
TREASURE ISLAND
THE MIRAGE
THE FLAMINGO
BELLAGIO
MGM GRAND
NEW YORK NEW YORK
EXCALIBUR
TROPICANA
LUXOR

Figure 6.3.4 Notable Hotels along the Strip.

Las Vegas' architecture is organized in a sparse manner but unified through the highway, where the driver is subjected to a series of sculptural and graphic advertisements that become a connector to engage people to the urban landscape beyond. As early as the 1970s, Robert Venturi and Denise Scott Brown discussed Las Vegas in terms of its commodification of the symbol and the spectacle. Today, many human experiences of reality are through media, where the media is the lens through which people see a hyperreal depiction of reality. The architecture is then reduced to be a sign itself, most notably discussed in Venturi's theory of the building as a "duck" and "decorated shed." For without the sign, there is no persuasion for engagement with reality. However, with the sign, reality transforms to hyperreality. Through the erasure of architecture, there is an erasure of reality (Venturi, Scott Brown, & Izenour 1977).

The commonalities between the Vegas Strip and videogame environments go beyond the bright lights and garish colors. Even the urban conditions mimic those of open world games. The concentration of highly developed, eye-catching buildings along a guided path, surrounded by "out of bounds" gray and boxy warehouse areas mimic where a game ends and starts in a play world.

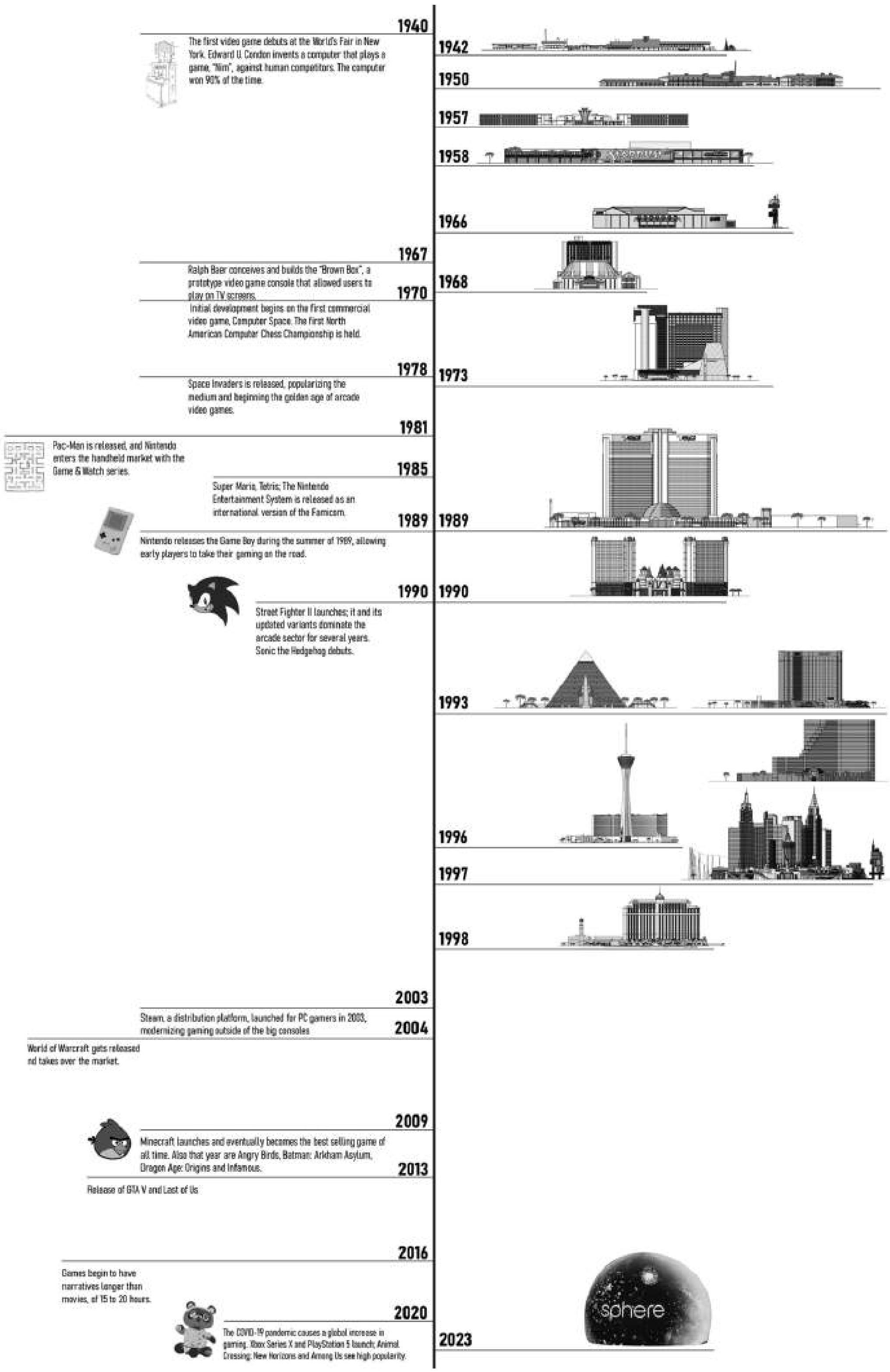

Figure 6.3.5 Timeline of the development of videogame and the Las Vegas Strip.

While conventional wisdom would suggest that Las Vegas is a collection of “architectural freaks” (Al 2017), one can examine the eclectic collection of buildings as they are informed by the state of media and design worldwide. If we examine the evolution of the Strip in parallel to that of the gaming industry, we can see some parallels (Figure 6.3.1). Originally nicknamed “the Last Frontier Village,” the Strip evolved from a shift toward a luxurious getaway in the 1950s. A pivotal point for the city occurred when the area began to be lined with large bungalows and garnered an influx of hotels. Attraction of tourists and wealth soon became the identity of the Strip, whereas the outskirts became the underbelly of crime rings and illicit activities. The early hotels capitalized on thematic strings from the frontier era of the Strip, incorporating desert and western motifs which characterized the locale.

Figure 6.3.6 The Flamingo hotel, first opened in 1957 with a exterior lagoon and animal park. This hotel is still operational today (image courtesy of Vincent Hui).

Videogames were still in their infancy in the 50s, with the release of early arcade games. The 60s rounded off the era of the city as a place of neon lights, and as Venturi and Scott Brown published in their manifesto, was descending into their worst nightmare. The classically affluent audiences transformed into a modernist wasteland of risqué shows and “decorated sheds.” During this time, Howard Hughes claimed upon the proposal of Circus Circus, “I don’t think we should permit this place to degrade into a freak or amusement park category, like Coney Island.”

Figure 6.3.7 Circus Circus, the hotel with an amusement park within its walls (image courtesy of Vincent Hui).

Figure 6.3.8 Circus Circus, the hotel with an amusement park within its walls (image courtesy of Vincent Hui).

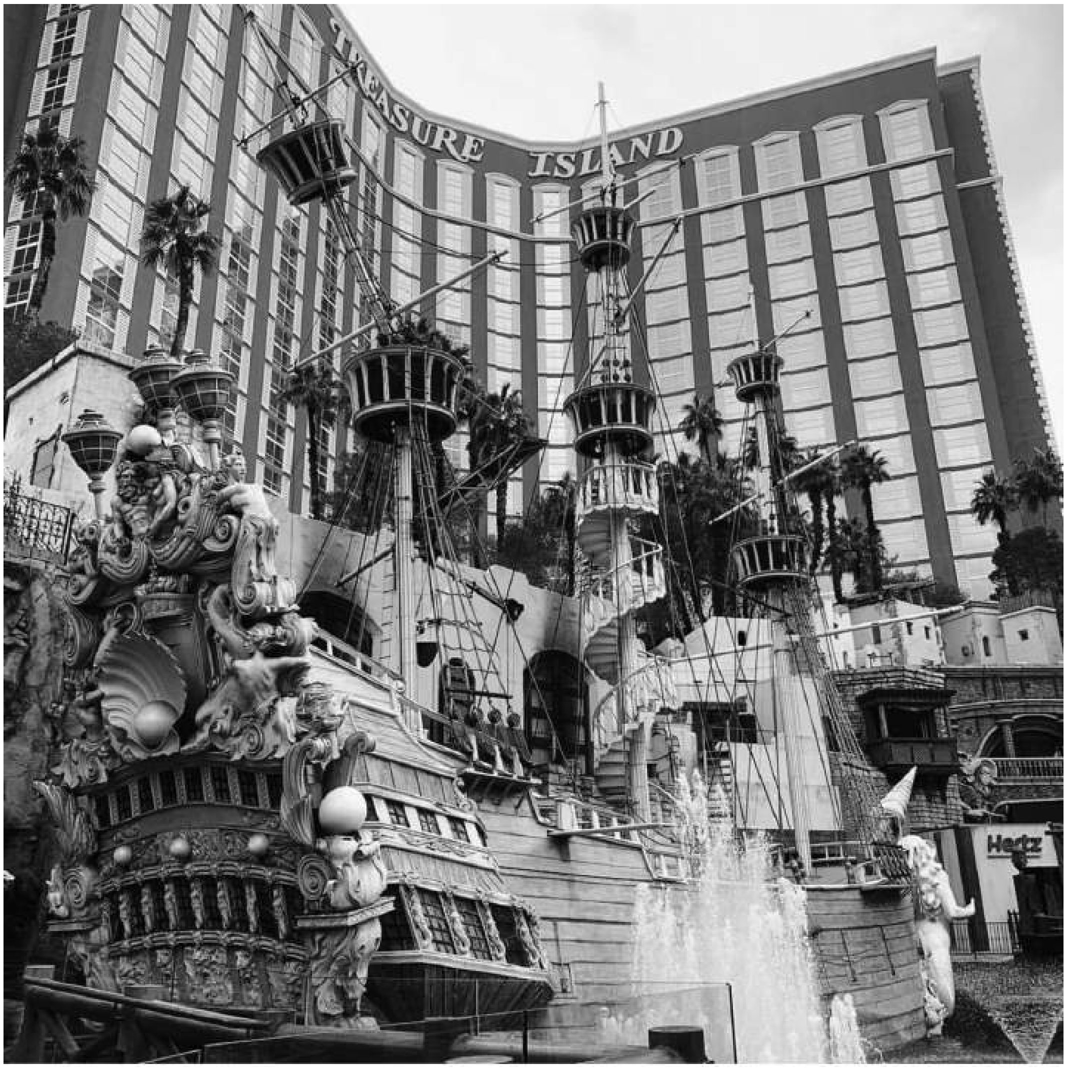

Figure 6.3.9 Treasure Island, themed like a pirate ship (image courtesy of Vincent Hui).

In the mid-80s, a strong shift, right at the time when gaming platforms became fully commonplace, marked the "Disneyfication" of the Strip. Charles Silverman explained, "Go to Casino A because Casino A is exciting to look at as opposed to Casinos B and C, which are ordinary" (Al 2017). This began the race for the greatest theme, the biggest gimmick, the most outrageous escapist experience a facility could offer its guests. Each consecutive hotel built in this time had increasingly outrageous themes, forming a string of "clashing and competing disneylands" (Al 2017) along the Strip. On the flip-side in the videogame industry, this time marked a growth boom, with many beloved titles released within this time period. Many of these games focused less on abstract ideas and began to delve into more thematic realms, each tackling a different 2D videogame world.

Figure 6.3.10 Caesars Palace, with an ancient Roman theme (image courtesy of Vincent Hui).

Figure 6.3.11 Excalibur Hotel & Casino mimicry of a miniature toy castle (image courtesy of Vincent Hui).

Figure 6.3.12 The Venetian, a styrofoam reconstruction of the sights of Venice (image courtesy of Vincent Hui).

Following the late 1990s, flashing lights, shows, and gambling lures no longer satisfied the exponentially growing and greedy Strip. It could no longer rely on the characterization of local America, rather, it leaned on the excitement of international travel. Developers like Mirage began to extract tourist fantasies of the most famous works of architecture and jumbled them all onto the strip like a line of toys (Al 2017). The Strip reduced these built networks into delusional places completely devoid of respect to the culture, politics, and meaning of their origins. Here is where simulacrum makes an appearance, where the hyperreal is more preferred to than the real (Al 2017). Rather than visiting all of these notable areas individually in reality, it is much more convenient, cost-effective, and fun to experience all the best works of human history right at the front of your luxurious hotel. The recreation of these artificial motifs miscommunicates knowledge and reality of the originals to all who visit the Strip, exploiting their aesthetic value at the sacrifice of their true essence. Similarly to how historians have turned to some videogames like the *Assassin's Creed* series for research and historical reference, poorer interpretations of the past, such as the Strip, pose a danger for patrons' ability to understand the past and present. In the *New York Times*, Ada Louise Huxtable quotes that the Strip was "built to be exactly what it is, [Las Vegas] is the real, real fake at the highest, loudest and most authentically inauthentic level of illusion and invention" (Al 2017). This is also the era when slot machines began to develop, with bright colors and flashing lights, clearly inspired by the success of the videogame arcade.

Figure 6.3.13 The Venetian, styrofoam an interior exterior space from Venice (image courtesy of Vincent Hui).

Figure 6.3.14 The Venetian, styrofoam a reconstruction of the canals of Venice (image courtesy of Vincent Hui).

Figure 6.3.15 The Venician, a syrafoam reconstruction of the sights of Venice.

The Strip is unique in that it shamelessly creates dupes of originals, but performs it so well that it is considered an icon of history and culture in and of itself. Globally recognized for its theatrics and bold mimicry, the Strip is a hot destination for one-of-a-kind shows, rare art, and starchitect buildings (Al 2017). The Strip has created its own authentic hyperreal reality that is unmatched to any other hyperreality and does it the most authentically. Robert Venturi claims that ideas of niche representations, symbolism, and signage, all elements portrayed in digital media such as videogames, have become the mediator between people and the city. In today's Las Vegas, videogames are beginning to infiltrate the architecture like never before, with The Sphere being the latest example of the phenomenon. Constructed in 2023, this building is not only the largest sphere in the world but also lacks a façade, becoming a large screen that integrates seamlessly in the cityscape. This large billboard then becomes a gateway directly into the digital realm, with an ever-changing architectural presence.

Nesting the Simulacra

The hyperreal takes on a whole new meaning when one considers videogames taking place in the city of Las Vegas. Such games take the hyperreal setting of the Strip and reflect it back into the media format — making it a simulacra of the simulacra. When a player navigates a world such as *Grand Theft Auto: San Andreas (GTA:SA)*, they are experiencing the culture captured in the "Disneyland" landscape in a form three times removed from the original, distorting it beyond any authenticity or recognition. This digital tourism is becoming increasingly prevalent.

Las Vegas is regarded as a center of tourism across the globe, and every year, the city draws millions of people, with the year 2019 attracting 42 million. However, increasing numbers visit digital dimensions of Las Vegas in lieu of the physical. For instance, *GTA:SA* has sold 27.5 million and *Fallout 4: New Vegas* has sold 12 million copies worldwide, each with repeating visitors daily at the leisure of players from their own home. This population experiences the city in a manner that feeds into its hyperreal existence where the game manipulates expectations of Las Vegas throughout the gameplay.

When the player is first placed within *GTA: SA*'s Las Venturas, it is not a recognizable space to them (Annandale 2006). However, as one begins to maneuver through the city, specific buildings become reminiscent of landmarks in the real-life equivalent. This second-degree separation from the historical and cultural source becomes a complete parody, retaining few characteristics of the original. Details are simplified, colors are dramatized, and scale is shifted in order to bring more emphasis to these recognizable buildings on the Strip.

In *Tom Clancy's Rainbow Six: Vegas*, the city is a function of representation, where the commercial recognition of buildings supersedes most realistic relationships that they may have. More than anything else the buildings are used as vehicles of advertisement. The game weaves reality at its discretion. While on foot, the exteriors of buildings present little accuracy that was seen from above, in favor of gameplay mechanics. Streets are converted into nonsensical battlegrounds where iconography takes precedence over reality. While these exaggerations may benefit gameplay, any tangible connection to reality is at this point morphed into an incredibly hyperreal landscape (Stark 2008).

There is absolutely no connection between the interior of a typical Las Vegas casino and one found in *Rainbow Six: Vegas*. The largest driver of how interior spaces are constructed lies in the fact that the game features a "Breach and Clear" mechanic; whereby before entering a space, the player can reload and prepare their team for an assault. It is because of this mechanic that spaces are uncharacteristically separated from each other. What would realistically be a large casino room is divided into five micro-casino spaces, with arbitrary offices placed in between them as points a user can breach from. At this point, their abstraction of a casino is exclusively characterized by nothing more than slot machines, neon lights, advertisements, and poker tables.

Stuck in a Hyperreal Cycle

If the videogame is a parody of an existing space that feeds the response and expectations within that environment, the original would soon become a second order caricature based on the decisions implemented through the influence of the videogame. Thus, this creates a hyperreality that fits neither reality nor the videogame experience, and is instead a reflection of a collision of these dimensions. The hyperreality becomes the reality and influences peoples' methods of communication, interaction, and perspective while altering the trajectory of the built world itself.

Not only is Las Vegas a hyperreal version of reality, but its own essence has been placed in a hyper-hyperreality through videogames. As videogames visualize Las Vegas through the filtered experience of fantastical hotels, extravagant casino mazes, and glorified tourism spectacle, people will assume these attributes exist and only exist in the real city. Therefore, to feed the consumerist needs, designers are influenced to capitalize on these expectations, creating a hyperreal Las Vegas.

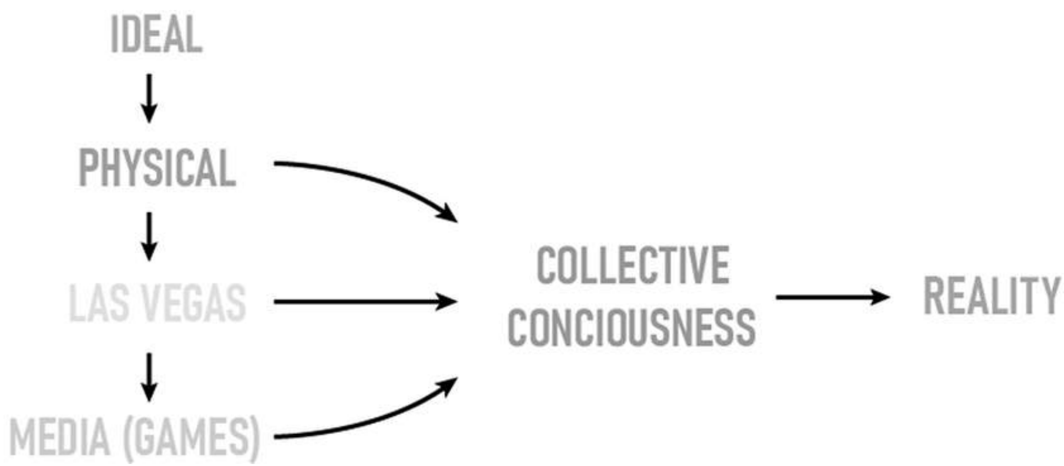

Figure 6.3.16 Videogame cities act as a site for recreation rather than shelter (image courtesy of Thoreau Bakker).

Rather than an accurate depiction of the "culture" in Las Vegas, the in-game world presents an "exaggerated and parodic satire of an America ruled by the corruption and greed of extreme right-wing populism" (Ouellette 2021). Exaggerating the lawless perception of Las Vegas via the emphasis of drugs, prostitution, murder, and car theft, the game presented a very skewed depiction of the city. Here, it is imperative to examine both medium and content of depicted representations, suggesting that although some harmful emphasis of spaces do take place within the in-game Las Venturas, the medium selected for its representation, the videogame, cannot be divorced from the content. Furthermore, the theory suggests that the content can be interpreted differently in different contexts.

Videogames are much more spatially immersive than other forms of media. The caricatures of the architectures, twice removed from their origins and divorced from the cultural and historical contexts, become a means to stigmatize and a basis for architectural racism and stereotypes. Outside of the medium of the game, the "carnival" nature of the city's performance persists in the mind of the players, perpetuating incorrect mythos about the city (Annandale 2006).

Back to Reality

Through the study of Las Vegas as an initial model for the future media-hyperreal architectural developments, it poses as one of the originals of an immersive simulacra phenomenon. Clearly, Las Vegas has itself become a framework for other similar "fantasy cities" across the world, such as Macau and the new district in Singapore built around spectacle and casinos (Balsas 2013).

As posed by Venturi and Scott Brown, interior spaces of the city divorce themselves from the exterior by reducing views and intricate mazes of entertainment and mesmerization (1977). Likewise, videogames have increasingly become immersive, with stronger narratives, lawless worlds, and more realistic environments which similarly trap users in edited copies of worlds. These hyperrealities provide a fantasy for humans, promising what reality cannot. Excalibur Hotel's release statement mentioned that it "would provide the modern person with a temporary release from the chores of daily life" (Al 2017) — a reprise videogames currently offer.

What happens in Vegas does not stay in Vegas; instead, it seeps into virtual worlds, and subsequently into reality. Throughout history, Vegas has proven to become the model for the next generation of architectural development. The Strip is an extreme precedent of this phenomenon, making its consequences particularly evident. However, many other other cities in the world have already been tainted with stains of the hyperreal, with its residents and visitors completely unaware that they are all active participants in the simulacrum.

"Today, we all live in Las Vegas" (Al 2017) and soon we will all live in a videogame.

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6.4
Games of Deletion

Runze Zhang and Alessio Grancini

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"Games of Deletion" is a project speculating on the use of augmented reality (AR), specifically related to design, architecture, and urbanism. The mobile application allows two players located in different cities anywhere on the globe to communicate with each other through a portal opened up using Image Tracking AR on large-scale murals. The game consists of pushing and pulling visual urban information from one location to the other, generating a collage of information and letting the two locations collapse in a unique physical-digital environment. Games of Deletion won the Gehry Prize for Best Graduate Thesis in 2018 at the Southern California Institute of Architecture.

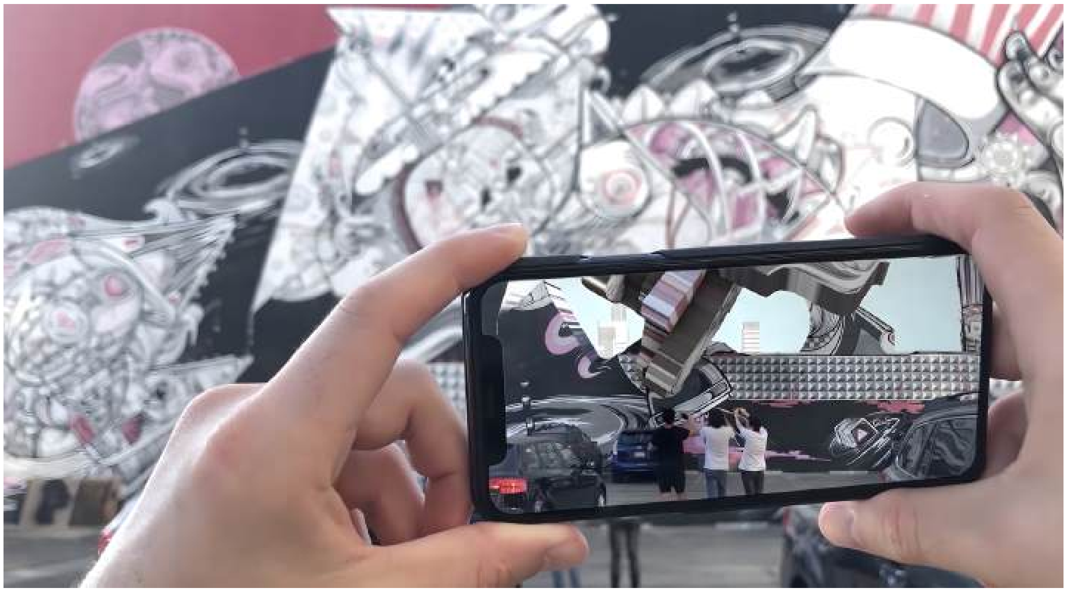

Figure 6.4.1 A 2018 Architecture Masters Thesis at the Souther California Institute of Architecture called Games of Deletion made use of a mobile game platform to create visual rifts between cities across the world through street art (Images courtesy of Alessio Grancini and Runze Zhang)..

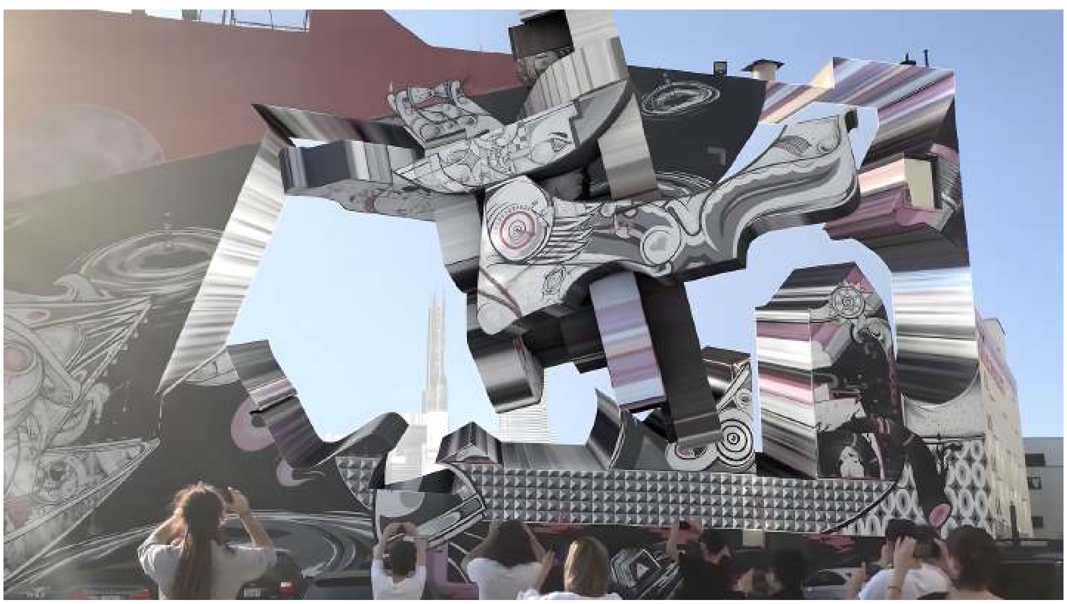

Figure 6.4.2 A 2018 Architecture Masters Thesis at the Souther California Institute of Architecture called Games of Deletion made use of a mobile game platform to create visual rifts between cities across the world through street art (Images courtesy of Alessio Grancini and Runze Zhang).

Figure 6.4.3 A 2018 Architecture Masters Thesis at the Souther California Institute of Architecture called Games of Deletion made use of a mobile game platform to create visual rifts between cities across the world through street art (Images courtesy of Alessio Grancini and Runze Zhang).

Figure 6.4.4 A 2018 Architecture Masters Thesis at the Souther California Institute of Architecture called Games of Deletion made use of a mobile game platform to create visual rifts between

cities across the world through street art (Images courtesy of Alessio Grancini and Runze Zhang).

Figure 6.4.5 A 2018 Architecture Masters Thesis at the Souther California Institute of Architecture called Games of Deletion made use of a mobile game platform to create visual rifts between cities across the world through street art (Images courtesy of Alessio Grancini and Runze Zhang).

Chapter 7
Projected Futures

This chapter explores the potential futures of study, research, and practice that are coming available through the myriad of ways architecture and videogames intersect. On the possibility of interactions taking place between players and artificial intelligence (AI), there is a distinctly different form of creation—and therefore knowledge—when analyzed through the lens of space and architecture. While AI is creating incredible advances, the reliance on human input in its solutions should be considered absolutely necessary. The main endeavor of representation in architecture and videogames—the creation of mood and a nonlinear cinematic environment—might in fact be a shared philosophical root of the two disciplines, causing them to merge altogether. As videogames present dizzying worlds in relation to our own world through multiple shared mediated experiences, they collapse into a new space of distributed domestic leisure. Architecture isn't just involved with the virtual worlds, but the domestic and social environments surrounding the physical world, further speculating the collision of the two disciplines.

7.1

On the Possibility of Enaction within Synthetic Worlds

Jose Sanchez

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Symbiosis within synthetic worlds

In the rapidly evolving landscape of technological advancements, automated (AI) systems have assumed an increasingly central role, influencing various facets of human life. These systems, heralded for their efficiency and precision, have infiltrated diverse domains, from autonomous vehicles to personalized recommendation algorithms. Yet, with their pervasive integration, questions have emerged about the implications of delegating decision-making to algorithms and the diminishing role of human agency in this symbiotic relationship with machines. We can observe a trend toward a larger autonomy of algorithms and a reduction of the designer's agency over the production of content. Still, I would like to make the case that small contributions of humans (as in the case of text prompts in AI generative models) will remain essential to offer a cultural context for the explorations of the solution space offered by AI tools. From this perspective, we can state that it is not in the best interest of such algorithms to completely remove human input from their generativity but rather embrace the necessary ties to human culture offered by initiators of AI content as well as the recipients that will engage with the content produced.

It is perhaps essential to identify that not all algorithms seek autonomy. The field of Human-Computer Interaction (HCI), as pioneered by J.C.R. Licklider, has offered us terms such as "human-computer symbiosis." In his paper "Man-Computer Symbiosis," Licklider envisioned a future where humans and computers would work together in a complementary manner, with humans focusing on tasks that require creativity and problem-solving while computers handle data processing and routine tasks (1960). This concept laid the foundation for the human-centered approach to computing that HCI later embraced.

The field of videogames provides a compelling context for understanding the concept of human-computer symbiosis within the broader domain of HCI. At the core of videogame design lies the creation of algorithmic systems specifically engineered to predict and respond to human inputs. This interaction forms a critical feedback loop: human actions inform the system's behavior, which in turn influences subsequent player decisions, establishing a continuous cycle of interaction between the user and the game's algorithmic environment. Simple games often offer a very small solution space for player agency, allowing for only a few variables as input. Still, we should not underestimate how a small number of variables can yield a large solution space of combinations; consider that even a binary option can cascade into millions of outputs if repeated over time. The axis of time can render deceptively simple games into engines of temporal combinatorics, allowing for complex patterns in the form of sequences. Even with a small number of inputs, players are able to craft "expression" in the patterning and sequencing of outputs. I have referred to these forms of patterning as "spatio-temporal combinatorics" or "spatio-temporal combos" to adopt the terminology that games already use in the description of complex permutations of actions (Sanchez 2015).

The game offered by deceptively simple AI interfaces for image generation is also that of combinatorial possibilities. Contemporary generative AI tools have proposed to use human language as an input device, as it provides the comfort or illusion of "already knowing the language." Still, if evaluated from the perspective of the solution space offered by the language interface, we can argue that this is one of the most complex interfaces in terms of number of variables and combinatorial potential. The inherent challenge in assessing the efficacy and creativity of prompts in text-to-image AI systems lies in the opaque, "black box" nature of the underlying algorithms. These systems are designed to process even the most arbitrary combinations of words and produce coherent, often visually appealing results. This capability, while impressive, complicates our understanding of what constitutes a "combinatorial expression" of prompts. Moreover, the AI's ability to produce familiar results from random word combinations suggests that our evaluation metrics might need to evolve to better capture the nuanced interplay between human creativity and algorithmic interpretation.

Critical Play and Enaction

I propose that we equate "prompting" as a form of "play" as the navigation of a human agent within a computational system. This coupling is structured as a synthetic assembly or a form of human-machine symbiosis with feedback loops in both directions. This is where the study of Play within game scholarship may prove helpful. Not all Play is equal; in her book *Critical Play*, Mary Flanegan describes critical Play as the means to create or occupy play environments that represent one or more questions about aspects of human life. For Flanigan, critical Play is characterized by a careful examination of social, cultural, political, or even personal themes that function as alternatives to popular play spaces (2009). I would like to bring attention to the relationship that Flanigan establishes between criticality and carefulness, or the practice of care, which implies ties and respect to the subject matter being engaged. From this perspective, critical Play is not likely to emerge from a "quick access" to an algorithmic interface but rather requires careful engagement.

Figure 7.1.1 Text-to-image explorations developed in Midjourney. These explorations seek to develop an intuition of the possibility

of combinatorial expression within prompts. Developed by Jose Sanchez.

Figure 7.1.2 Text-to-image explorations developed in Midjourney. These explorations seek to develop an intuition of the possibility of combinatorial expression within prompts. Developed by Jose Sanchez.

Figure 7.1.3 Text-to-image explorations developed in Midjourney. These explorations seek to develop an intuition of the possibility of combinatorial expression within prompts. Developed by Jose Sanchez.

In the landscape of videogames, a fundamental dichotomy emerges between games conceived as extractive practices and those that attempt to engage the player with a careful coupling often tied to cultural imaginaries. Critical Play might be possible in both of these contexts; while in the latter, it might take place as a form of "buying in" into the premise of the software, in the latter it might require a "playing-against" attitude. As documented by Liam Mitchell in his book *Ludopolitics: Videogames* *against Control*, players have mounted an immanent critique of the contemporary technocultural moment, playing with and against the impulse of control. This Play rarely takes a consciously or deliberately political form, and it never fully escapes the logic that binds it or the world in which it is embedded, but it can nonetheless trace the fault lines of modern technology and perhaps elide its totalizing demands (2018).

As a game designer and software developer, I would like to focus on the potential synergistic coupling between players and software, suggesting that a subset of critical Play could be equated to a form of enactment. In his book, *Design for the Pluriverse*, Arturo Escobar revisits the writings of Francisco Varela to establish a critique of the modernist take on cognition; instead of "the representation of a pregiven world by a pregiven mind," cognition is "the enactment of a world and a mind on the basis of a history of the variety of actions that a being is the world performs" (2018). Escobar utilizes the concept of enaction (embodied action) to highlight the deep interconnection between participatory engagement and the actualization of worlds. The embodied cognition offered by a practice of enactment summons a degree of cultural acceptance to a synthetic world, as in the case of videogames.

I have discussed how an ethnographic approach to re-enactment practices in the context of performance art, such as in the re-enactment of the Battle of Orgrave by Jeremy Deller (2001), are capable of bringing forward the forces, emotions, and aspirations that are embodied in the participants; variables that are carried by the performers and that elude computational modeling (Sanchez 2022). But it's important that we practice certain skepticism when equating gameplay within videogames with a form of enactment; after all, videogames are often "representations of a pregiven world," one that has been constructed and calibrated with an intended form of engagement. In the words of Liam Mitchell:

This technological substrate bends games towards a "compulsion for efficiency and control", which means that players "inevitably carry over a cybernetic bias that could reinforce certain assumptions and mindsets." Computers are particularly good at modeling control because they are built that way, and games are the privileged form of modeling because they make them systematically explicit. They valorize it. They are, in other words, so appealing not just because of the control that they offer, but rather because of its clear, uncomplicated perfection. Single-player games become "clockwork worlds. (2018)

Here again, we can establish a distinction between game or software design that intends to control and guide players through a linear path and videogames that lean towards the unexpected. Videogames have adopted the term "sandbox" to describe games that allow the player to construct their own objectives out of a catalog of actions and contexts. While often portrayed as open-world, "build your own adventure" games, I would like to argue that sandbox games deploy a game design principle of inviting players to explore the combinatorial space of the software solution space. Players are invited to construct expression through combinatorics. Far from being rigid "pregiven worlds," sandbox games are able to offer an open-endedness to play, what Michell calls "emergent gameplay" (2018), offering combinatorial actions that surpass the expectations of the software developers.

Figure 7.1.4 Common’hood Videogame developed by Plethora Project, studio led by Jose Sanchez.

Figure 7.1.5 Common’hood Videogame developed by Plethora Project, studio led by Jose Sanchez.

Figure 7.1.6 Common'hood Videogame developed by Plethora Project, studio led by Jose Sanchez.

Figure 7.1.7 Common'hood Videogame developed by Plethora Project, studio led by Jose Sanchez.

Figure 7.1.8 Common'hood Videogame developed by Plethora Project, studio led by Jose Sanchez.

Figure 7.1.9 Common'hood Videogame developed by Plethora Project, studio led by Jose Sanchez.

Within sandbox games, players enact their decisions within the game world, and in doing so, they contribute to the ongoing construction of the game's cultural and narrative significance. Videogames, in this light, exemplify how certain interactive experiences could facilitate a unique form of cognition through active engagement and embodied action, aligning with Escobar's perspective on the significance of enactment. But this possibility should not be, by any means, considered a dominant condition of interactive media; on the contrary, it seems to be the exception.

Synthetic worlds that foster collective engagement, where players actively participate in stewardship, represent digital commons. These spaces are essentially extensions of existing cultural dynamics, growing organically from the collective will and actions of their participants. In this context, we might be tempted to consider how a digital commons could be ignited or artificially incentivized. Such a possibility misses the point of how digital commons come to life. True initiation of a sense of collective care and stewardship over these commons cannot be sparked by any external force or individual effort. Rather, it emerges naturally from the collaborative spirit and shared values of the community. This underlines the fact that the nurturing of a digital commons is inherently a communal venture, born from the collective engagement and mutual commitment of its members to oversee and care for their shared digital environment.

Uninspiring Automation

The ascending adoption of automated systems offers an inspiring narrative of efficiency or a linear resolution to the problem of material scarcity for a finite planet. Still, by contemplating the modalities by which human expression has adapted to be entangled with algorithmic systems, we might be able to splinter our technological imaginaries, steering away from fully automated systems. The coupling between players and digital worlds through enactment challenges the deterministic view that algorithms alone can predict and precompute outcomes. While statistical forecasting algorithms, commonly associated with generative AI systems, excel at recognizing patterns and making predictions based on historical data, they may fall short in fostering realms for enaction, and in turn, meaningful cultural expression. The emergent value systems and decisions stemming from human-computer coupling in participatory digital technologies possess an elusive quality residing in the blind spot of statistical forecasting.

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7.2

Reversibility and Atmosphere

The Shared Philosophical Implications of Architecture and Videogames

Graham Harman

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Architecture is not only an ancient art, but was the topic of systematic theory no later than Vitruvius (1998) in around 30–20 BCE. Videogames seem not even to have existed until William Higginbotham's early version of *Pong* in 1958 (Teruel et al. 2016, 17), and were perhaps not an academic subject until the appearance of a prominent 1997 book by Janet Murray (2016). These diverse origins and pedigrees do not prevent the two genres from having significant structural overlap. In what follows I will consider two of the points they share in common: a similar relation to time, and a shared dependence on atmosphere.

Reversibility

In an earlier article I briefly considered the differing relations of the various arts to time; here I will do the same but with more specific terminology (Harman 2023b: 146). We can speak first of *instantaneous* artworks: those which are entirely present to us from the start, even in those extreme cases where we meditate before them at length. The best examples here are pictorial, as in paintings or illustrations. However packed a given work might be with colorful elements, as in the paintings of Hieronymous Bosch or the children's books of Richard Scarry (1968), the whole is given at a single stroke. Much of Michael Fried's famous polemic against minimalism in "Art and Objecthood" hinges on his support for such instantaneity, as summarized in his closing motto "presentness is grace" (1998, 168). For even if minimalist solids seem to be assembled in a room in a single moment, their theatricality — for Fried — is characterized not only by their histrionic effect, but also by their immersion in the temporal flow of everyday human experience. This can be seen in Fried's disdain for Tony Smith's breathless account of a nighttime drive down the then-unfinished New Jersey Turnpike (1998, 157). Slightly less instantaneous than painting is sculpture. Here too, it is immediately evident that the entire work lies directly before us. But unlike with painting, it is not just a matter of moving one's eyes to catch every detail in sequence. Instead, certain bodily movements are needed to catch all possible angles of vision on the work. For the formalist, however, such kinetically induced variations are aesthetic misfortunes that ought to be kept to a minimum. As Clement Greenberg wrote of an Edgar Degas retrospective in 1945: "His bronzes […] depend just a little too much on the spectator's finding the right point of vantage […]" (1986, 6). Search online for some images of sculptures by Degas, and you will quickly see what Greenberg means. Painting and sculpture go naturally with instantaneous experience, even if the instant in question is drawn out for 45 minutes or longer by a highly enchanted spectator.

Figure 7.2.1 Beams of light are a common technique of visual atmosphere in videogames (image courtesy of Thoreau Bakker).

With the term *durational* arts, I refer to those that require the beholder to remain captive for a specific, delimited period of time; moreover, they usually demand to be experienced in the order arranged by their creator. The clearest example is probably dance. We cannot ask dancers to stop in midair while we go to the lobby for refreshments. Although we might pause the video recording of a dance performance, such interruptions are intrusive and hazardous for one's enjoyment of the genre. Close behind in this respect is music. In principle, a powerful royal audience member might signal the orchestra for a caesura, though in practice such behavior has proven to be comically rare. Third on this list would be cinema, since one is normally expected to watch a film from start to finish in real time. The only factor making cinema less purely durational than dance or music is its increasing association with at-home technologies allowing viewers to pause and replay scenes. This happens frequently in our era when spoken lines are not clearly heard, or when a given scene is so brilliant or shocking as to provoke disbelief. The sudden execution of comic relief attorney Howard

Hamlin by a member of the Salamanca Cartel in the final season of *Better Call Saul* is a scene my wife and I replayed in amazement some four or five times before we are able to go further in the episode (“Plan and Execution” 2022, 48:46). Fourth on the list of durational arts is literature, simply because pauses are frequent and even expected by the author; this is the primary reason it tends to be broken into sections and chapters. It is doubtful that anyone has ever read straight through *War and Peace* without a break, and even more doubtful in the case of Marcel Proust’s multi-volume classic. Nor would it make sense in most cases to jump around a novel randomly in an order unintended by the author. Durational arts should be experienced with the fewest possible interruptions, and in the order intended by their creator. Exceptions do exist, but there is a good reason these outliers are usually called “experimental.” The audience is meant to go home and sleep between each opera in Richard Wagner’s *Ring* Cycle, but these works are supposed to be heard on consecutive nights, not in consecutive years.

We turn now to the *exploratory* arts, as most clearly embodied in the two central topics of this chapter: (1) architecture and (2) videogames. In both cases our experience of such works is drawn out in time, just as with dance, music, cinema, and literature. In arts of this kind, memory plays a more important role than it does in painting and sculpture. But in the cases of architecture and videogames, the chronological order and pace of the experience remains (in most cases) under the control of the participant rather than being ordained by the author. Admittedly, designer control is not entirely absent from either genre. An architect can attempt to micromanage our visit to an edifice by strongly encouraging the use of a specific entrance, or by permitting only a single path of circulation. But even when this happens, the visitor can choose a pace of movement with which they are comfortable, pausing at will for contemplation or photography without really subverting their experience of the building. The case of videogames is slightly different and has also evolved during recent decades. The games of my youth were usually structured as a series of levels traversed in mandatory order, with characters often moving from left to right in the manner of a reader. My most intense personal contact with videogames came during the summer of 1988, when I held a job as day manager of an arcade in Geneva-on-the-Lake, Ohio, and in off hours would frequently play the games myself. Two of the classics from that summer were *Shinobi* (a one-player ninja raid through a series of increasingly menacing bosses) and *Double Dragon* (best played co-operatively with a friend, though the teamwork culminated in having to beat one's friend unconscious to win the girl). Games of that era usually involved a tightly organized sequence of events from which it was not easy to deviate without failure. The in-game use of clocks to discourage loitering made for added pressure to complete all tasks as rapidly as possible.

Figure 7.2.2 Open world games can be explored on foot or even by car (image courtesy of Thoreau Bakker).

But with improved technology and increasingly sophisticated players, videogames evolved to the point where one was able to explore a world on one's own terms and (much of the time) in whatever order one pleased. The thriving multiplayer game *World of Warcraft* is one example. But I also remember being deeply moved by Ian Bogost's discussion of *Grand Theft Auto* and its range of vocational niches, despite never having played the game myself. Along with the titular mission of stealing cars,

> […] another option is just to wander the streets of Liberty City, by car or by foot. Nothing compels the player to follow the game's mission-based storyline or to take on any of the side missions. Many players choose to exact random violence on passersby […].
>
> (Bogost 2006, 154)

Even more interesting is the strategy adopted by artist Jim Munroe. His own approach to *Grand Theft Auto* was initially to wander the streets, "finding a hidden staircase to the top of a building, where he enjoys watching the sun set over Liberty City harbor" (Bogost 2006, 156). In even more imaginative fashion, Munroe used the in-game character editor to create a Canadian tourist who took photographs around the city, and then a priest who prayed over the bodies of the city's numerous victims of crime. It is often hypothesized that videogames will eventually make the leap from popular entertainment to high art, though it is usually conceded that the genre has not yet arrived at that point. If this does ever happen, I suspect that Munroe's plotless explorations will serve as a kind of model. Although elsewhere I have argued against Immanuel Kant's claim that architecture's beauty is sullied by its usefulness, there is a sense in which behaviors tend to become art forms once detached from their stated purpose (Kant 1987, 191; see also Harman 2022: xiii-xiv). The aimless exploration of a videogame space undoubtedly brings us closer to that point.

As for the freedom of architectural exploration, in *Architecture and Objects* I wrote about the importance of movement for renewing our conception of architectural form (Harman 2022: 157). Although one usually conceives of form as the "visual look" of a building, this neglects the fact that any privileged postcard view amounts to a drastic oversimplification of a three-dimensional object that can be explored both within and without (see Harman 2023a). Perhaps surprisingly, it was the young Peter Eisenman (well before his Derridean fascination with the building as "text") who spoke of architecture as a basically kinetic experience, held together by memory as anchored in a small number of basic geometrical solids (2004: 9). But if the notion of a building's visual look subordinates it to a viewer, the solution is not to denounce "humanism" and treat the building as a self-contained system of signs from which human concerns are deliberately excluded. Instead, it is to realize that the composite object formed of human and building (contra Eisenman, architecture without humans is an absurd notion) is deeper than any instantaneous view of this object and any intellectual grasp of it. Though the basic form (or "zero-form") of a building cannot be exhausted by our recollections of exploring it, this form is inconceivable without links to possible exploration (see Harman 2016b). The reversibility of exploration in architecture, and increasingly in videogames, is a key feature distinguishing these two fields from the other genres of art mentioned so far.

Figure 7.2.3 Exploration of videogame worlds often leads to atmosphere created by assets rather than weather (image courtesy of Thoreau Bakker).

Atmosphere

All art appears within an atmosphere, but not all art contains its own atmosphere. We can wander a field of Rodin sculptures in the garden behind a national museum in Paris, or (hypothetically) meet the same works in a highbrow sado-masochist dungeon near Las Vegas. Prior to the 9/11 terrorist attacks, one could even view prominent Rodins on the 105th floor of the North Tower of New York’s World Trade Center, in the doomed office spaces of Cantor Fitzgerald. While the aesthetic experience of viewing a Rodin sculpture varies greatly between these three scenarios, this is due not the work of Rodin himself, but to those who selected where and how to display it. In this respect sculpture is the art of figures par excellence, since the sculpture as a whole is nothing but a terminus for the eye. If we now introduce the familiar terminological pair of figure and ground — to be refined shortly — we can say that sculpture does not produce its own ground, but takes it from whatever gallerist or entrepreneur is in charge of deciding the setting. With painting the case is already significantly different: the painter does not usually depict objects floating in a void, but stations them within an overall atmosphere that shapes our reaction to them. This can drastically affect the mood of a Crucifixion scene, as seen from the discrepancy between the beautiful Mediterranean light of the Perugino/Signorelli depiction and the gory midnight work by Matthias Grünewald a few decades later. But even though we as beholders are highly sensitive to the overall mood of a painting, it is the Crucifixion (or apple, or mountain) that inhabits the atmosphere rather than us. We stand at a certain distance and observe the object and its atmosphere simultaneously.

Architecture has an altogether more intimate link with atmosphere. When viewing a column on the interior of a building one does not merely observe it being cradled by an atmospheric mood, but actually inhabits that atmosphere along with the column. Nor is this merely the result of deciding whether to array Rodin's sculptures in a garden or a dungeon. When I am inside the Reims Cathedral, I experience an atmosphere belonging to the cathedral itself. This atmosphere embraces not just me as a visitor, but all the legible entities within the cathedral. The ingenious argument of Roland Barthes in his *Camera Lucida* (1982) made a similar case for photography, with his famous distinction between atmospheric *studium* and the individual *punctum* that explicitly captures the eye (see also Harman 2021). Yet photographs embody the distinction between figure and ground more in the manner of painting than of architecture, since only in the latter do we occupy the same *studium* as the objects of interest.

As a rule, modernist architecture tried to move away from highly legible aspects such as façades toward the more encompassing reality of space.

Siegfried Giedion's weighty manifesto *Space, Time and Architecture* (1977) took an important step in this direction, though an earlier step had been taken when Le Corbusier downplayed the façade in favor of the plan: "The plan is what determines everything; it is the decisive moment. A plan is not a pretty thing to be drawn, like a Madonna face; it is an austere abstraction" (1986, 48–49). Eisenman appears to take a similar modernist stand on behalf of plan and section over façade (2011: 112). Yet in practice, one notes the delight he takes in subverting the normal convenience of domestic space and his intense concern with the facial textuality of such buildings as Luigi Moretti's Casa "Il Girasole" (2011: 210; 2008: 27–48). Whenever architecture turns atmospheric, Eisenman can usually be found denouncing the phenomenological approach he loathes: "I'm not interested in Peter Zumthor's work or people who spend their time worrying about the details [of] the grain of wood on one side or the color of the material on the surface, etc. I couldn't care less" (Ansari & Eisenman 2013). Yet one need not be an architectural (or philosophical) phenomenologist to appreciate the key role of atmosphere in both disciplines.

Recent philosophy has seen a moderate boom in reflections on the atmospheric side of experience, much of it due to the work of the German philosopher Gernot Böhme (1937–2022). Though I have reservations about his conception of atmosphere as the "between" of the modern subject-object dualism — see the previous critiques of "onto-taxonomy" by me and Niki Young — his writings on the topic provide a valuable resource (Böhme 2017; see also Griffero 2019; Gregersen 2021; Harman 2016a; Young 2021). This tradition was accompanied or anticipated by the notion of "levels" in the book *The Imperative* by Alphonso Lingis, for whom a level is defined as an atmosphere within which any object is encountered (1998). As Lingis puts it: "A level is neither a content grasped in a perception nor a form imposed on an amorphous matter of sensation; it is that with which or according to which we perceive” (2018: 57). He does not fail to give a number of beautiful examples. For instance:

> As we approach an outdoor café in the night, we see a volume of amber-hued glow. When we enter it, our gaze is filled with the light. We begin to make out forms discolored with an amber wash, like fish seen through troubled waters. After some moments, the luminous haze neutralizes and faces of people emerge in their own complexions. The tone of the light has become a level about which the colors of things and faces surface according to the intensity and density of their contrast with this level. The light ceases to function as a radiance in which we are immersed; we begin to look not at it but with it and according to it. Our gaze follows the light as it penetrates open spaces, outlines contours, stops on surfaces, and comes upon things it finds and does not make visible.
>
> (2018: 55)

If atmosphere for Böhme is a meeting ground for the traditional modern poles of subject and object, Lingis downplays the role of the subject in co-constituting the world, as seen in his jab at Immanuel Kant that a level is not “a form imposed on an amorphous matter of sensation.” The role of the human beholder for Lingis is to respond to the imperatives in the world itself, much as a surfer is called upon to do justice to the intricacies of each wave, rather than imposing arbitrary stunts and tricks on the highly articulated waters of the Pacific.

Object-oriented ontology (OOO, pronounced “triple O”) identifies a cut between the real and the sensual (Harman 2011). The real is that which can never appear directly to human thought; more than this, it is that which cannot even be fully expressed in causal relations between inanimate things. In this respect it is much like the Kantian thing-in-itself, except that the latter merely withdraws from human thought, while OOO's real object haunts even the collision of rocks in distant space. How do figure and ground align with this difference between real and sensual? Here it is crucial to insist that both figure and ground, or object and atmosphere, belong squarely on the sensual side of the fence. Martin Heidegger himself is often at fault in pairing his distinctions with the false claim that they have a basic ontological character. Consider his self-interpretation of the tool-analysis in *Being and Time*, which (with his own passive acceptance) is often mistaken for a difference between practical and theoretical behavior, even though neither of these procedures enables a direct contact with Being (1962; see also Harman 2002). The same holds for his overreliance on moods as opposed to thoughts, as if *Angst* were somehow closer to Being itself than the proof of a geometrical theorem could ever be (1998). Even if atmosphere is rarely the explicit target of our thoughts, it is something with which we make direct contact. The difference between real and sensual cuts far deeper than that between implicit and explicit. Nor is atmosphere the same thing as a "field," since the latter merely constrains the role of individuals by embedding them in some continuous function at work in a given space (Gabriel 2015). While fields might be posited (and are, by physicists and others) as existing on the level of the real, atmosphere is closely allied with the sensual experience of space (Harman 2013: 236; Schumacher 2008; Allen 1997).

We can say there are two major sources of atmosphere in any situation. The first is produced by objects deliberately kept subordinate: ambient music, lighting conditions, the specific palette of a painting or an interior design setting. The second comes from the primary objects of attention, but from a background contained in these objects themselves. To take an example from popular culture, there is a general atmosphere to Peter Jackson's *Lord of the Rings* (2001) films, communicating an unspoken set of rules about things that can and cannot occur in J.R.R. Tolkien's fictional world. But additionally, such prominent characters as Gandalf or Gollum have kinetic mannerisms and grammatical peculiarities that may not always be essential to these characters and their roles, but which they release into the air in a way that contributes to the overall atmosphere of the films. The relevant term for this in the history of philosophy is "emanation" or "overflow," central to the works of the Neo-Platonic tradition that is so out of fashion today (Plotinus 1992). Yet it also lies at the core of the presently more fashionable school of German Idealism: J.G. Fichte's (1982) philosophy starts from thought thinking itself and progresses from there to everything else by way of a certain excess or emanation, not unlike the more openly mystical way that the ancient Plotinus accounts for the different levels of the world. In any case, with the notion of atmosphere we have an undeniable case of emanation in the province of everyday life.

Figure 7.2.4 Example atmosphere of a videogame world (image courtesy of Thoreau Bakker).

This returns us, in closing, to the topic of videogames. Since this is such a recent genre, its larval or embryonic phases have occurred within the lifetimes of many of us, and thus we easily recall its early evolution in a way no longer possible for architecture. Atmosphere is verifiably a latecomer among the features of videogames. For what, if any, was the "atmosphere" of *Pong*? The full attention of the player was on the two thin rectangles serving as paddles and the comet-like dot representing the ball. Any atmosphere that may have been operative was generated by the pizzeria or student union in which one happened to be playing, not by the game itself. The same holds for the initially exhilarating *Space Invaders*, which I first encountered at a noisy Iowa county fair. Even when *Pac-Man* took videogames to a more emphatic and socially arousing level, its standard atmosphere was that of the arcade patrolled by mouthy and aggressive preteen boys in some Reagan-era indoor mall. Jim Munroe would have found it difficult to dream up offbeat methods of playing such games, which as a rule were mostly devoid of internal atmospherics. There were scattered exceptions, of course, as with the Atari 2600 *Adventure* cartridge. After succeeding several times in slaying the duck-like dragons and retrieving the flashing chalice, bored players would shift their ambitions to prankish exploration: whether by locking the dragons together in a single castle, prompting the nomadic bat to do unusual things, or finding the rumored (and real) secret message. Yet there came a point in the evolution of technology and design when atmosphere became a major component of the gaming experience, as seen already in the case of *Grand Theft Auto*. When my brother and nephews first introduced me to *World of Warcraft*, they were less concerned with displaying specific player abilities than providing a geographic tour of the game's new world, much as an architect would lead visitors through a newly completed building. As videogames continue on this likely trajectory, they will increase their area of overlap with architecture, until perhaps one day the two genres coincide altogether.

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7.3
Paper Visions
Theorizing Virtual Architecture

Ryan Scavnicky

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The space of a videogame is the space of architectural thinking. After all, so many buildings are first conceptualized and designed as a 3D digital model, so it makes sense that examining videogames as architectural works requires only minor shifts in the application of core architectural ideas. This creates a new extended boundary of architecture and the public imagination and offers a glimpse into a future of spatial design where virtual and physical spaces merge, opening doors to new domesticities and other potential worlds at the intersection of these two dynamic fields.

Understanding the role that architecture plays within game environments must include consideration of societal desires of play in order to understand the potential spatial and cultural effects of that game.[1] In any particular narrative, the buildings inside of an environment can be understood as characters just like any other. This character is sometimes helpful, like Howl's Moving Castle, mysterious like the Inverted Castle in *Castlevania*, or straightforwardly evil like Bowser's Castle.[2] As an example, my studio Learning from Los Santos looked at the Gerudo Ice House from *Zelda Breath of the Wild* and diagrammed it through Jay Appleton's prospect and refuge theory, as well as points of spatial conflict between player and monster or NPC. We then reimagined the building from virtual space to "real" space as a gas station, which revealed extreme similarities between game and real architecture, and the space of player vs. monster with player vs. worker.

As videogames become more immersive and culturally mainstream, they begin to shift from mere 3D environments to entire ecosystems.[3] Meaning the space of a game is not limited to the virtual model in which the players interact and the buildings they interact with, but the physical and social containers surrounding the leisure time and space of play. These containers are as diverse as a living room couch in a single apartment for a gamer playing with friends spread across the world, a busy traveler playing a solo handheld game while half listening for the call to board their next flight, and a chat room with thousands of viewers on a Twitch stream. Each of these scenarios are spatial containers that provide two layers of oscillating information. The creation of virtual architecture rests upon understanding these mixed mechanics layered with social interactions that are structured, staged, and organized into an intentional spatial experience.

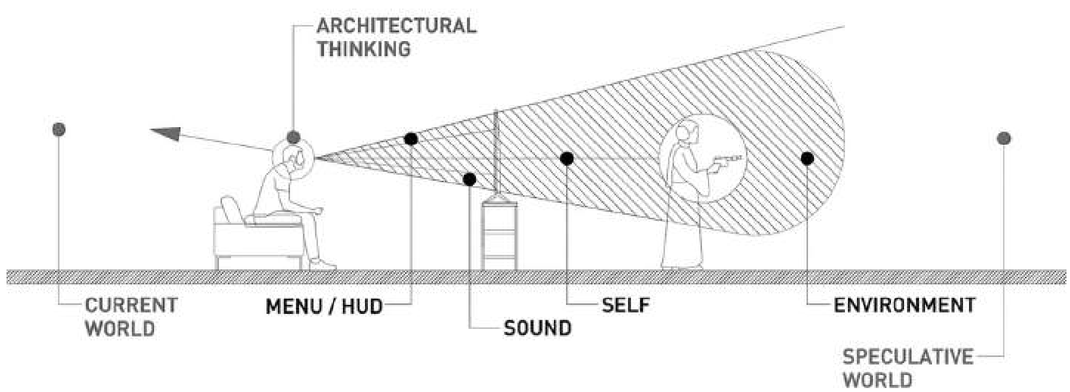

Figure 7.3.1 Diagram by Author.

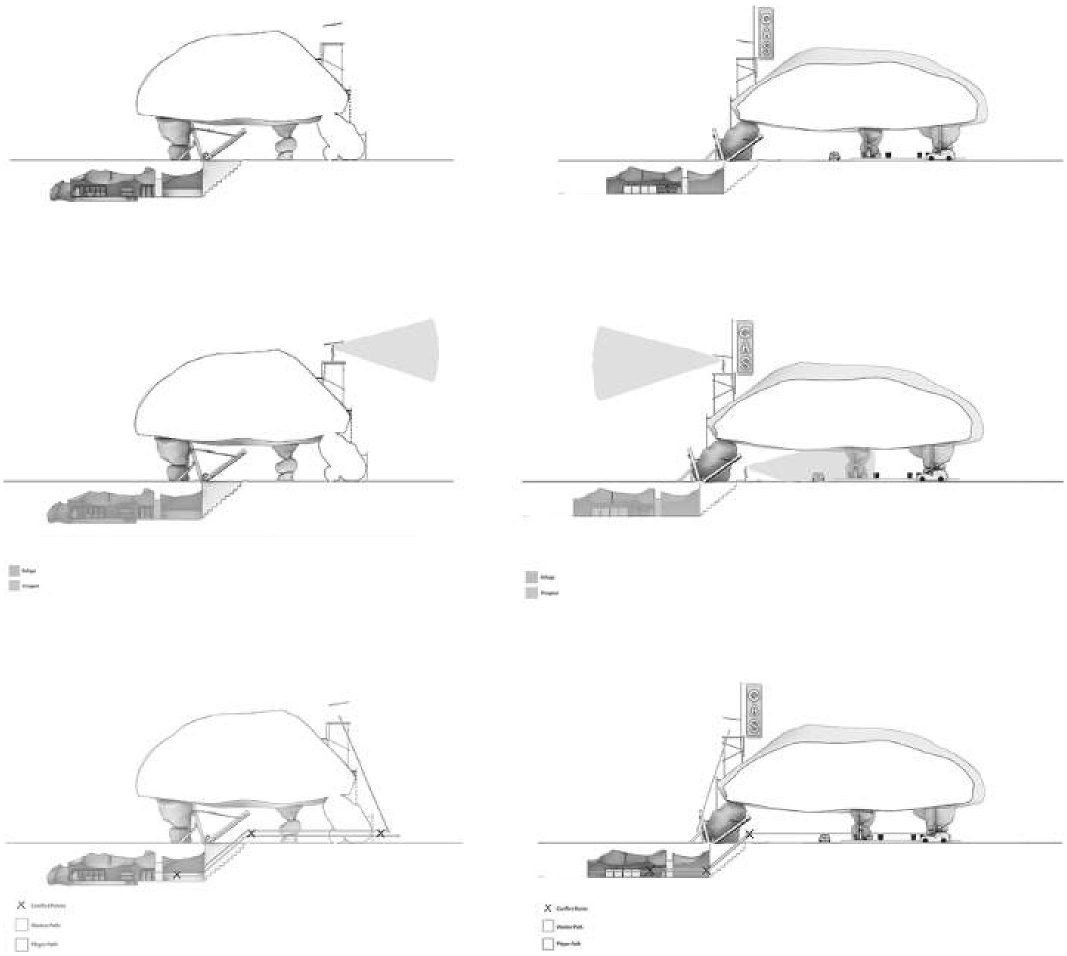

Figure 7.3.2 Diagrams of Sections of Gerudo Ice House turned into an American Southwest Gas Station.

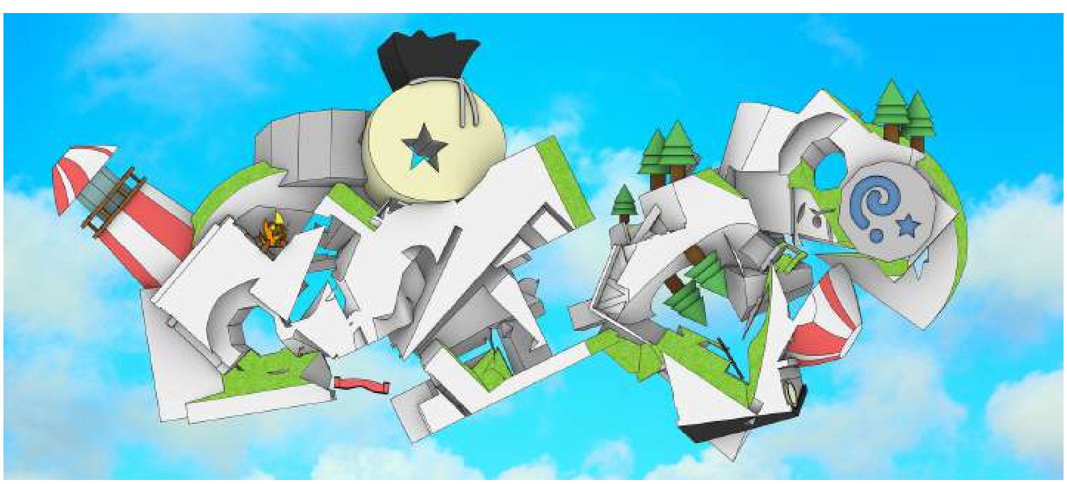

Figure 7.3.3 Learning From Los Santos, mixing platformer with the architectural section by student Conner Deck.

Any simulated world exists in relation to the known world. In architecture, models of possible worlds are used as a way to make a statement about the world today and how it should change. Historically referred to as “paper architecture,” buildings can be more influential as unbuilt plans than they are as a finished product, hence the design stays “on paper.” Canonical figures like Daniel Burnham and Frank Lloyd Wright[4] often pointed out the crucial way architecture can simulate a new reality for people and convince them that it was indeed possible.[5] Still today there is a strong interest to pursue this kind of thinking in architecture, what Aaron Betsky calls “anarchitecture” in his latest tome *The Monster Leviathan* (2024). Ultimately, to be effective, paper architecture must stir the public imagination in such a way as to spark real change.

Paper Visions

> “Only through the structure of the image, and in no other way, can the reign of necessity merge with the reign of freedom.” — Manfredo Tafuri, *Toward a Critique of Architectural Ideology* (1969)

Visionary architecture is an intentional type of paper architecture that concedes its impossibility in order to interrogate various conditions of the world. Perhaps none have worked so closely with this as a type than Lebbeus Woods. He famously kept a blog where he playfully and directly interacted with virtual commenters.[6] In a post titled simply “Visionary Architecture” from December 11, 2008, Woods identified three essential attributes. First: the projects propose new principles by which to design for the urban conditions they address. Second, the designs are total in scope. Third, the designs invent new types of buildings (2008). Woods gives two examples: Le Corbusier’s *Plan Voisin* and Steven Holl’s *Spatial Retaining*

Bars. Examining these canonical examples alongside outsider architectures through this lens will allow us to speculate a new set of Woods' conditions to satisfy.

In 1925, Paris was suffering from overcrowding and poor housing conditions while steel construction was allowing most major cities to build vertically. In response, Le Corbusier designed a series of buildings that would house one million people right in the city center. He proposed demolishing a large section of buildings extending along the Rive Droite directly at Île-de-la-Cité, enough room to clear space for an airport runway. The proposal was ultimately rejected, but the ideas it instigated changed the profession forever. Some have turned out to be good ideas, like housing many people in spacious and equitable living conditions, like *Co-Op City* by architect Herman Jessor, which recently turned 50 years old. Some have turned out rotten, like the clearing of large quantities of a historic core. One particularly devastating example is the west end of the Over-the-Rhine neighborhood in Cincinnati that was cleared to create the Interstate 75 freeway, displacing a majority black population.[7]

In 1989, the city of Phoenix, Arizona searched for answers in planning the growing metropolis and its seemingly endless encroachment into the desert. Single-family home zoning was putting incredible stress on the highway system, causing the city to spread out of control. Steven Holl proposed *Spatial Retaining Bars*, a giant development of horizontal towers to form an implied edge between the city and desert. This idea was not only to mark the edge, but to contain the developments and potentially organize the chaos. What would've been a massive undertaking at the time, we may consider today to have been well worth the effort. The city has now spread for hours in every direction, causing extreme reliance on automobile infrastructure that stresses the city to the limit. While these two examples from Woods exist squarely within the discipline of architecture, we next consider an outsider example, while staying in the architecture field.

In late 2021, Dennis McFadden of the architecture review board of UC Santa Barbara tendered a resignation letter just as a new building proposal for the school was made public. The proposal, designed by then 99-year-old billionaire Charlie Munger of Berkshire Hathaway, made headlines because a majority of the building's 4,536 beds were without a window to the outside. This controversial decision was described as one made out of necessity: UCSB is in desperate need of housing. Yet, this housing need could be filled like many other universities around the world whose dorms have windows, so the windowless rooms understandably drew a lot of public scrutiny. The media outcry earned the project the nickname "Dormzilla" prompting the university to back off, demonstrating the societal values that effective paper architecture can tease out. The vision, it seems, was out of sync with the limits of the living conditions expected by the masses, and therefore pressured society to organize around its defeat. Lastly, we look for an example entirely outside of the field of architecture that created a massive change to civic space.

In the summer of 2016, Americans couldn't get enough of the mixed reality mobile game *Pokemon Go*, which revitalized the brand in the hearts of millions who grew up with the franchise but found themselves decades removed from their old GameBoy. The game works by building a digital twin of your mobile device map, and by walking around you encounter Pokemon, which you try to capture using mixed reality passthrough via your camera. Success in the game involves hatching and leveling up your Pokemon by actively walking around with them, which uses the phone's step tracker. So, one must do a lot of traipsing about and exploring your neighborhood, looking for landmarks called "PokeStops" for you to get items, trade, and replenish.

These PokeStops became overnight sensations, attracting throngs of people to municipal buildings, libraries, and parks in large numbers. The number of *Pokemon Go* players newly introduced to public life stimulated civic spaces in a way that was so extraordinary that in July of 2016, *Pokemon Go* players stumbled upon two dead bodies a week while venturing into off-the-beaten-path locations. The game is highly interactive between players who are physically proximate, with items like a "lure" which would attract rarer and more frequent Pokemon to all players in the vicinity. It takes hours of work to earn just a single 20-minute lure, or one can buy them for a fee. But in one important instance, my local dive bar in downtown Los Angeles was advertising the placing of a "lure" on the three different PokeStops within range of their patio during a happy hour complete with drink specials. Meanwhile, empty bars without PokeStops were desperately trying to figure out how to add them.

Pokemon Go is a spectacular example of gaming's ability to transform the built environment at a large scale by creating a mirror virtual architectural world. This leads into a future of visionary architecture existing in the deep societies, new economies, and interactive mechanics of future games. Just as we can't imagine a videogame made by only a single person, we can no longer theorize architecture by a single author. Both architecture and videogames should be theorized as coming from multitudes of authors across experiences, backgrounds, and specialties. Thus, we can speculate an update to the three points suggested by Woods for a new form of virtual visionary architecture. First: the projects propose new principles by which people interact and behave. Second, the designs are total in scope. Third, the designs invent new types of spaces.

7.3.2 Ethical Considerations

An additional challenge when judging videogames as architecture is the almost universal requirement to commit an act of violence or murder in order to experience the space in itself. In the essay *On Style*, Susan Sontag addresses the concealment of moral faculties to properly judge the aesthetic content of a work of art. (1966) She presents the example of writer Jean Genet, and most of the characters in *King Lear*. Sontag writes "it is immaterial that Genet's characters might repel us in real life. The interest … lies in the manner whereby his 'subject' is annihilated by the serenity and intelligence of his imagination." Yet Bernard Tschumi's famous *Advertisements for Architecture* state that "to really appreciate architecture, you may even need to commit a murder." The conceit here is that it is the actions performed, not architecture, which defines space. If you want to make meaningful space, you could do something memorable in it, the most transgressive example being murder. If space is defined by its actions rather than its walls, the actions of pretend play, community-building, and leisure created and nurtured in virtual environments are as transgressive as Tschumi could ask for.

It is certainly possible to have virtual mediums without narratives of murder, so to have a pure aesthetic experience of a certain game, what other faculties might we be able to suspend? Within this framework, we see an agency of architectural thinking develop. The virtual architecture space of a game like *Journey*, which puts two random players together on a quest but limits their ability to communicate, examines our standards of behavior and teamwork via storytelling. Games like *Zelda: Breath of the Wild* create an architecture that showcases visions of ecologies which stand as a model for reparative natures. Even games like *Fall Guys* create a virtual architectural space that tests our understanding of bodily advantage, as each player has the exact same physical ability.

In suspending those faculties, it is possible to introduce a player to a world as a critique of their own, in essence, completing the notion of a virtual visionary architecture. As Lebbeus Woods said of his own work "I'm not interested in living in a fantasy world. All my work is still meant to evoke real architectural spaces. But what interests me is what the world would be like if we were free of conventional limits. Maybe I can show what could happen if we lived by a different set of rules" (2008).

7.3.3 Pixels and Poetry

> [Academic architecture] is "a dismal science, which in every instance demands of our ideas that they finalize themselves as solutions … close themselves in, prove themselves, eradicating the mystical, the unspeakable, eradicating every last trace of poetic ambiguity …" — John May, *Under Present Conditions Our Dullness Will Intensify*

To make space for these kinds of activities, virtual space must be imbued with meaningful cultural value. Game designers already know how to make a space meaningful to players. The tactics and strategies employed (the passing of time, player and community participation, etc.) mirror historical architecture theories attempting to create the same type of effect. When a player has agency to play a game in a way that is enjoyable for them, the play creates meaning because the game space itself has an embedded history. The game holds within it the marks and changes made by the player. And even greater is the meaning created by participatory and community cultures inside of games. The sandbox style game, for example, is the ultimate game type to foster meaning and engagement with an environment.

In the *Seven Lamps of Architecture*, John Ruskin theorized architecture and its relationship to craft (1849). Lamp Five, the lamp of life, argues that buildings should be evidently made by human hands so that the joy and history of the craftsperson or laborer is seen and enjoyed. At first glance, this seems easily related to the environment of a game changing as the player interacts with it. However, there is an important difference to bear in mind with the lamp of life in relation to labor. The craftsperson referred to by Ruskin is a builder, not the homeowner. We can better relate this theory with the signature worldbuilding details and easter eggs of contemporary production. In an era so marred by reports of the poor working conditions of videogame studios, these touches bring a player in important close relation to a new type of craft. Thus, we could speculate a future architecture wherein the labor of the multiple workers or craftspeople is given agency enough to leave a signature on the world built for a player to inhabit.

When it comes to domestic space in particular, Ruskin believed that "restoration, so called, is the worst manner of Destruction" (1849). Meaning that the history of a building and its age is preservation itself. The markings and scars of inhabitation are the very soul of the work of architecture. To see one's own effect on the environment is to truly live inside of it. In the same way that games mark the passage of time and progress of the player by changing the environment, so does a house grow with a family. What's important here is that there is little difference between the marks you've made on the wall of your childhood home and the weapons you've hung to display in the house you can purchase in *Zelda Breath of the Wild* —both are a particular shared cultural experience made through meaningful insertions on space.

Game mechanics like the total loss of an item when it wears out or the glass shattering permanently on the car I shoot up in *Grand Theft Auto* properly reflect this desirable architectural agency. Other successful examples include when franchises like *Halo* remastered the infamous *Blood Gulch* multiplayer map, or the smashing success that *Fortnite* had when re-releasing its original maps. These sentiments are felt through contemporary meme culture, which often has pictures of places like the Warehouse in Woodland Hills from *Tony Hawk Pro Skater* with words like “Scientists at Harvard University have created this 3D Model depicting what The Garden of Eden may have looked like” or “Images you can hear” or my personal favorite “You’ve just ordered Pizza Hut and a 2L Mountain Dew. You’ve loaded up Diablo on your PC. No school tomorrow. Your parents don’t care if you stay up all night long. A perfect Summer night. You are 39 years old. The year is 2023.” These memes showcase a contemporary longing which equates a particular virtual space with the comfort of domestic leisure.

According to the website *Fortnite.gg* the game typically has around 400,000 active players at any given time, but during the release of classic original maps on Thursday, November 2, 2023, it peaked around 3.1 million active players. Imagine Cleveland, Ohio swelling from 390,000 people to hosting Rod Stewart’s free 1994 show at Copacabana Beach in Rio de Janeiro, which had an audience of approximately 3.5 million. This type of swelling is among the largest gatherings of people in human history, and will only grow in scale and proportion next to the obvious limitations of the purely physical world. As a study of this phenomena, I wondered how the spaces and floor plan of *Control*, a videogame supposedly taking place in 33 Thomas Street (formerly the AT&T Long Lines Building) would look if we tried to fit it into the hulking Manhattan mass, and what it would be like to visualize all the active players of the game moving through it, from their own space.

Figure 7.3.4 Visualization of Control taking place in real world Manhattan.

7.3.4 It's Architecture With or Without Architects

The discipline of architecture has always grappled with the extraordinary expanse of buildings and spaces in the world and the difficulty surrounding the choice of which few to denote as canonical examples. In 1964, Bernard Rudofsky organized an exhibition at the Museum of Modern Art in New York City called *Architecture without Architects* in which the canon of architecture history itself was challenged (1964). Presenting what is now broadly known as vernacular architecture, Rudofsky interrogates the notion of the master builder and its history by presenting works built not by individuals but by cultures responding to specific local material conditions and environments. In the book written for the exhibition, Rudolfsky writes "part of our troubles results from the tendency to ascribe to architects—or, for that matter, to all specialists—exceptional insight into problems of living when, in truth, most of them are concerned with problems of business and prestige."

Photographs of the MOMA exhibition, however, reveal images of indigenous and vernacular structures without context positioned across a simple stud wall system. The show was designed for people to take inspiration from this architecture and make new buildings from it, which perpetuates the cycles of prestige Rudofsky so despises. It additionally created a clear border between the "insiders" and "outsiders" of the discipline by presenting this work to a particular audience of museumgoers, which resulted in the fetishization of the work itself rather than learning with interest, empathy, and respect. Rudofsky again, "the present exhibition is a.. vehicle of the idea that the philosophy and know-how of the anonymous builders presents the largest untapped source of architectural inspiration for industrial man" (1964). This smells more like colonialism than honest representation.

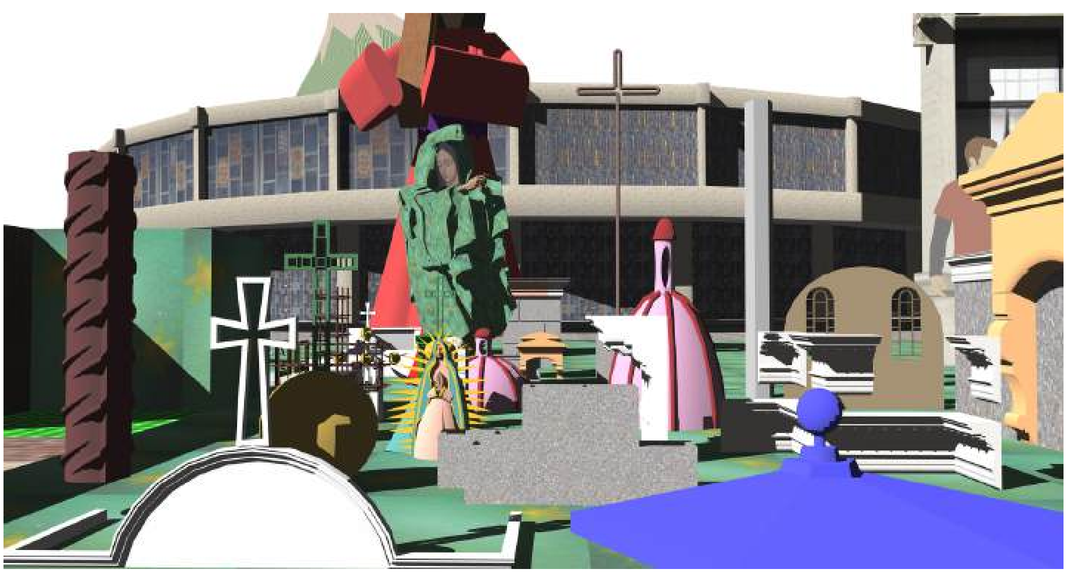

Figure 7.3.5 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

Figure 7.3.6 Still image from El Grand Tour by Andres Souto of mUcHo estudio/taller.

In opposition to this, a YouTube video by Andres Souto of mUcHo estudio/taller called *El Grand Tour* gives a guided tour of the fantastic and wild speculative architecture available on the Sketchup Warehouse. This type of representation opposes the fetishizing quality because it speculates a radical repositioning of authorship. Instead of a survey of amateurs by masters prepared to pounce on the discovered unnamed talent, the video supposed the amateurs have the mark of true genius and it is us who should marvel at the work. This comparison and reversal showcases a new possibility for architecture to work through challenges of authorship and vernacular as it navigates changes in world culture and then remixes it. A better framework for this type of creation is Jill Stoner's *Toward a Minor Architecture*, which highlights the need to take things apart in our constructed wasteland and emerge from power structures to liberate from below (2012).

Yet we still must rely on the idea of vernacular architecture not for fetishization of form over materials, mechanics, and shared authorship but the way vernacular creates and nurtures a shared domestic image. A recent commercial for Nintendo Switch showed two brothers playing *Goldeneye 007* — a game released on the Nintendo 64 in 1997 — online with one another in February of 2023. While playing together in their current lives, they are transported to their childhood bedroom where they have stored memories of domestic leisure and play. This meaningful physical-digital interaction, and the clear reflection on virtual space as an extension of the domestic, has resounding implications for the future of all spatial design.

This manifests through my work and research as a gamer and an architecture teacher. Building on sentiments expressed poetically by a famous post from Viviane Schwarz on X (formerly Twitter) which stated "Zoom sucks, we started having editorial meetings in *Red Dead Redemption* instead. It's nice to sit at the campfire and discuss projects, with the wolves howling out in the night." So during 2020, to experience immersive space as a class, I held desk crits remotely, but rather than Zoom, we met inside of a virtual space called Sansar, which comes with a variety of community-built avatar skins (Figure 7.3.7). We also held our final critiques online and instead of a typical jury, we invited a Twitch chat to do a "chat plays" stream where the chat is the jury (Figure 7.3.8). This generated feedback not just by architecture faculty but by outside characters, truly opening the architecture jury to the broader public while experiencing a new type of shared domestic space.

Figure 7.3.7 Desk crit inside of the virtual space of Sansar. Audrey Lemon on the left, turtle. Author Ryan Scavnicky on the right, broccoli.

Figure 7.3.8 Twitch Chat Final Review, studio Learning from Los Santos, Spring 2022.

Through slightly shifting core ideas and foundational concepts, domesticity in architecture is changing from one that is contained to one that leaks into shared virtual containers. The merging of videogames and architecture reveals a dense stew of spatial design, societal influence, and cultural significance. Videogames, evolving into immersive ecosystems, transcend digital environments to become cultural artifacts akin to physical buildings. They shape behavior, reflect societal norms, and transform physical spaces, destroying the assumed boundary between virtual and real-world architecture.

The concept of virtual visionary architecture has emerged, and it promises collaborative design and participatory experiences that reflect the multiplicity of voices in our society. Whether huddled around a living room console or engaging with a global community through online platforms, players inhabit diverse spatial contexts that enrich their experiences. Understanding the intricacies of these mixed domestic mechanics and social interactions is essential for reimagining the discipline of architecture through the design of virtual worlds as a new project of our shared cultural imagination.

Notes

1. In *(Re)Mastering* Dark Souls by Timothy Welsh, "revelatory experiences of gameplay require specific, historically situated playstyles, ones that play with and against gaming's natural disposition toward objectivization.".
2. Indeed the very notion of *Castleness* can be traced through an understanding of Baudrillard's four stages of simulacra. For example, Hohenzollern Castle is of course a stage 1, while Neuschwanstein Castle is stage 2, a perversion of that reality. This makes Disney's Cinderella Castle a stage 3 simulacrum as it was modeled after the image of Neuschwanstein. Lastly, a stage 4 simulacrum, bearing no

relation to reality, something like the 3d model of Hyrule Castle from *Zelda*.

3. These paraphrased remarks are from a talk by Hito Steyerl for the presentation of the exhibition "Harun Farocki. Empathy" curated by Antje Ehmann and Carles Guerra at Fundació Antoni Tàpies, in the context of LOOP Festival 2016. Introduction by Carles Guerra. Steyerl remarked that "games should not be dismissed as unreal fictions or distortions of reality but are better thought of as reality itself, or even new technologies of government trying to compute and manage populations.".
4. Even Daedalus, by some accounts.
5. The famous "Make no little plans; they have no magic to stir men's blood and probably themselves will not be realized," as spoken in a speech recorded in the *Chicago Record-Herald*, Oct. 15, 1910, and Frank Lloyd Wright's famous Mile-High Illinois, which utilized technologies that were not yet invented but seemed plausible, like vertically running trains. These projects toe the line between science fiction and reality.
6. The Lebbeus Woods blog is an interactive website as an early example of a shared cultural virtual space, complete with anonymous and some not-so-anonymous commenters with usernames that sound a lot like gamer tags.
7. In fall of 2023, the City of Cincinnati officially offered an apology to everyone displaced by this awful civic project, an apology falling on uneasy ears after nearly 70 years of continual destructive development.

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7.4

Interview with Liam Young

On His Roles as MS Fiction and Entertainment Coordinator at Sci Arc, Designer, Director and Producer

Liam Young

DOI: 10.4324/9781003408970-41

Do you think you could give a brief summary of your role and journey to this point?

I trained as an architect from a very traditional program in Australia that was interested in timber, detailing, the poetics of space, genius loci, a relationship to context. I now tell stories about the global urban and environmental implications of emerging technologies. Knowing what I know now, I wouldn't go back in time to my 18-year-old self to go to film school. I think the work that I do now is specific and unique, because I have that background.

Sheer will or luck has enabled that to happen. I wanted to create a program that would formalize those relationships between architecture and adjacent disciplines in the entertainment industry, videogames being one of them, because it took me a long time to figure out how to engineer my practice to get here.

Architects are in the luxury service industry in the same way that Louis Vuitton designs handbags for the few people that can get access to them. Architects, for the most part at least, are about creating trinkets for the wealthy and I was frustrated because the training I had as an architect seemed to be so much more extensive than what actually was happening in practice. Architecture is still one of those extraordinary undergraduate degrees where you do classes in philosophy and critical theory, alongside classes in engineering and structures, alongside classes in coding and software, as well as charcoal life drawing and making collages and models and learning how to present and construct a narrative. Very few disciplines are left with that breadth of training. And the great tragedy of our profession today is that architects' breadth of knowledge is reduced down to this service design industry.

I started telling stories and speculating because that seemed like the only way to get ahead of the technology supply chain and actually make meaningful insertions into it because so much of what shapes the urban spatial experience today is defined by what I call before culture technologies. Things like drones, autonomous vehicles, AI, are all technologies that are already here, and they've arrived faster and earlier than our cultural capacity to understand what they might mean.

So, we speculate, we take risks … it's risky not to speculate, not to imagine what technologies might mean before they enter into the world.

Because otherwise we end up in the position that we're in on the crest of a tsunami of global planetary crisis.

I create imaginary worlds because I'm interested in the ways that they become sites in which we can prototype critical ideas about who we are and who we want to be.

Figure 7.4.1 Stills from the "Where the City Can't See" film.

Figure 7.4.2 Stills from the "Where the City Can't See" film.

Figure 7.4.3 Stills from the “Where the City Can’t See” film.

Is there anything you think architects should know about digital world building as different from the physical?

I wouldn’t want to make a distinction between world building for digital environments versus world building for physical environments. Digital is just a different kind of site, really. My training in architecture was all about site. When I’m designing for film or a game, I’m still engaging with the form of site analysis and site proposition in the same way that I was trained to do back when I was 19.

For architects to limit themselves to physical sites is an extraordinary missed opportunity. Our skill set can start to apply across the spectrum from the physical to the virtual. Anywhere on that spectrum is where I like to locate my work and the work of our students.

What we do is interrogate that notion of site. This may be a tangent to the subject of the book, but perhaps interesting. I think architecture and the discipline are in desperate need of reevaluating what the site means. For everyone, typically, as a designer, the site drawing is the largest drawing we produce. But most often, that site drawing defines the limit of a problem.

What is inside the margins of that site drawing is something that we acknowledge, deal with, analyze, and research. What falls off the edges of the map is someone else's problem. It's not part of the discussion around a project. We exist in a moment where nothing exists on a single site anymore: to make even the smallest building, you're setting in motion a planetary network of supply chains, resource fields, and extractive industries.

The idea of a 1:5000 site plan is totally meaningless when you're trying to have a conversation about the planetary impacts of the work that we do as designers. In the same vein, what's a site plan for the metaverse or the Internet? What is a site plan for a complex series of game environments with multiple levels and intersecting narrative paths that open up new territories or close off others?

And I think the site plan is one of these roots of the problem that locks us into a certain mode of disciplinary action which denies the richness and the scale of the crisis that we currently face. Both are just different kinds of sites, and the scale at which we operate is critical to evaluate and reevaluate who we are going to be.

Does the digital site change the way that you approach the design?

What I notice are similarities when looking at the physical and the digital. One of the great dangers of designing for digital environments is the perpetuation of the mythology that the digital somehow is ephemeral and nonphysical. A digital environment has just as many tendrils out to the physical world as a real site that an architect might be designing for. The digital landscapes in videogames are enabled by stacks and stacks of rare earth in a giant shed somewhere on the edge of a city. They are made manifest by literal cables of spun glass stretched across oceans and continents. To say that the digital doesn't have physical effects is a total denial of the planetary infrastructure that is necessary to enable us to open up a game and wander around with a giant sci-fi gun blowing the heads off green aliens.

The reason that I'm interested in game environments is because for a lot of people, they spend more time inside those digital worlds than they do in the physical world. And if we really value what we do and talk about as designers, architects, urbanists, to not acknowledge the spatial experiences that huge populations of the world are having inside these digital environments is denying all of the impacts that we might talk about in the context of the physical. The way that the environment shapes who we are, defines our politics, defines our worldview operates in exactly the same way in the digital environment. So to constantly be making games purely to generate revenue, or to entertain and create escapist fantasies for us to check out from the real world, denies the possibility to enrich people's lives and affect change.

When people spend over 40 hours a week inside these environments, to not engage with them in the same way that we engage with the design of a real city is catastrophic. And that's why I'm a massive advocate of people with spatial design training moving into these game environments and moving into the game industry as a discipline because it's a discipline that desperately needs it. Because so many people that come out of more traditional forms of game education are either trained in technical capacity and understand what buttons to press, or they're trained as storytellers or entertainers. But if these are the lived realities of so many people, then it's important that we bring into those spaces all the conversations, the discourses that we might have in the more traditional disciplines of architecture.

It's no longer viable to talk about the real and the virtual. These are totally outmoded terms. The digital has physical and very real effects. The physical has very real effects in the digital. It's just a soupy, interconnected reality that we all exist in. We are both the sum of our physical selves and our digital selves. We cast shadows in both the physical space and the digital space. And as a discipline, we need to be able to move back and forth between those two worlds.

How do you feel occupying virtual space like that changes the way that people understand their own space both for designers and laypeople?

My experience of Los Angeles is seen through the lens of all these stories that take place in it. When I go to Santa Monica pier, I remember the headshot I took, or all the NPCs I smashed into with the really hot Lamborghini that I stole in *GTA V*. You can't separate that from the real experience at that place. So why aren't architects drifting back and forth and creating experiences, moments, events, and stories in both of those landscapes, acknowledging that both of those territories construct real experience and real memory? It's totally bizarre to me.

Even when I lived in London, there were writers of mystery novels set inside Google Maps, where you would click through waypoints, and each waypoint had a different part of the story. There was a murder mystery told on my commute between my studio in Central London and my house. When I go back, the St. Pancras station is the site of a murder, not the place one catches the train to go across the Channel to Paris.

I think that cities are shared fictions, constructed physical experiences and digital ones. That's what really defines the city today. If we're in the business of making cities or thinking about what cities are, we also need to be thinking about games and films and imaginary worlds.

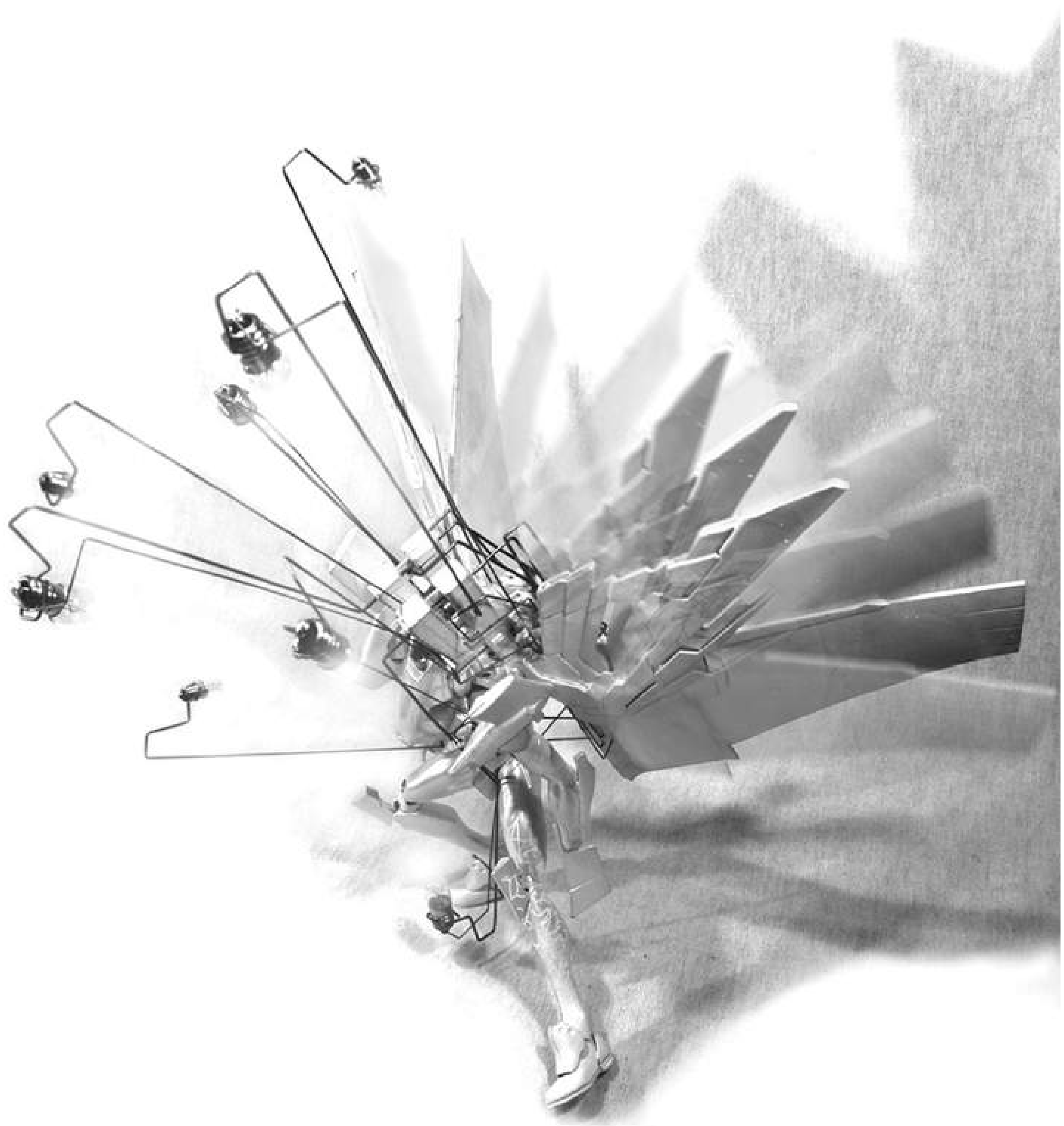

Figure 7.4.4 Aurora from the "Specimens of Unnatrual history".

Figure 7.4.5 Roving Forest from the “Specimens of Unnatrual history”.

Could you touch on your ideal future role of the architect?

They’re just different types of architects. There are architects who make buildings, and they’re not going to go away. I think they’re going to be reduced more and more to a luxury commodity, but they're not going to go away. There are architects who are curators, editors, writers, directors, game designers, environment artists, concept designers, politicians, creative directors, and artists.

Many people would think about rhetoric like this as some form of weakening or dissolution of the profession. But I think it's an absolute necessity. There are two modes of operating: one is to double down and retreat to the fundamentals. And you see that happening in a lot of architectural schools to return to Neo Pomo. You know, that you have the reimagination of the axonometric or isometric drawing. Getting fascinated with an arch and a column? Again, is part of that movement, you know, to double down on what architects historically have done, to reference internally within the discipline, as postmodernism did, then regurgitate more and more, you know, to endlessly cycle within the gene pool.

That's one way of operating. And the other is to do what I am talking about, which is find new territories for architectural thinking. To operate with some kind of force that we might migrate out of the discipline into occupying others parasitically. All of these other forms of industry actually gives us more to do and makes us stronger and creates more spaces we can have an impact on.

To be clear, that's not about architects doing one of these many programs that now exist, now that label themselves as like film and game design programs in an architecture school that for the most part are run by architects or academics or architectural academics producing architects that are interested in games or interested in film and running studios that end up producing for clients. This isn't that. This is literally working inside the game studio. This isn't about taking these skill sets back into the architecture discipline. This is about infiltrating all of these other disciplines with architectural practice, knowledge, and training.

I think that's the future of the discipline, co-opting and stealing models of practice, economies of practice from these other fields, and you know, making architectural work and exploring architectural ideas inside those environments as an antidote to what we currently do, which is make a bunch of books that no one but architects read, hold a bunch of conferences that no one but architects go to, hold a bunch of Biennales that create parties for other architects to meet other architects. We're really good at screaming into the void and talking amongst ourselves. But if we truly value the things that we talk about in these formats, it is our total duty to find ways to connect to broader audiences with these ideas. And there's no broader audience than gamers. You know, it's the biggest sector of the entertainment industry. It has the biggest budgets attached, generates the most revenue, and literally, people spend their lives in those contexts.

And to not treat that as another kind of site which we can work signals the death of the discipline.

How do the two fields meld together in your practice?

As a designer and director, my medium is imaginary worlds for Hollywood, film, videogames, and TV. My own practice exists within the ecosystems of entertainment, but also within the ecology of the art world. I'm interested in the ways that we can use fiction. It is this extraordinary shared medium.

When we close our eyes and envision the future, those mental images still reflect the modes of thinking that have shaped us. We see trees on rooftops, community gardens in Brooklyn, people tending to chickens and gathering eggs in their backyard — a retreat from technology, a return to the local mythology as an antidote to the planetary crisis we've created. However, it's challenging to assert their relevance because many remarkable individuals dedicated their lives to these visions of the future, but they no longer align with the scale of the crisis we face. Perhaps if we had heeded the calls in the sixties or seventies, they might have sufficed. Yet, here we are.

In contrast, contemporary visions that address the necessary scale of change, such as planetary visions, often lean toward dystopia. They depict scenarios where villains like Thanos or evil mega-corporations drive the narrative, portraying the crisis of our age as overpopulation. It's peculiar that the iconic villains in gaming and film are genocidal maniacs who believe they're saving the world by eradicating most of the population. This theme pervades various media, from the Marvel Cinematic Universe to James Bond movies.

However, we still need aspirational, hopeful visions of a future that operate on planetary scales. My work, "Planet City," encompasses a VR experience, TED Talk, film, installation, and graphic novel. It presents a vision of what the world could be if we addressed the crisis we face — a single city accommodating the projected 10 billion people by 2050, condensed into an area roughly the size of Texas. This concept aims to return most of the Earth to nature, reclaim stolen land, and restore territories to species previously marginalized by human activity.

"Planet City" is a pragmatic endeavor, leveraging sustainable technologies and repurposing existing resources from our cities rather than exploiting virgin land. It's not merely a proposal but a provocation, suggesting that if we can envision something like "Planet City" on a global scale, we can apply similar principles to reconfigure our current urban landscapes. Climate change is no longer just a technological challenge; it's a cultural and political crisis, requiring a shift in our collective imagination.

The necessary technologies to address this crisis already exist but have been hindered by political narratives and biases. To effect meaningful change, our efforts must transcend mere technological solutions and operate within cultural spaces, particularly popular culture mediums like gaming.

Figure 7.4.6 Imagery from “Planet City”.

Figure 7.4.7 Imagery from “Planet City”.

Figure 7.4.8 Imagery from “Planet City.”

Hence, my latest project, “The Great Endeavor,” explores humanity’s largest-ever construction project — a global network for carbon removal and storage equivalent in scale to the current oil and gas industry. This project visualizes the work of scientists currently buried in reports and journals, facilitating a broader conversation about this monumental undertaking, which will define our generation.

"The Great Endeavor" challenges our preconceived notions of the future, which often revolve around idyllic landscapes rather than the massive infrastructure required for carbon removal and storage. By presenting these concepts in accessible formats, such as documentaries and streaming platforms, we can engage in conversations about the future we truly desire.

Additionally, I'm working on a narrative game akin to "The Last of Us," exploring a post-utopian world. Instead of focusing on apocalyptic scenarios, this game imagines a world where we've successfully addressed our problems, prompting players to navigate and explore the remnants of those solutions.

Many games have cautioned us about what not to do, but they've often left us feeling paralyzed. Now, I'm interested in creating games that contribute to our collective vision of desirable futures, fostering dialogue about the kind of world we want to inhabit together.

Figure 7.4.9 Imagery from "The Great Endeavor."

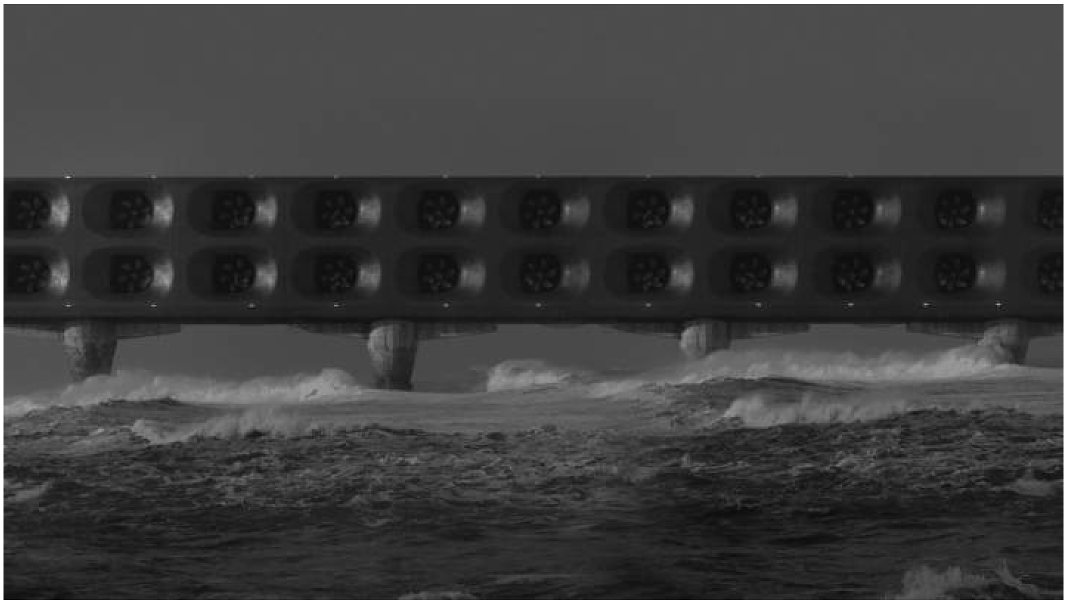

Figure 7.4.10 Imagery from “The Great Endeavor.”

Figure 7.4.11 Imagery from “The Great Endeavor.”

What else do you see developing in traditional architecture education?

I really value the architectural education that I had, which is quite traditional in school, because I think in many ways disciplines like games or mediums like film animation, immersive in many ways, have come to cross over the last few years. By that I mean that if we're thinking about game design, if we're thinking about VR, or immersive storytelling, the language of cinema or directives falls apart in those environments. The idea of an edit doesn't make any sense, nor does linear narrative based on a script. Compositional framing, based on a particular fixed rectangle, just no longer applies.

But the language of architecture is actually what is most meaningful when you're in a game environment, when you're in a VR world or an immersive experience, you can't talk about an edit, but you can talk about a transition or a threshold. You can talk about scale as opposed to frame. And that's the discipline of architecture, right? The language through which we talk about space and design, the language through which we've learned actually is now the most appropriate language in which to be thinking about other forms of narrative. Right now in LA no one is buying scripts anymore. They buy worlds. The Game of Throne–ification of entertainment has led to prequel series, spin-off series features, etc. The franchise of storytelling means that it's about world-building and worldmaking.

So traditional film programs are defined around the linear process of writing a script, funding that script, costing it, designing it, producing it, making it, post-producing it like that isn't the way things are working now. People are creating worlds. They're populating that world with characters, roleplaying those characters in that environment the same way that an architect might roleplay what it's like to spend a day in a house that we're imagining, and generating narrative through that process of role-playing. And that's a very special way of thinking. It's kind of what architects have always done. Making and designing space is in many ways the same process and practices of making and designing the world of a game, the world of a film or a TV show.

So if someone came to me straight out of high school and said, I want to be designing games, what should I do right now? I wouldn’t send them to a game design program. I’d say, do an undergraduate architecture course and then do a master’s in game design because I see it as a form of specialization.

The program that I run is essentially a special program of specialization. We acknowledge there are different types of architects. So we create a year where they can specialize and decide if they want to work in a game environment or work in film or TV or go back and work in architecture. So I do think there are certain fundamentals that are important about an undergrad architecture degree that apply in the virtual space as much as the physical.

And that’s the thing I would hold on to is I wouldn’t lose that breadth of knowledge, you know, like to really design virtual architecture. You need to read the same critical theory. But someone who’s doing a standard architecture undergrad is doing. You need to understand scale and transition and develop a language to be able to speak about those things. You need to be able to imagine what it’s like for someone to occupy a space and move through it, and to understand the impacts of a design choice you make on that experience and you need to be able to do site analysis and research. That becomes about processing speed and GPU more than it becomes about circulation and paths. But it’s still a mode of site analysis. So I guess I would go back to the previous discussion about a different kind of site.

Figure 7.4.12 Alma from drone 6.

Figure 7.4.13 Still from “In the Robot Skies.”

Figure 7.4.14

The infrastructures, the mechanics of the screen that was once existing on a network of flowing rectangles has now become the mechanical infrastructure of space. Very soon we're now going to be talking about resolution as a new class in the same way we talk about marble countertops as some definition of luxury. High-res space is gonna operate in the same kind of way. We gotta slum it in a low-res dive bar or go shopping in high-res boutiques on Rodeo Drive. We're going to talk about refresh rates and hertz in the same way we talk about material performance. We're gonna need to understand the permutations of the permeability of various materials based on Wi-fi signals.

Architecture is the creation of game environments, and sometimes they look like videogames. But as the world becomes more mediated through the lens of whatever headset or contact lens you start to subscribe to, it's just going to look like architecture — buildings, streets, urban spaces. Game design is very soon going to be architecture and interiors. The idea that we once had a game design program and an architecture program that were different — it’s going to feel very weird. It’s going to be different kinds of specialties like, “I design with concrete.” “That’s cute, I do pixels.” We’re at the bleeding edge of that, which is exciting.

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Pages in *italics* refer to figures and pages followed by "n" refer to notes.