

ARCHITECTURE AS SETTING THE STAGE:

**A framework for architectural design of virtual reality places
centering the concept of presence through Wideström,
Hernandez-Ibañez and Barneche-Naya, and Slater**

**by
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AUTHOR'S DECLARATION

*I hereby declare that I am the sole author of this thesis.
This is a true copy of the thesis, including any required
final revisions, as accepted by my examiners.*

*I understand that my thesis may be made electronically
available to the public.*

ABSTRACT

Architecture shapes our physical world – and it shapes our virtual worlds as well. Virtual architecture creates the place in which a participant in Virtual Reality (VR) can understand and be immersed in the VR experience. This research contributes a framework for conceptualizing how architecture can work in service of immersive VR experiences that evoke a feeling of *presence in the participant*. *Presence* is the sensation of “being there” in a mediated environment through the allocation of attentional resources perceived physically and psychologically. It is the authentic feeling of being in a world other than the one in which one is physically located – the ultimate goal for a heightened VR experience.

Architecture as Setting the Stage highlights *presence* felt in a VR experience as the benchmark for a successful virtual space. The framework synthesizes the concepts of Wideström’s *Stage*, Hernandez-Ibañez and Barneche-Naya’s *Virtual Utilitas*, and Slater’s *Place Illusion*, centering *presence* within each. This research is prompted by powerful VR experiences that evoked presence in myself - like the cave setting in *Scanner Sombre* and the depictions of home in *The Book of Distance*. The latter VR project, *The Book of Distance* created by Randall Okita, is used as a case study in analysing how architecture supports engagement and connection between the participant and the virtual spaces.

The concept of *Stage*, from the philosophical dissertation of *A Seeing Place (2022)* by researcher and lecturer Josef Wideström, provides language and philosophy in conceptualizing the relationship between the physical and the virtual. The metaphor of *Stage* positions virtual space as a stage, connecting concepts of how we understand theatre to how we understand VR. *Stage* highlights how audiences in theater and participants in VR negotiate their understanding of representations, whether physical or virtual, leading to agreements about their meaning and context. This research extends his metaphor of *Stage* into the language of architectural design.

Hernandez-Ibañez and Barneche-Naya’s framework *Virtualitas* from their conference paper *Cyberarchitecture (2012)* addresses the need for the analysis and translation of established architectural theory into the realm of virtual architecture, enabling architects to approach virtual design with the same depth of consideration as physical practice. The concept of *Virtualitas* redefines the traditional architectural Vitruvian Triad - *firmitas*, *utilitas*, and *venustas* - to encompass virtual architecture’s broader

considerations beyond aesthetics. Their contemporary framework informs the concept of *Virtual Utilitas* in this research, which centers presence as a key condition in VR architecture achieving *Virtual Utilitas*.

Researcher and psychologist Mel Slater’s established concept of *Place Illusion* (2005, 2022) offers psychological insight into how the construction of virtual spaces are perceived, and its influence on achieving *presence*. *Place Illusion* describes the influence of the coherent and convincing creation of place on a participant in a VR experience.

Architecture as Setting the Stage works as a conceptual bridge in understanding the properties of virtual architecture and informs three propositions of how architecture influences a participant; directing attention, relational meaning, and expression of boundaries. The propositions speculate how virtual architecture through design impacts *presence*. The framework and propositions are then applied to a VR experience case study, *The Book of Distance (2020)* by Randall Okita and the National Film Board of Canada. *The Book of Distance* is investigated through a first-person written account of observations and reactions to the experience. This descriptive passage aims to portray an authentic experience in VR. The passage is then followed by an analysis of the experience through the propositions informed by *Architecture as Setting the Stage*.

VR holds exciting potential for defining new experiences that go beyond those constrained by our physical world. Architectural knowledge, when adapted and applied to a virtual context, plays a significant role to the creation of VR experiences. Architects must confront the complexities of VR through a language for common understanding and help shape our virtual worlds.

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DEDICATION

To RKT and NUNYA - thank you for your virtual company.

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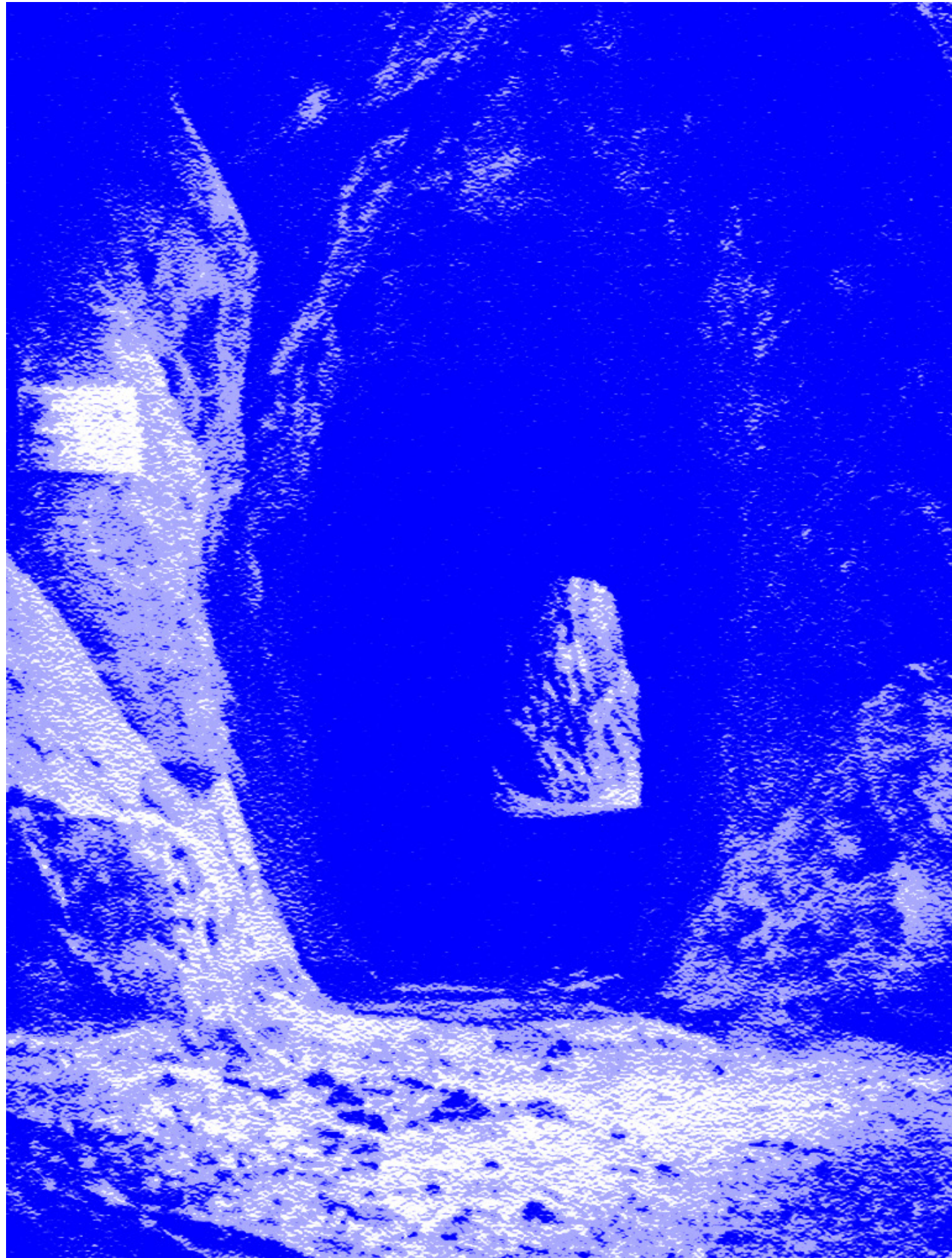


Fig. 01: A cave
Image edited by author. Original photograph taken by Jonny Gios, September 4, 2021.

I am immersed in darkness with a scanner in hand that pulses to reveal coloured dots in my vision. In the void, I feel unsure of where solid ground is, and where the boundaries are, resulting in a feeling of being completely untethered in the unknown. As the environment gradually becomes perceptible, the ground materializes, the space reveals to be compressive and textured, and I no longer feel lost and boundless, but grounded and isolated. The void fades away as I carve out a preexisting path, a rough tunnel with a slight incline only noticeable as I move forward, scanning the ground beneath my feet. As I wave the scanner around, pulsing with lasers, the main stage of a large, cavernous volume reveals itself to me at the end of the tunnel. I am in a cave. Stalactites pepper the ceiling above as it arcs down to become the ground, and deeper paths reveal themselves. In this VR experience, I explore with a feeling of awe at how the environment reveals itself at the tips of my fingers. The distinct contrast of the void to the containment of the walls of the cave is immediate and at my discretion, as I work my way forward scanning, some volumes appear completely solid, with others dotted scarcely. As I continually walk into the unknown, further exploring the cave, I feel unsettled. Curiosity moves me forward, seeing the environment take shape, balanced with fear in not knowing what will appear next out of the darkness.

I am in a cave, and I am not comfortable here.

The VR video game I have entered is titled Scanner Sombre. This game, released in 2017, embraces a distinct game mechanic of giving the player agency in revealing the environment through a virtual point cloud scanner. In this experience, I am underground in a cavernous tunnel maze, exploring the unsettling depths for a way out.

VR as an immersive medium offers the opportunity for a participant to enter a world, either a simulative or a fantastical one, and feel as if they are there. However, this setting of a cave is one I have encountered many times before in VR. There are a variety of VR experiences and games that have at least one segment where the participant finds themselves in a cave, or cave-like, place. Whether the cave is the main setting of the experience, or a short segment offering a new environment.

Caves offer immersion that evokes a feeling of isolation. I feel a push and a pull into cavernous types of spaces; one of fear and another of curiosity.

I see a cave; I understand I am in a cave – but what about this place makes me feel like I am in a cave?

There is no one answer as to why caves have been so prevalently used in VR experiences.

From a technical perspective the cave is not complex to model and does not take as much computational resources as a more detailed expression of space. The cave is an easily understandable, attainable, and low effort form of architecture in virtual space that is accessible and effective in evoking a reaction and focusing attention.

To evoke the image of a cave brings with it the reference to Plato's allegory of the cave. The influential work encapsulates commentary on the nature of reality and knowledge that resonates across various disciplines and contexts to this day. Plato's allegory offers insights into our understanding of what is reality and what is illusion. Concepts of manipulation of reality, perception and illusion emphasized in the allegory, and could be the basis of an entire thesis on VR design. The profound roots of the historical allegory considered in conjunction with my experience in the virtual cave, give particular insight into my deep emotional reactions as described in the previous passage. There are complex qualities in the virtual cave that demonstrate the power of virtual architecture, which creates virtual space, has on a participant's emotional reaction. The cave is introduced here as a simple and understandable example of a type of architecture that creates a virtual space in which an emotional response is evoked from a participant - from myself.

The excerpt of my experience in this virtual cave-like place is offered as an introduction to the questions of feeling presence in VR. Through the lens of this research the virtual cave can be understood as a type of virtual space formed by architecture that is effective at achieving engagement, connection, and evoking a feeling of presence in a participant. This thesis explores how architecture of a virtual space influences an effective VR experience. Therefore, the questions raised from being in a virtual cave can be generalized to explore:

How can architecture engage a participant in a VR experience?

How can architecture support intuitive interactions within a VR space?

How can architecture support a feeling of presence?

These questions will be explored and considered through the conceptual framework *Architecture as Setting the Stage* and applied to other virtual spaces as presented in the VR project *The Book of Distance*.

PART 1:

CONTEXTUALIZING THE FRAMEWORK

OVERVIEW

SCOPE

**A DEFINITION OF VIRTUAL REALITY AND
VIRTUAL SPACE**

**ARCHITECTURAL THEORY AND VIRTUAL
DESIGN PRACTICE**

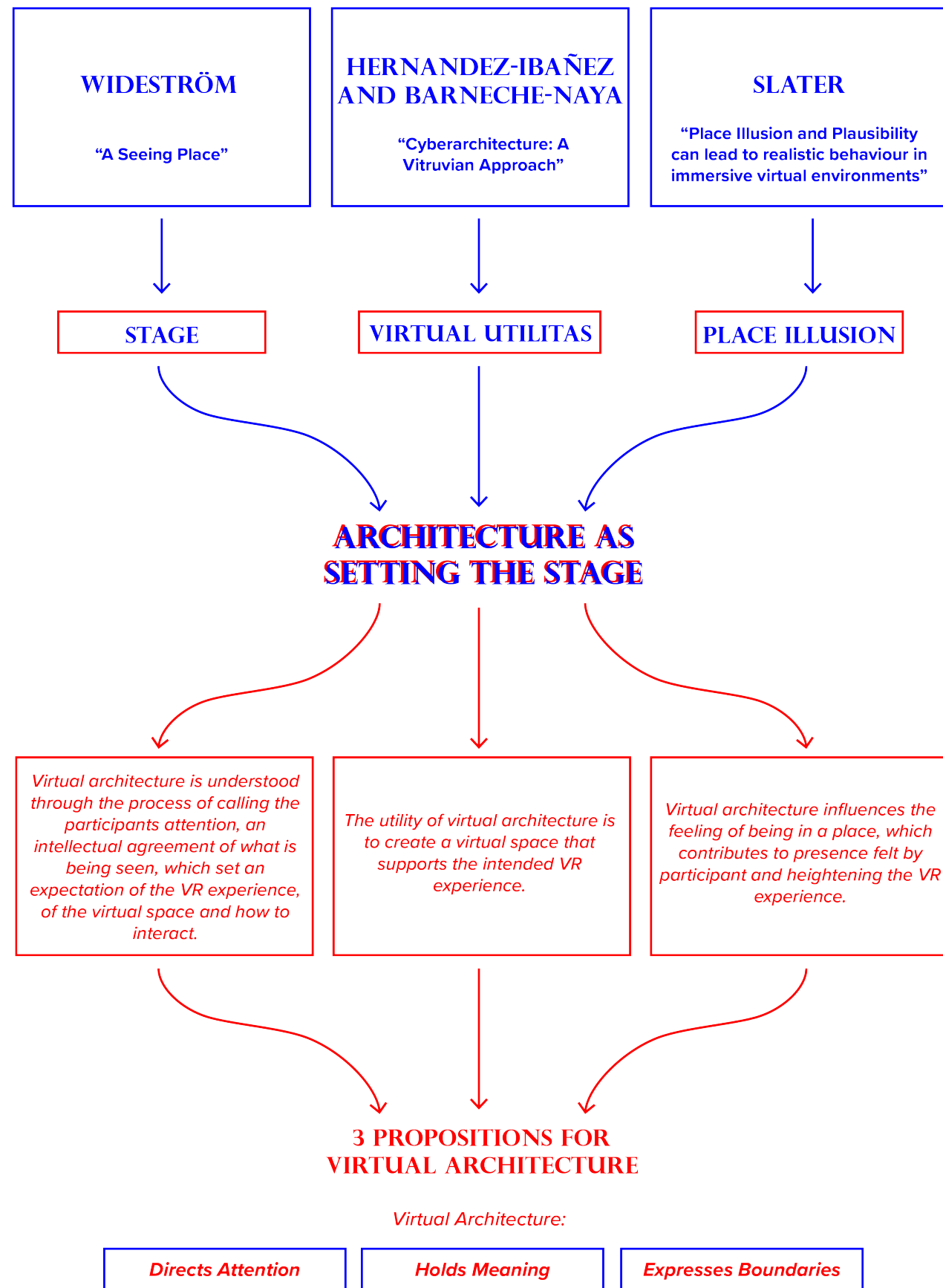


Fig. 02: Framework Architecture as Setting the Stage and associated concepts.
By author.

OVERVIEW

How are we shaping our virtual places? This thesis aims to contribute to the ongoing discourse around virtual space design in VR, emphasising the importance of designing for *presence*.

This research aims to contribute a framework for conceptualizing how architecture can work in service of immersive experiences that evoke a feeling of *presence* in the participant. Presence refers to the immersive experience of feeling fully engaged and present in a virtual environment, achieved through the focused allocation of attentional resources both physically and psychologically. It is the genuine sensation of being in a different place than ones physical surroundings – making a VR experience more engaging, and effective.

This thesis is inspired by encounters with notably impactful VR experiences, such as the cave in *Scanner Sombre* and the chosen case study project, *The Book of Distance*. Despite belonging to distinctly different genres of VR experiences, both evoked a strong feeling of presence and prompted three probing questions that this thesis explores:

How can architecture engage a participant in a VR experience?

How can architecture support intuitive interactions within a VR space?

How can architecture support a feeling of presence?

The conceptual framework synthesizes the metaphorical concept of *Stage* by Josef Wideström, the architectural concept of *Virtual Utilitas* by Hernandez-Ibañez and Barneche-Naya, and the psychological concept *Place Illusion* by Mel Salter. The resulting conceptual framework *Architecture as Setting the Stage* seeks to break down the conceptual barrier architects face when conceiving of virtual spaces by giving common language and clarity to the experiences we are creating in VR – present and future. *Architecture as Setting the Stage* is offered as way of conceiving of and constructing virtual architecture for VR experiences.

Building on the philosophical dissertation of *A Seeing Place*, by researcher and lecturer Josef Wideström, this research extends his metaphor of *Stage*, which provides an

understanding of the physical and virtual divide, into the language of architectural design. *A Seeing Place* is the doctoral thesis of philosophy by Josef Wideström published in 2020 at Chalmers University of Technology Department of Computer Science and Engineering in the Division of Interaction Design. The work incorporates Wideström's research involved VR projects in the late 1990s into the early 2020s at Chalmers MediaLab. *A Seeing Place* is a framework for understanding the interplay between physical and virtual space. Wideström's metaphor of *Stage* is unfolded and used as a starting point in understanding how architecture is understood through perception, and how that can be applied in analyzing virtual architecture design. *Stage* draws parallels between how we intellectualize and understand theatre and VR, using the concepts of agreement, negotiation, and expectation. Wideström's *Stage* metaphor emphasizes that we understand what we see in the virtual space through our attention being called and direct, through an agreement and understanding of what we see, and results in an expectation of the experience. The *Stage* is the virtual space and is defined by its set – the virtual architecture.

Utilitas, the concept of the utility of architecture as described in Vitruvius' Vitruvian Triad, is recontextualized into the virtual as described in the 2012 conference paper *Cyberarchitecture: A Vitruvian Approach* by digital architectural researchers Hernandez-Ibañez and Barneche-Naya. In the history of architectural theory, the work of Vitruvius (15 BCE) and his ten books of *De Architectura* have been profoundly influential, notably the Vitruvian Triad. The Vitruvian Triad identifies three foundational principles of architecture; *firmitas*, *utilitas*, and *venustas*, conventionally translated as strength, utility, and beauty.¹ The foundational concepts by Vitruvius have been influential in many theories over centuries and is used commonly in architectural theory and discourse as it is recognizable and understandable language in the discipline. The contemporary redefining of the Vitruvian Triad by Hernandez-Ibañez and Barneche-Naya investigates how the principles of *utilitas*, *firmitas*, and *venustas* translate into virtual space design. The research in this thesis builds off of Hernandez-Ibañez and Barneche-Naya's description of *utilitas* and proposes a *Virtual Utilitas*. *Virtual Utilitas* positions the utility of virtual architecture as working within a VR experience to support the feeling of *presence* in the participant.

Lastly, the concept of *place* is explored by drawing on the work of Mel Slater and his concept of *Place Illusion*. Slater is a distinguished researcher at the University of Barcelona, working in their department of clinical Psychology, and with their Institute of Neurosciences. With a background in computer science, virtual reality, and psychology, Slater is the co-director of EVENT Lab (Experimental Virtual Environments for Neuroscience and Technology) and coordinator of the European Metaverse Research Network.² *Place Illusion* and *Plausibility Illusion*, concepts published by Slater, have been significant concepts contributing to our understanding of how participants respond to VR experiences. In this thesis, *Place Illusion* is investigated as a connecting concept between *presence* and place making, emphasizing on the influence the construction of a virtual space has on an experience in VR.

1 Saul Fisher, "Philosophy and the Tradition of Architectural Theory," The Stanford Encyclopedia of Philosophy, (2016): 1, <https://plato.stanford.edu/entries/architecture/tradition.html>

2 Mel Slater, "Mel Slater 'About Me,'" February 7, 2024, <http://www.melslater.me/>.

Architecture as Setting the Stage positions architecture as a supporting force in the creation of the feeling of *presence* in a VR experience. Architecture is asked to support the intended experience in VR – the intended experience being what the interaction designer, client, or creator wants it to be. If the VR experience is one of adventure meant to entice awe and curiosity in an otherworldly place – then the architect's role is to ensure that the space seen by the participant embodies and elevates those goals. The architecture of a virtual space should provide the same level of depth of consideration for an experience that architects have in our physical practice. The architect should consider "what is being asked of the virtual architecture to make this experience?". That is the spark, the beginning of the design process for virtual architecture. The architecture is designed to support the intended experience – like the set to a play.

Through the synthesis of the three key concepts, *Architecture as Setting the Stage* offers the following insights on virtual architecture in VR:

Virtual architecture is understood through the process of calling the participants attention, an intellectual agreement of what is being seen, which then sets an expectation of the VR experience, of the virtual space and how to interact.

The utility of virtual architecture is to create a virtual space that supports the intended VR experience.

Virtual architecture influences the feeling of being in a place, which contributes to presence felt by participant and heightening the VR experience.

When it comes VR and architecture, there lacks investigation into architectural understanding and design thinking applied to spaces that exist only in the virtual. Most research that intersects architecture and VR technology focuses on VR as a tool for designing in the physical world, or education.³ While there has been noteworthy progress in developing virtual environments, there remains a lack of standardized methodologies and theoretical frameworks tailored specifically to virtual architectural design. By investigating the relationship between architecture and the virtual through these three key concepts, *Stage*, *Virtual Utilitas*, and *Place Illusion*, the framework works to help bridge the gap in understanding the physical-virtual divide in architecture.

The conceptual framework is then used to inform three speculative propositions for virtual architectural design. The propositions are an example of ways to critically analyze the influence of virtual architecture in a VR experience in support of *presence*, which can be applied to case studies or used to inform design decisions. The three propositions state:

3 Julie Milovanovic et al., "Virtual and Augmented Reality in Architectural Design and Education An Immersive Multimodal Platform to Support Architectural Pedagogy," in *Future Trajectories of Computation in Design, 17th International Conference, CAAD Futures 2017* (Istanbul, 2017).

1. **Calling and Directing Attention:** Virtual architecture can direct attention of a participant, to help ensure the participant's attention is kept within the experience and directed to important moments in the VR experience.
2. **Expression of Boundaries:** Virtual architecture is the perceptual expression of boundaries in a VR experience – which is important for navigation, way finding and maintaining the coherence of the Place Illusion.
3. **Meaning in Architecture:** Virtual architecture holds meaning in how it is perceived. The imagine of the virtual architecture, whether simulative or abstract, communicates meaning how the participant perceives it and understands it.

This thesis is structured into three parts: contextualizing the framework, defining the framework, and applying the framework.

Part 1, contextualizing the framework, defines the key terms of space, the virtual and virtual space, and explores the existing relationship between architecture and VR. By investigating architecture and VR through the lenses of representation and theory, the context of this research is established within of the ongoing discourse of how emerging understandings of architecture are expressed as new mediums emerge.

In Part 2, defining the framework, the conceptual framework *Architecture as Setting the Stage* is created through examining and synthesizing the three concepts of *Stage*, *Virtual Utilitas*, and *Place Illusion* while centering *presence* as the key factor for an effective experience. The framework informs three propositions for how virtual architecture can influence the feeling of *presence*.

Part 3, applying the framework, explores the framework and propositions further, by applying them to a first-person account of a VR experience as a case study. The case study is conducted through a written first-person account of the experience, and reflections on the application of research. The VR experience chosen for the in-depth case study, titled *The Book of Distance (2020)*, is written and created by Randall Okita with the National Film Board of Canada (NFB).⁴ *The Book of Distance* is a room-scale⁵ participatory narrative experience, which utilizes space and architecture in direct support to the experience. This narrative-driven immersive experience was chosen on two merits - ease of accessibility and its level of spatial engagement.

The chosen case study is conducted through a personal retelling of my reactions, observations, and feelings throughout moments of the VR experience *The Book of*

Distance. The first-person description, stylized in blue text, describes my experience to provide insight and meaning to how the VR space and experience affected me. Through descriptive writing, it shows what influenced my attention, understanding, and emotional response – giving insight into my feeling of *presence*. The passages following the first-person account examines and evaluates the impact the virtual architecture had on the experience. The second analytical passage is my response and reflections to my own experience, and instead of describing the experience through my emotions and sense, I examine the experience through the three propositions informed by *Architecture as Setting the Stage*.

This thesis is an engagement with the complexities of how architecture functions in VR. Each chapter works to engage another conceptual layer of the virtual, VR and architecture – accumulating as a new perspective of their relations. I position myself as an educator and a student, offering my work as a contribution to architects' understanding of our virtual worlds, hoping that we may have a say in what our future will look like.

⁴ Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR, https://www.nfb.ca/interactive/the_book_of_distance/.

⁵ Room-scale is a design paradigm for VR in which users can freely walk around a play area. This contrasts with a standing/seated design paradigm, in which the experience is designed for the participant to not move through the space, and interactions are either at arms length, or other movement mechanics are introduced.

SCOPE

This research approaches how architecture knowledge can be applied to the creation of VR spaces, considering VR not as a tool to be incorporated into the contemporary discipline, but as a unique medium for interacting with virtual space. This thesis proposes a conceptual framework that aids the comprehension of architecture's functionality when recontextualized into the virtual.

Research and conversations revolving around VR touch on a variety of subjects and their associated disciplines. Topics of discussion that VR intersects with include entertainment, community, technology, identity, design, economy, education, accessibility, politics, ethics, psychology, and medicine. These discussions have their interconnections and overlaps, however there is strength in focused research to contribute to the larger landscape. Kent Bye is a philosopher and experiential journalist who has been producing the podcast *Voices of VR* since 2014. Now surpassing 1200 episodes, his important journalistic work documents the complex and shifting landscape of the Extended Reality (XR)⁶ industry, engaging the perspectives of many diverse stakeholders weighing in on current conversations. Bye has interviewed pioneering artists, storytellers, and technologists who are driving the field of virtual and augmented reality.⁷ *Voices of VR* has featured moral philosopher and author of *Ethics of Virtual and Augmented Reality: Building Worlds*, Erick J. Ramirez, a notable researcher in the applied ethics of XR.

Although there are larger discussions on the landscape of VR experiences, this work concerns itself with the design thinking behind virtual spaces in VR, and how we can effectively apply architectural knowledge in the creation of virtual places.

This research creates a framework and common language for discussing how virtual architecture contributes to a feeling of presence in a participant. The framework does not claim to answer definitively how virtual architecture should be designed but is offered as an investigation into its underlying theories and concepts.

⁶ Extended Reality (XR) is an umbrella term encapsulating Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), and everything in between.

⁷ Kent Bye, "Voices of VR," March, 2024, <https://voicesofvr.com/>

In the selection of a case study, the decision to not include VR video games as a genre of VR experience was made to be able to focus on the architectural design of virtual spaces in support of an overall experience. Although VR video games hold powerful experiences, many are focused on and designed around the craft of VR game mechanics. Virtual architecture does play a role in the environment design of VR video games; however, it is difficult to distill the influence of virtual architecture in an experience when the focus of the experience is elsewhere. To ensure that the research was deliberately centered on the relationship between virtual architecture and its contribution to the feeling of *presence*, priority for the research and case study was placed on VR projects and art pieces that have strong spatial design incorporated into the experience.

It must be noted that there is a broad issue with the general availability and accessibility of VR experiences. VR projects in the art and design world have been frequently displayed in galleries or exhibitions but are rarely accessible online to be experienced outside the gallery setting. *Radiancevr.co* is a website and platform for VR experiences in art, with the mission statement of being an online archive and research platform for VR in visual art. Radiance's database of projects are only made available through their app on the Meta Quest VR system and can only be experienced through 360-degree video.⁸ Steam by Valve, a gaming platform, hosts the largest array of accessible VR experiences which opens the door for accessing more hardware intensive experiences. Therefore, the choice of case study was limited to what was accessible as a fully immersive and interactive VR experience. *The Book of Distance* by Randall Okita was selected as a free VR experience that strongly utilizes virtual space construction in a narrative based experience.

8 Tina Sauerlaender and Philip Hausmeier, "Radiance VR," November 2023, radiancevr.co.

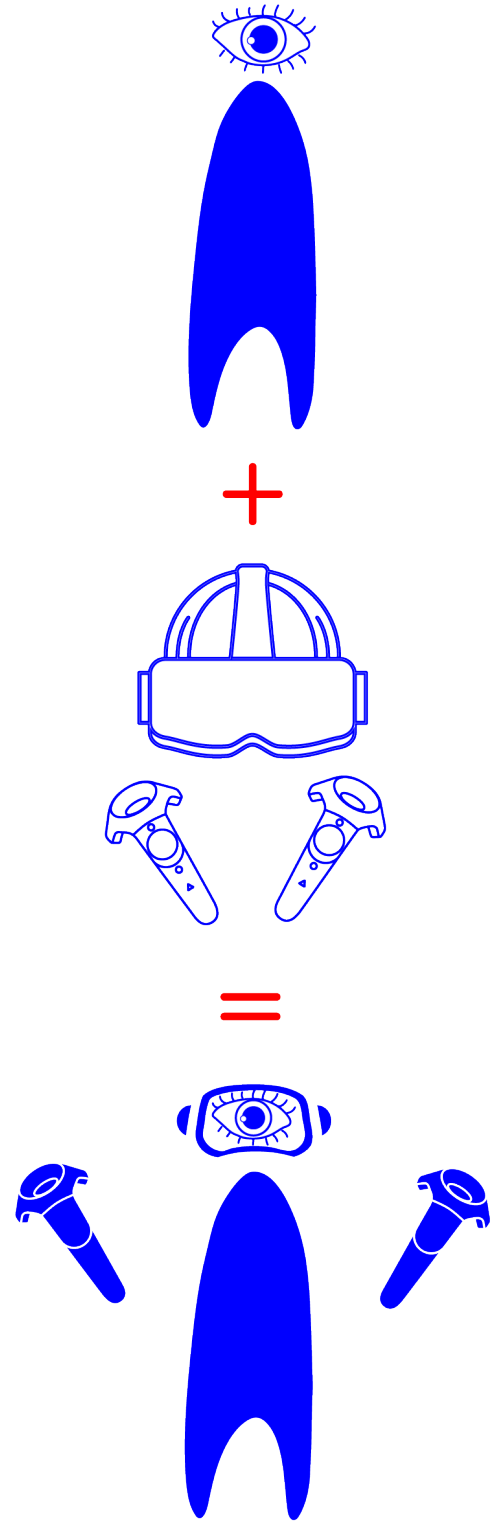


Fig. 03: Head Mounted Display and controllers.
By author.

A DEFINITION OF VIRTUAL REALITY AND VIRTUAL SPACE

VIRTUAL REALITY

VR is the ultimate computer-generated representation in which a participant has the potential to not only be a passive viewer, but also engage in real-time, immersive interactions. Since its advent, VR has captivated many, being used to create and experience spectacles and worlds that are 'more than real', seemingly only limited by our imagination and technological advancements. It is alluring, it is immersive, and it is full of potential.

Architects have sought three-dimensionality in their representations for centuries. In 1415, Filippo Brunelleschi's groundbreaking demonstrations of a 'Renaissance Virtual Reality' showcased the power of perspective in representing architectural scenes with extreme accuracy. The Brunelleschi apparatus was a demonstration of the identity between what is seen and what is represented. The perceptual identity between physical space and representation had a significant impact on the historical and ideological context, contributing to philosophical discussions of representing the world in the fifteenth century.⁹

The concepts of VR have been explored through fiction since 1935 and the technology for making those concepts a reality has existed since the 1960s.¹⁰ However, humans fascination with the illusion of a three-dimensional space and objects predates the invention of the technology that has led to contemporary VR technology. Illusions such as *trompe l'oeil*¹¹ give a sense of three-dimensionality, achieving the full effect only when viewed from a fixed position. The history of VR and architecture is one that runs deep, as the evolution of tools have influenced the design and creation of architecture.

⁹ Daniela Bertol and David Foell, *Designing Digital Space: An Architect's Guide to Virtual Reality* (New York ; Wiley, 1997): 14-15.

¹⁰ Bertol and Foell, *Designing Digital Space*, 5-20.

¹¹ *Trompe l'oeil* is French for 'fool the eye' and denotes the painted representation of a three-dimensional scene, rendered in such a way that from a particular viewpoint the scene looks to be three dimensional. Bertol and Foell, *Designing Digital Space*, 20.

Many developments in perspective lead to a better understanding of the two human eyes and binocular vision. In 1838 English scientist and inventor of the Victorian Era, Sir Charles Wheatstone, was the first to describe stereopsis – the component of depth perception through binocular vision that allows for the ability to perceive the world in 3D.¹² His research led to the earliest types of stereoscopes, an invention that uses two images taken from different viewpoints creates the illusion of depth and immersion when viewed properly. This would become the first device developed that engaged binocular vision to create a very realistic effect. As photography became popularized, different stereoscope devices were created for consumer use and popularized in Europe through the nineteenth century.¹³

The stereoscope would regain popularity branded and mass produced as the *View-Master*, introduced in 1939.¹⁴ The stereoscopes of the twentieth century and its successor, the *View-Master* were popularized in the United States with images of landscapes and monuments being the most popular. This technology allowed for an exciting visual experience of simulated 3D views of places that were considered attractions. Like following mediums in history, the stereoscope in the twentieth century gave the public access to visuals and knowledge that they may not have been able to access otherwise.¹⁵

Following the popularity of photography and drawing – and their manipulations - we jump to the digital revolution. The advent of computer-aided design (CAD) allowed architects to create digital models, providing a transition from static drawings to dynamic, manipulatable representations. Visualization techniques evolved with the introduction of 3D modeling tools, leading to the first VR machine patented in 1962 by cinematographer Morton Heiling, named the *Sensorama*.¹⁶ The *Sensorama* used a stereoscopic 3D screen that could fully immerse a single individual in a viewing experience.

In 1975 Krueger's *VIDEOPLACE* was the first interactive VR platform. *VIDEOPLACE* did not use goggles or gloves, instead using a combination of computer graphics, projectors, video cameras, video displays and position-sensing technology. The experience consisted of dark rooms with large video screens to surround and immerse the participant in virtual experience.¹⁷

In 1985, company VPL Research, Inc became known as the first company to sell VR goggles and gloves, including the *DataGlove*. The *DataGlove* was a wired glove

worn on the hand that could monitor movements and transform them into inputs. Four years later, Mattel Inc released the *Power Glove* based on the *DataGlove*, and was a controller accessory for the Nintendo Entertainment System.¹⁸

The Binocular Omni-Orientation Monitor (BOOM) is a small box containing two VRT monitors that can be viewed through two eye holes, created in 1989 by Fake Space Labs.¹⁹ Combining the *DataGlove* with the BOOM created an experience in which a participant could see the virtual environment as well as manipulate it, like the 1990 NASA project *Virtual Wind Tunnel* that allowed the participant to manipulate streams of virtual smoke.²⁰

CAVE (Cave Automatic Virtual Environment) systems, invented in 1992, further pushed the advancements of immersive capabilities within 3D models using stereoscopic projections.²¹

From illusions of three-dimensional spaces to total immersive rooms of projections – each invention and innovation strove for increased immersion in their interaction with virtual realities.

Those advancements all lead to the current VR technology most common today: a head mounted display (HMD) with a near-eye display²² that encompasses a user's full vision, and hand controllers. The HMD is used alongside hand controllers that use pose tracking, a system that detects the precise angle and position of the HMD, hand controllers, and any other body tracking sensors. In VR, the user's perception is based on purely virtual information. This is different to augmented reality (AR), also referred to as mixed reality (MR), or extended reality (XR), as these VR-style experiences layer virtual content with the physical world. Although there is overlap of capabilities between both styles of VR technologies, an exclusively virtual experience holds the greatest potential to create worlds and experiences beyond what we have in our physical world.²³

In the contemporary context, virtual reality is defined as a set of images and sounds,

12 Bertol and Foell, *Designing Digital Space*, 20.

13 Dom Barnard, "History of VR – Timeline of Events and Tech Development," Virtual Speech (blog), 20 February, 2023, <https://virtualspeech.com/blog/history-of-vr>.

14 Bertol and Foell, *Designing Digital Space*, 19-32.

15 Bertol and Foell, *Designing Digital Space*, 19-32.

16 Barnard, "History of VR – Timeline of Events and Tech Development".

17 Barnard, "History of VR – Timeline of Events and Tech Development".

18 Barnard, "History of VR – Timeline of Events and Tech Development".

19 Asmaa Saeed, Lamya Foad, and Lamiaa Fattouh, "Environments and System Types of Virtual Reality Technology in STEM: A Survey," *International Journal of Advanced Computer Science and Applications* 8, no. 6 (2017), <https://doi.org/10.14569/ijacsa.2017.080610>.

20 Saeed, Foad, and Fattouh, "Environments and System Types of Virtual Reality Technology in STEM: A Survey."

21 Saeed, Foad, and Fattouh, "Environments and System Types of Virtual Reality Technology in STEM: A Survey."

22 High resolution screens place very close to the eyes to create a virtual image in the field of view of one or both eyes.

23 Laia Tremosa, "Beyond AR vs. VR: What Is the Difference between AR vs. MR vs. VR vs. XR?," Interaction Design Foundation - IxDF, July 25, 2023, <https://www.interaction-design.org/literature/article/beyond-ar-vs-vr-what-is-the-difference-between-ar-vs-mr-vs-vr-vs-xr>.

produced by a computer, which seem to represent a place or a situation with which a person can engage.²⁴

VIRTUAL REALITY: A HIGHLY IMMERSIVE MEDIUM THAT MEDIATES PERCEPTION OF A 3D ENVIRONMENT THROUGH COMPUTER HARDWARE AND SOFTWARE.

The domain of VR has primarily been in that of visualization, interaction design, computer graphics, video games, and 360 videos. Engagement with VR extends across a variety of disciplines and industries, ranging from philosophers engaging with existentialism, to social scientists investigating ethical implications, to designers and artists exploring aesthetics, and to large tech companies investing in the consumer usability.

The technological advancements of 3D modeling and visualization tools quickly became of interest in the world of architecture as a representation tool in the form of contemporary VR technology.²⁵ As the gap between reality and fiction, there has been ongoing development leading to the creation of fully immersive virtual worlds - pushing the envelope on VRs earlier applications. VR, as a technology, has initiated the development of virtual spaces and entire virtual worlds. Although we cannot predict the evolution of immersive technologies, but virtual worlds have been an increasingly part of our lives with the accelerating popularity of VR.

In most cases, these virtual spaces are simulative models recreating the familiar architecture of physical art galleries, simple volumes confined by white walls within which virtual art appears. The architecture of these virtual spaces mimics our physical world with no additional benefit or appeal.

In this quickly growing virtual landscape, architects have rarely been stakeholders in the development of the technologies, their applications, and their implications. As our virtual spaces have become more complex, and more accessible than ever before, a complex relationship has emerged between our physical spaces and our virtual ones that speaks directly to the interests and expertise of the architectural discipline. Questioning how we think about and create our virtual space from an architectural perspective raises priorities akin to the priorities with which architects have been concerned throughout history. Priorities such as utility, durability, beauty, and form working harmoniously, as an example.

The role of the architect is to mindfully design the spaces in which interactions occur. In the virtual it is no different. To better design for interactions and experiences in VR, the architect must understand how architecture is perceived in this new medium, and design accordingly.

24 Cambridge Advanced Learner's Dictionary & Thesaurus, Cambridge University Press, s.v. "Virtual Reality, n.," accessed December 12, 2023. <https://dictionary.cambridge.org/dictionary/english/virtual-reality>

25 Bertol and Foell, *Designing Digital Space*, 36-50.

So, is science fiction becoming reality? And if so, how do architects fit into this new age of VR habitation?

There are many fundamental questions to address before those broad questions can be answered. What is architecture in the virtual world? Questioning 'what is site, what is materiality, what is form in this new medium?' opens new possibilities and poses: What is the role of the architect in the virtual?

VR technology is both a "tool" as well as a "world". VR is a digital medium that conveys images, information, or messages to a user, as any medium does. However, when we talk about VR as a world, it implies that VR can be so immersive and persuasive as a medium that a participant can experience a sensation of actually being in that virtual world. Therefore, VR is an interface for enabling *presence* in virtual space.²⁶

26 Josef Wideström, "A Seeing Place: Connecting Physical and Virtual Spaces" (PhD Dissertation, Chalmers University of Technology, 2020): 37.

SPACE

Virtual space is space – so what is space? The definition of space has caused debate across many disciplines throughout history.

According to Gottfried Wilhelm Leibniz, an influential figure in relational theory of space in the seventeenth century, space exists solely in the relations among bodies, and is not an independently existing entity.²⁷ This definition centralizes the relationship between physically distinguished bodies as they exist together, defining boundaries, and as a body moves relative to another, the space changes with it.²⁸ In language more related to architecture, the Leibniz notion of space is understood as the space between physical entities of material – such as a floor to ground to ceiling, or a person to a wall.

The concept of space has always been of intense interest to architects; however, it was not prominent in the architectural vocabulary until the 1890s, when it was developed as an architectural category by German writers in modernist projects. Since then, spatial studies within the discipline of architecture in the Western world has become pervasive and splintered into a variety of schools of thought and definitions. Two main perspectives on space in architectural studies and discourse can be categorized as followed: volumetric theories and aesthetic theories.²⁹ These theories form a basis of understanding two major perspectives on architectural space that persist in many contemporary architectural philosophies.

Volumetric theories center space as an enclosure in their definitions. In this school of thought whose origins can be credited to nineteenth century architecture Gottfried Semper³⁰, it posits that architecture's first impulse is to enclose space, and the role of architectural elements is to make enclosed space visible. This is consistent with a Vitruvian tradition that the essential aspect of architecture is to separate the interior from the exterior.³¹ This inside-outside relation and understanding of space translates into how we experience natural landscapes, as configurations such as caves and canyons give the sensation of inside, while large open expanses of landscape would give the sensation of openness - of outside.³²

Aesthetic theories centers space as a mental construction, understanding space as the aesthetic affect of architecture on subject. Aesthetic definitions of space pay attention to the process of perception of space and lends itself beyond the discipline

27 Richard T. W. Arthur, "Leibniz's Theory of Space," *Foundations of Science* 18, no. 3 (August 1, 2013): 501, <https://doi.org/10.1007/s10699-011-9281-4>.

28 Erdem Üngür, "Space: The Undefinable Space of Architecture," 2011, <https://www.researchgate.net/publication/321155578>.

29 Üngür, "Space: The Undefinable Space of Architecture."

30 Üngür, "Space: The Undefinable Space of Architecture."

31 Üngür, "Space: The Undefinable Space of Architecture."

32 Bertol and Foell, *Designing Digital Space*, 55-56

of architecture and share in the created space of art, animated from within.³³

These two understandings of space, the material and the psychological, do not exist in opposition – they work together to define not just what space is, but how we understand space. Space, for the sake of this thesis, is considered having two significant principles. The first is that space is formed between two bodies in relation to one another. The second is that space exists independently to being observed, but only is given meaning when perceived by a person. The following definition of space, as described by Wideström, encompasses this position:

SPACE: AN ENTITY CONSTITUTED BY THE RELATIONS BETWEEN OBJECTS AND FORMED BY STRUCTURE. SPACE EXISTS WITHOUT OBSERVATION BUT APPEARS THROUGH HUMAN INTERACTION.³⁴

It is necessary in this research to clearly establish definitions and meanings being used, as a universally understood lexicon has yet to be popularized across all the participating disciplines.

33 Üngür, "Space: The Undefinable Space of Architecture."

34 Wideström, "A Seeing Place," 42.

THE VIRTUAL

The virtual can be understood in many ways, and in the contemporary associated with digital technologies – such as VR. Virtuality as a philosophical concept in Deleuze builds on Proust's idea of a memory.

“The virtual is opposed not to the real but to the actual. The virtual is fully real in so far as it is virtual. Exactly what Proust said of states of resonance must be said of the virtual: ‘Real without being actual, ideal without being abstract’; and symbolic without being fictional.”³⁵

To understand how architecture translates into virtual space, we must also understand what the virtual means. The word virtual comes from the Latin *virtus*, meaning potential or power, later understood as *virtualis* which had a meaning akin to how we understand the word *virtue* today. *Virtue*, as a personal quality, was how a person whose actual existence embodied or reflected a moral and ethical ideal. In the context of today, the meaning of ‘the virtual’ still holds the concepts of *virtue*,³⁶

“The virtue of something is its “capacity” or efficacy”³⁷

The virtual as something that is but yet to be actualized – become real - means it holds an infinite well of possibilities. It is the almost tangible, the almost real. When we inhabit the virtual then we are in virtual space. Virtual space exists through perception, and it affects and is affected by seeming, not being:

“The virtual seems to be the counterfeit of the real; the virtual; has effects by seeming, not being.”³⁸

The virtual has existed as a concept long before the internet age. It has existed in forms of ritual, story, and the built form of architecture and environments that hold fantasies. Examples of historical virtualism can be found in the simulations and representations of real-world artefacts that take on a life of their own; maps as a way to contain and characterize complex landscapes, or the drama of Baroque churches meant to immerse viewers and transcend to the heavens – but not actually.³⁹

In *The Virtual*, published in 2003, he explores the concept of the virtual and its role in shaping society and culture. The author Rob Shields is a Canadian professor,

35 Gilles Deleuze and Charles T Wolfe, “The Actual and The Virtual,” *ANY: Architecture New York*, no. 19/20 (1997): 19.6-19.

36 Rob Shields, *The Virtual*, (New York: Routledge, 2003), 4.

37 Donna J Haraway, “The Promises of Monsters: A Regenerative Politics for Inappropriate/d Others,” *Cultural Studies* (Routledge, 1992), 305–47, <https://doi.org/10.4324/9780203699140-22>.

38 Shields, *The Virtual*, 4.

39 Shields, *The Virtual*, 7.

sociologist, and cultural theorist whose work spans architecture, planning and urban geography. In *The Virtual*, it opens with deconstructing the basic meanings of the virtual, Shields pulls apart the concepts of the virtuality as real yet in opposition to the actual and the virtuality of our digital forms. He brings to light the speed at which contemporary virtualization, through the widespread use of computers, the internet, and increasingly immersive technologies, created a culture that has deep involvement with the virtual, but with little understanding. The virtual and the physical are not in opposition, in fact they are deeply entwined and influence one another – the virtual although not actual, has real effects on our world, lives, and interactions. The virtual has never been and will never be tied to a singular type of experience, theory, or technology. To understand how the virtual continues to affect our material world it is important to learn from the manifestations of the virtual both past and present.

“The virtual implies a willingness to believe in the reality of dreams and marks the concern with history and the past as well as creative change.”⁴⁰

THE VIRTUAL: THAT WHICH IS SO IN ESSENCE BUT NOT ACTUALLY SO.

VIRTUAL SPACE

American philosopher and writer, Susanne K. Langer writes in her work *Feeling and Form* in 1953 about the creation for forms symbolic of human feeling using the term *virtual space in painting*. According to Langer, *virtual space is what is created in a work of pictorial art and exists in the apparition of a painting*.

“Virtual space, being entirely independent and not a local area in actual space, is a self-contained, total system. Whether it be two-dimensional or three, it is continuous in all its possible directions, and infinitely plastic. In any work of art, the dimensionality of its space and the continuous character of it are always implicitly assured. Perceptual forms are carved out of it and must appear to be stilled related it despite their most definite boundaries.”⁴¹

Langer suggests that virtual space is autonomous in character, the virtual space created in one painting is independent of another. A virtual space exists as an organic whole. Although this idea of virtual space from 1953 predates the digital, the understanding already existed of a virtual space as being an abstract space created through representation and through seeing, contemplation and understanding.⁴² Langer's definition of virtual space, applied to the contemporary, lends itself to the understanding of other abstract spaces understood in the digital landscape of the contemporary, such as ‘image space’ and ‘digital space’.⁴³

40 Shields, *The Virtual*, 7.

41 Susanne K. Langer, *Feeling and Form*, 1st ed. (New York: Scribner, 1953), 73.

42 Ranjan Ghosh, “Susanne K. Langer's Aesthetics of Painting and Some Indian Art,” *Indian Philosophical Quarterly* 4, no. 3 (1977), 298-301.

43 Ghosh, “Susanne K. Langer's Aesthetics of Painting and Some Indian Art.”

The meaning of virtual space is contemplated in the work of Wideström, who explores virtual space as an intersection of image space and digital space. Image space is the abstract space accessed through images and relates to human knowledge found in art and visual culture. Image space can be understood as a contemporary translation of Langer's definition of virtual space in painting.

Digital space relates to natural sciences and is the abstract space constructed from digital information. Digital space is constructed from digital information – images, text, sounds – mediated by technology.⁴⁴ Examples of digital spaces include much of the internet in the forms of webpages, platforms, games, and messaging applications. A digital image does not need to simulate a three-dimensional space to be considered a space.

Virtual space is a perceivable and digital non-physical space. Not all digital spaces are virtual spaces, however only digital virtual spaces are considered in this research into VR. Virtual space is space that is not physical, yet not imaginary. This definition highlights the perceptible interactivity that VR allows, and conceptually connects architectural space understanding.

VIRTUAL SPACE: A PERCEIVABLE AND DIGITAL NON-PHYSICAL SPACE.

Virtual space is space. The definitions and understanding of space are not lost when 'virtual' is next to it.

44 Wideström, "A Seeing Place," 22.

ARCHITECTURAL THEORY AND VIRTUAL DESIGN PRACTICE

The landscape of discourse on the virtual has been dominated by a wave of technological breakthroughs in VR technology. Virtual space has moved from the conceptual to become a practical and tangible space that touches our real lives. However, through history there have been many great thinkers across a variety of disciplines who engage with the concepts that come with the territory of new technologies being integrated into our lives. Categories such as media theory, future technologies and theories, interaction design, VR technology, psychology and perception in VR, and architectural theory each shed unique insight and innovation in how we conceive of and use new technologies, such as VR.

The people and works from the last half century, such as the ones included on the timeline graphic on the following page, have paved the way for the landscape of VR technologies and applications that we have today. Some of works encapsulate new frameworks and language for understanding, which have helped further interdisciplinary discourse and innovation.



Fig. 04: Curated timeline of research and work related to VR development.
By author.

- 1964** **Marshall McLuhan**
 “Understanding Media: The Extensions of Man”
 Category: Media Theory

McLuhan’s concept that “the medium is the message” is fundamental in understanding how technologies like VR shape human interaction and perception.
- 1977** **Christopher Alexander**
 “A Pattern Language”
 Category: Architectural Theory

Alexander’s emphasis on human-centered design principles influences both the physical construction and the virtual design spaces in VR.
- 1995** **William J. Mitchell**
 Title: “City of Bits”
 Category: Interaction Design and VR,
 Architectural Theory

Mitchell investigates the intersection of digital and physical architectures, emphasizing the transformative role of digital environments.
- 1997** **ANY Magazine**
 The Virtual House Competition
 Category: Architecture, Future Technologies and Theories
- 2004** **Neil Leach**
 “Digital Tectonics”
 Category: Future Technologies and Theories
- 2009** **Mel Slater**
 “Place illusion and plausibility can lead to realistic behaviour in immersive virtual environments”
 Category: Psychology and Perception in VR
- 2012** **Hernández-Ibáñez and Barneche-Naya**
 “Cyberarchitecture: A Vitruvian Approach” from 2012 International Conference on Cyberworlds
 Category: Architectural Theory and VR
- 2020** **Josef Wideström**
 “A Seeing Place”
 Category: Future Technologies and Theories

For example, the term digital tectonics has been used extensively by contemporary architectural theorist Neil Leach, refers to a new paradigm of thinking in architectural culture. Tectonics is a term closely related to the physical properties of matter in architecture and construction.⁴⁵ As more digital tools have been integrated into architectural practice, the long-standing dynamic between the digital and the tectonic, the immaterial and the material, has shifted from being in opposition to working in tandem. The digital, which offers possibilities for creating alluring forms, and the tectonic, which speaks to the interaction between material and construction, now work hand in hand as technology has been developed in service of marrying the two. Leach writes that we are in a new age of culture in architectural practice, and as we become more dependent on the capabilities afforded by new technologies, digital tectonics reveals itself as a useful framework for conceptually linking the use of digital tools and the process of constructing material architecture.

This paradigm, when applied to virtual architecture in VR, takes on new meanings and understandings as the material of the physical world is removed. In VR, the form derived from digital processes and the construction of the matter becomes one and the same. However, the critical understanding of how the digital influences the tectonics of the virtual still remains relevant. Through the framework of digital tectonics, the material of virtual architecture fundamentally changes into something new and unfamiliar to physical architecture.

Another example of work that has an interdisciplinary perspective on addressing new technologies and the virtual is the architecture competition “The Virtual House” published by ANY magazine in 1997. Six prominent architecture teams participated in the competition, in which their reflections in the virtual were visionary, concerned with issues of memory, nature, semiotics, and philosophy. The six notable architects included in this competition included Toyo Ito, Alejandro Zaera-Polo, Jean Nouvel and Lois Nesbitt, Peter Eisenman and Ingeborg Rocker, Herzog and de Meuron, and Daniel Libeskind.⁴⁶

John Rachjman writes the description of The Virtual House in the 1997 ANY publication, in which he opens with the problem of the “Virtual House”. The problem being that the virtual looks like nothing we already know or see. Rachjman write within the description of the Virtual House, that it is not possible to be created. Instead, Rachjman offers speculations of what the question of the Virtual House as an architectural design problem raises.⁴⁷ Architects have thought in terms of utopia and ideological program – the virtual introduces another perspective of thought.

45 Neil Leach, David Turnbull, and Chris Williams, Digital Tectonics (Hoboken, NJ: Wiley-Academy Press, 2004), 4.

46 Rajchman, John. 1997. “The Virtual House: A Description.” ANY: Architecture New York, no. 19/20: 20.6-20.7. <http://www.jstor.org/stable/45048860>.

47 Rajchman, John. 1997. “The Virtual House: A Description.”

“It says “no” only to affirm possibilities through a virtual construction that says “yes” as well as “and”.”⁴⁸

The evocative briefing written by Rajchman shows the fascination and appeal to connecting the deep conceptual of the virtual and architectural design – as well as challenges that synthesis brings. Starting from the philosophy of the virtual and meshing with architectural thinking, The Virtual House created work and discussion that has been quite formative in the conceptual development of virtual architecture.

The work of the architects was published alongside work of notable philosophers and thinkers on the virtual, culminating in a conversational discussion on the future of the virtual in architecture. Through the competitions, insights theories discussed about the virtual in 1997 still inform the underlying concepts of the virtual, however with the changes in the technology that allows for our interaction with the virtual brings with it a new complexity in understanding virtual space, and how to create it.

While the research in this thesis has the intended audience of architectural designers aspiring to navigate the complex landscape of VR space creation, it is important to recognize the expansive interdisciplinary history that underpins our current understanding of VR at both surface and deeper levels.

The framework Architecture as Setting the Stage synthesizes three bodies of work from the perspective of philosophy from the work of Josef Wideström, classical architectural theory as reinterpreted by architectural researchers Hernandez-Ibañez and Barneche-Naya, and cognitive psychology from the work of Mel Slater. By focusing on the concepts coined by these three researchers, the proposed framework engages three important disciplines that each touch on how we perceived space in VR from their own perspective. The works complement one another in emphasizing the importance of presence in VR as a benchmark of effective VR experiences.

These three key readings are drawn from recent discussions on VR and architecture, building on the debates about digital media that have transformed the theory and practice of architecture over the past six decades. The works highlighted in the timeline each exert a significant influence on VR discussions and research, starting with canonical sources from the 1960’s that lay the groundwork for contemporary debates and the three key theories in this thesis. Mel Slater’s description of ‘*Place Illusion*’ offers terms that aid in expressing the significance of the virtual environment and place-making in VR, and its influence on the creation of presence. Slater’s 2009 work addresses the elusive qualities of presence in VR and provides insight on how psychologically we perceive a place in VR. Slater’s work in the context of virtual architecture provides a strong link between the role architecture has in place-making

to the psychological evocation of presence. In their 2012 work, Hernandez-Ibañez and Barneche-Naya revisit the foundational Western text of Vitruvius, translating the terms into a detailed framework that describe traditional architectural qualities into their equivalents in digital media. Their work centers architectural principles in the discussion of digital media, and how their intersection creates new understandings of architecture in a virtual medium. Finally, the conceptual metaphor of *Stage*, coined by Josef Wideström in his recent 2020 dissertation, provides a fundamental framework for understanding how space is created, perceived, and holds meaning in a virtual context. *Stage* explains how architecture in the virtual context acts as an orienting boundary and relays contextual meaning of the space, which are crucial elements for establishing the architectural dimensions of VR perception.

The architectural theory tradition encompasses the analysis and explanation of architectural works, styles, movements, and modes of design. Critical frameworks for understanding architecture and architectural design provide a common language developed over the centuries and are a foundation for furthering development of architectural discourse, design, and creation. To engage with virtual architectural design, we must also engage in the theory of virtual architecture. The architect’s unique tool set can bring a new layer of understanding to the creation of VR spaces and worlds– but first we must understand the components of VR, beyond physical headsets and cables.

Next we look to a curated set of terms, frameworks, publications, and manifestos that aid in furthering discourse and understanding of virtual architectural design.

⁴⁸ Rajchman, John. 1997. “The Virtual House: A Description.” *ANY: Architecture New York*, no. 19/20: 20.6-20.7. <http://www.jstor.org/stable/45048860>.

PROPOSITIONS FOR VIRTUAL ARCHITECTURE, SPACE POPULAR

In 2018, the architect duo Lara Lesme and Fredrik Hellberg under their studio Space Popular, presented a solo exhibition at ArkDes in Stockholm entitled “*Value in the Virtual*”.⁴⁹ This immersive installation presented two simultaneously active environments, one physical and one virtual, in which visitors could experience a blending of their Stockholm environment as it dissolved, mutated, and transformed through a Virtual Reality experience. The six constructed environments referenced real world places in Stockholm. Included with the studio’s immersive experience were 10 Propositions for Virtual Architecture. These propositions clearly define their position on the future of the virtual worlds and serve as the foundation for their work in the evolving design landscape for the virtual.⁵⁰

Space Popular’s work specifically engages with the role of architecture in the contemporary creation of virtual worlds. These propositions frame an ambitious view of the future of virtual worlds and their intertwining with our physical ones. They concern themselves with many factors with which architects engage in our physical world and propose how those things will translate into the virtual, with the impact and influence of architecture at the center. These propositions focus primarily on how architecture will behave in the larger network of virtual worlds and infrastructure –they do not touch on how the practice of architecture will translate as a design issue, or how architecture will behave between an individual in the virtual world and the virtual space the architecture is helping to create. *Architecture as Setting the Stage* looks to expand on the invaluable work started by Space Popular by positing propositions for how architecture as design practice can work in service of successful VR places.

The propositions by Space Popular present an optimistic and alluring list of statements that express our potential future within virtual worlds. Although bold in their claims, they touch on many perspectives of how new technologies have changed our relationship with the world as we knew it in the past. Many points on the list, notably proposition 8 and 9, are already realities on how we interact on the internet and have changed how we interact with art and commerce online. These propositions bring attention to how the projected oncoming virtual worlds will change a variety of our societal elements, such as economics, fashion, societal values, avenues of self expression and more. Space Popular is anticipating the future and thinking of how architecture will change in that future. It is important to anticipate the changes new technologies bring to our world and take the wheel in driving our future. It is important; it is necessary; and—even if these propositions do not become our reality—these frameworks and speculations prepare us to consider our futures within virtual places.



49 “Space Popular: Value in the Virtual,” e-flux Architecture, October 26, 2018, <https://www.e-flux.com/announcements/214128/space-popularvalue-in-the-virtual/>.

50 Lara Lesmes and Frederik Hellberg, “Propositions for Virtual Architecture,” Space Popular, 2018.

Fig. 05: Image from Value in the Virtual exhibition by Space Popular (facing page, right) Laura Lesmes and Frederik Hellberg. “Propositions for Virtual Architecture.” Space Popular, 2018.

Fig. 06: Photo from Value in the Virtual exhibition by Space Popular (facing page, left) Laura Lesmes and Frederik Hellberg. “Value in the Virtual.” Space Popular, 2018.

Fig. 07: Ten Propositions for Virtual Architecture by Space Popular (next page) Laura Lesmes and Frederik Hellberg. “Value in the Virtual.” Space Popular, 2018.

10 PROPOSITIONS FOR VIRTUAL ARCHITECTURE

Published 18th September 2018 as part of the [exhibition catalog](#) for the exhibition [Value in the Virtual](#) at ArkDes, Sweden's national centre for architecture and design.

Lara Lesmes & Fredrik Hellberg 2018

1. Virtual content will radically alter the value of architecture

The limitations that define our physical environment—such as gravity, light, or material resources—are of no concern in virtual worlds. As such, fundamental assumptions of what, how, why and for whom architects design will be recast.

3. Virtual worlds will intensify our interest and appreciation of physical environments

Virtual worlds are an invention of the physical – they rely on our haptic knowledge of the world around us. In a similar way to how fiction shapes our lives, simulated reality will intensify our interest in and care toward the physical world.

2. Values will be both gained and lost in the transition to the virtual

Just as the elevator allowed and then encouraged us to dwell higher above the ground, new spatial scenarios will lead to different patterns of life. Spatial qualities yet to be imagined will change the ways in which we value our environment.

4. Architecture will be appreciated by the spatial experience it provides

Virtual environments will have the capacity to shape, lift, suppress, and influence us. Architecture in the virtual will be able to change at the speed of thought and, being freed from its primary role as shelter, will lead with experience as purpose.

5. Spatial experiences will become increasingly specific and tailored to its dwellers

Redecorating your virtual home will be as simple as changing clothes. Rapid spatial customisation will increase demand for content and objects in virtual marketplaces.

7. Peripheral attention will broaden from objects and faces to facades and streets

Physical architecture is largely static and, as a result, peripheral to our perception of everyday lived experience. Virtual architecture has the potential to be as interactive as human beings are with one another.

9. Social appreciation will manifest visually as embellishments to our attire and environments

In virtual worlds, an evolved form of 'social media' will be tethered to our avatars. Social interactions will become intensely spatial experiences.

6. Planetary scale virtual worlds will coexist with their physical counterparts

The future Internet will carry a persistent map of the entire physical world. Virtual worlds will coexist and interact with this map, allowing any virtual object or user to be positioned between layers with millimetre precision.

8. Virtual craftsmanship will gain appreciation as virtual worlds become the norm

Digital craftsmanship will become mainstream; the intangible will carry the same value as tangible objects do today.

10. Attire and architecture will blend into a continuous extension of the self

Architecture provides a format for everyday life but remains peripheral to our lived experience. As inhabitable virtual environments become the norm, the environments that we shape will shape us wholly in return.

8 PROPOSITIONS FOR A CIVIC PORTAL INFRASTRUCTURE, SPACE POPULAR

“We propose a threaded network of virtual textiles that our virtual selves pull aside to move between virtual environments. Such textiles only become apparent once we aim to touch them, pulling apart in mid-air the environment we are in and allowing us to access another. Thus, they are parallax tapestries that, on closer inspection, reveal through the quality of their threads the conditions of the space behind them which we agree to once we cross the threshold.”⁵¹

- 8 Propositions for a Civic Portal Infrastructure for the Virtual Environment, Space Popular (Lara Lesmes & Fredrik Hellberg) 2021⁵²

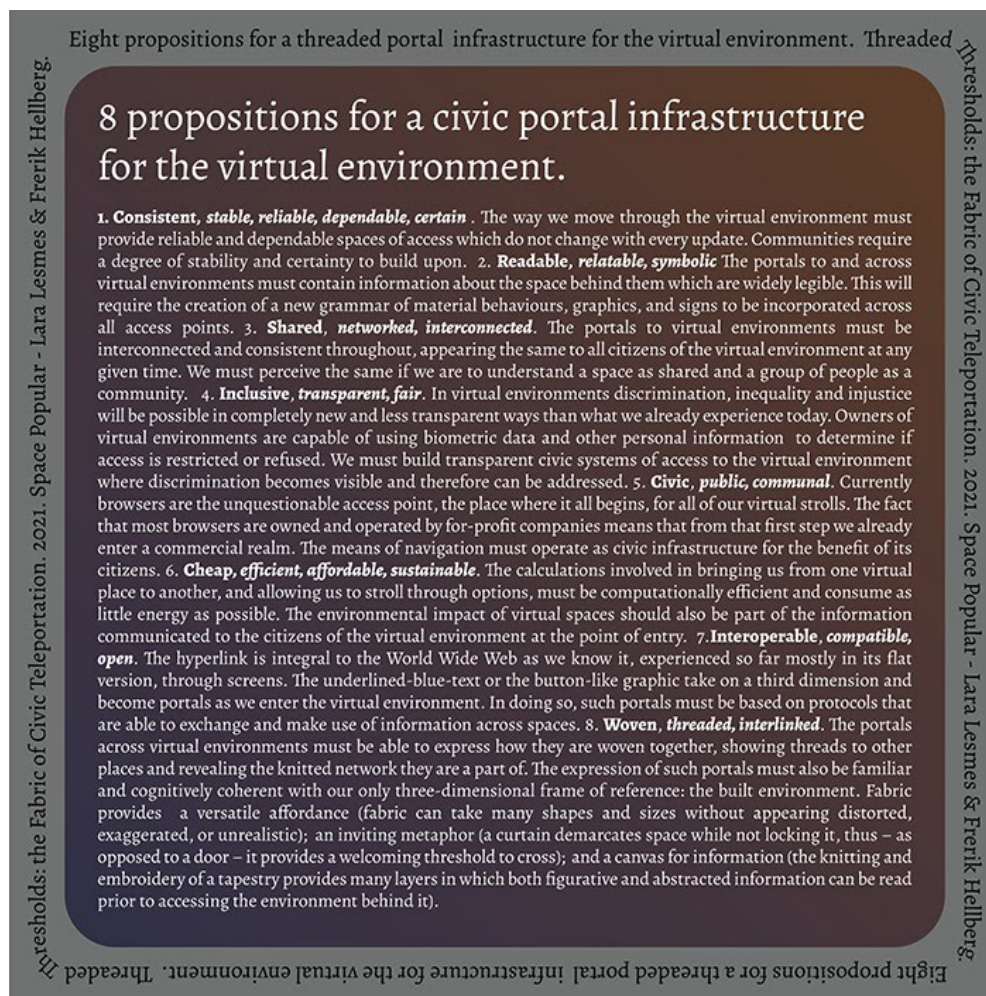


Fig. 08: Propositions for a Civic Portal Infrastructure for the Virtual Environment. Lesmes, Laura, and Frederik Hellberg. “8 Propositions for a Civic Portal Infrastructure for the Virtual Environment.” Space Popular, 2021.

⁵¹ Laura Lesmes and Frederik Hellberg, “Space Popular Proposes a ‘Civic Infrastructure for Virtual Teleportation’ to Help People Navigate the Metaverse,” Dezeen, 2021, <https://www.dezeen.com/2021/11/08/space-popular-manifesto-dezeen-15/>.

⁵² Laura Lesmes and Frederik Hellberg, “8 Propositions for a Civic Portal Infrastructure for the Virtual Environment,” Space Popular, 2021.

8 PROPOSITIONS FOR A CIVIC PORTAL INFRASTRUCTURE FOR THE VIRTUAL ENVIRONMENT⁵³

- 1. CONSISTENT, STABLE, RELIABLE, DEPENDABLE, CERTAIN:** *The way we move through the virtual environment must provide reliable and dependable spaces of access that do not change with every update. Communities require a degree of stability and certainty to build upon.*
- 2. READABLE, RELATABLE, SYMBOLIC:** *The portals to and across virtual environments must contain information about the space behind them which are widely legible. This will require the creation of a new grammar of material behaviours, graphics, and signs to be incorporated across all access points.*
- 3. SHARED, NETWORKED, INTERCONNECTED:** *The portals to virtual environments must be interconnected and consistent throughout, appearing the same to all citizens of the virtual environment at any given time. We must perceive the same if we are to understand a space as shared and a group of people as a community.*
- 4. INCLUSIVE, TRANSPARENT, FAIR:** *In virtual environments discrimination, inequality and injustice will be possible in completely new and less transparent ways than what we already experience today. Owners of virtual environments are capable of using biometric data and other personal information to determine if access is restricted or refused. We must build transparent civic systems of access to the virtual environment where discrimination becomes visible and therefore can be addressed.*
- 5. CIVIC, PUBLIC, COMMUNAL:** *Currently, browsers are the unquestionable access point, the place where it all begins, for all of our virtual strolls. The fact that most browsers are owned and operated by for-profit companies means that from that first step we already enter a commercial realm. The means of navigation must operate as civic infrastructure for the benefit of its citizens.*
- 6. CHEAP, EFFICIENT, AFFORDABLE, SUSTAINABLE:** *The calculations involved in bringing us from one virtual place to another, and allowing us to stroll through options, must be computationally efficient and consume as little energy as possible. The environmental impact of virtual spaces should also be part of the information communicated to the citizens of the virtual environment at the point of entry.*
- 7. INTEROPERABLE, COMPATIBLE, OPEN:** *The hyperlink is integral to the World Wide Web as we know it, experienced so far mostly in its flat version, through screens. The underlined blue text or the button-like graphic take on a third dimension and become portals as we enter the virtual environment. In doing so, such portals must be based on protocols that are able to exchange and make use of information across spaces.*
- 8. WOVEN, THREADED, INTERLINKED:** *The portals across virtual environments must be able to express how they are woven together, showing threads to other places, and revealing the knitted network they are a part of. The expression of such portals must also be familiar and cognitively coherent with our only three-dimensional frame of reference: the built environment.*

⁵³ Lesmes and Hellberg, “8 Propositions for a Civic Portal Infrastructure for the Virtual Environment.”



The eight propositions include language that gives direct design values to their conception of how an individual would experience the virtual environment and pass between different spaces. Alongside the propositions, rendered images of a ‘portal’ depicts a curtain or fabric embedded in the environment’s materiality. When this curtain is pulled away it reveals a view into a different virtual space. Space Popular asserts that architecture should work as a visually coherent code, a three-dimensional hyperlink, and a consistent piece of infrastructure across all virtual worlds. The architecture should be readable, relatable, familiar, and symbolically understandable to the user. By using the form of a fabric textile to create a threshold, it feels welcoming and does not visually detract from the environment. These design decisions create a user friendly and appealing solution for connecting virtual spaces.⁵⁴

The strength of this work, both in writing and the speculative images, is in the specificity of the problem they have identified in virtual space. The choice to focus on the threshold between virtual space speaks directly to the realm of architecture and is an applicable translation of the work of physical architecture into the virtual context. Beyond the identification of the strengths of architectural design in this application, the propositions clearly identify issues and concerns that can guide other design solutions.

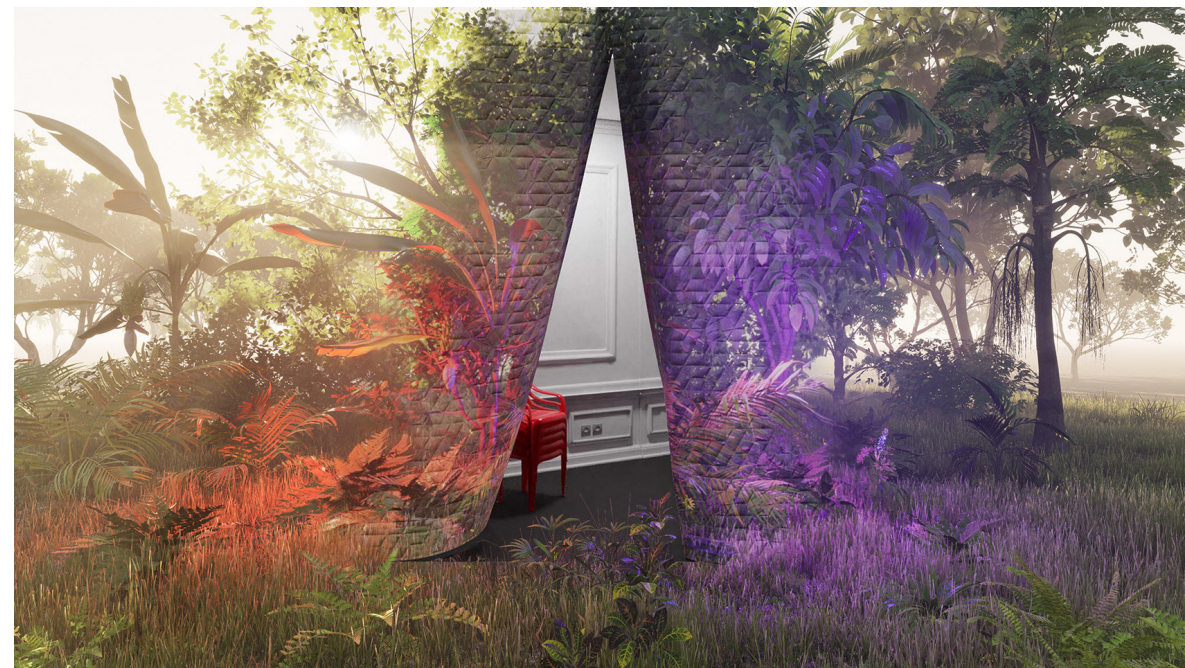


Fig. 09: Rendered image of proposed threshold. (facing page, top)
 “Space Popular Proposes a ‘Civic Infrastructure for Virtual Teleportation’ to Help People Navigate the Metaverse.”
 Dezeen, 2021. <https://www.dezeen.com/2021/11/08/space-popular-manifesto-dezeen-15/>.
 Fig. 10: Rendered image of proposed threshold. (facing page, bottom)
 “Space Popular Proposes a ‘Civic Infrastructure for Virtual Teleportation’ to Help People Navigate the Metaverse.”
 Dezeen, 2021. <https://www.dezeen.com/2021/11/08/space-popular-manifesto-dezeen-15/>.

⁵⁴ Lesmes and Hellberg, “8 Propositions for a Civic Portal Infrastructure for the Virtual Environment.”

DESIGN PRACTICES IN VIRTUAL REALITY, JONATHAN RAVASZ

In this 2016 article written by Jonathan Ravasz, a prominent designer of human interfaces in VR technology for the Oculus and Apple Vision Pro, he breaks down key design elements in a VR experience. Referencing authors who explore human perception and environment in their work as well as his own industry knowledge, the article explains elements that can be incorporated into a VR environment design without the technicalities of specific technologies or cognitive concepts.⁵⁵

DESIGN SOLUTIONS FOR VIRTUAL REALITY⁵⁶

1. **ROLE OF THE GROUND:** *The ground to horizon relationship is as important in VR as in our physical reality.*
2. **ATMOSPHERE:** *Atmospheric (aerial) perspective can help users to understand the scale of the virtual environment, therefore making the experience more natural. This gradual fading of the landscape is a clear cue for depth and distance.*
3. **TERRAIN FEATURES:** *Ground is rarely an open environment. It is usually cluttered. Open environments allow locomotion to any direction over the ground, whereas a cluttered environment allows locomotion only at openings.*
4. **INTRODUCING THE USER TO THE ENVIRONMENT VIA SOUNDSCAPES:** *This allows to build a mental image of the environment via sound, lowering the shock factor.*
5. **GUIDING THE USER WITH OBJECTS:** *Subtle changes in the environment, such as growing flowers at the openings of a field in order to draw the users attention to the correct path, could still maintain the genuineness of the place.*
6. **CONTEXTUAL RETICLE:** *In non-tracked VR (e.g. Gear VR, Google Cardboard), reticles are used in order to show the user the specific point where they gaze.*
7. **INTERACTIVE OBJECTS:** *If objects are not all interactive, users should be hinted with which objects they can interact. The contextual reticle can be a help in this case, but in some cases, in order to avoid confusion, the interactive objects should change, too.*

It is important to have a language based on the conceptual, technical, and architectural elements present in VR to describe how pieces of a virtual space come together. In this framework, it utilizes language that evokes that of how we construct our physical world, but also considers the significant difference in how our perception and interaction within VR is mediated by the technology.

For any set of design considerations, theories, or solutions to be suggested as a holistic list is nearly impossible – as the perspectives to approach VR and the design problems that can be investigated are far too numerous. The frictions of the technologies used to create VR virtual spaces impose strict limitations on how space can be created, with these technologies' own complications and loopholes. These include constraints in graphics rendering, skill limitations in terms of understanding the program and coding, and limitations in managing model assets, materials, and more. These design considerations must be kept in the back of our mind when imagining contemporary possibilities within VR. However, perspectives that foreground the technical and interaction design elements of VR are not the focus of this thesis. As technology evolves, so will the design practices that center the technical considerations. Instead, this research is an investigation into the spatial implications of designing successful VR places so that architects can find a foothold in discussions of VR environments.

⁵⁵ Jonathan Ravasz, "Design Practices in Virtual Reality," UX Collective, May 8, 2016. <https://uxdesign.cc/design-practices-in-virtual-reality-f900f5935826>

⁵⁶ Ravasz, "Design Practices in Virtual Reality."

A SEEING PLACE, JOSEF WIDESTRÖM

A Seeing Place is a doctoral thesis of philosophy published in 2020 at Chalmers University of Technology. Wideström's work is an investigation of the relations between virtual and physical space in search of a unifying design concept that works for when the two spaces co-exist.⁵⁷

A Seeing Place is a design context for complex physical-virtual design problems and allows for the conception of them, not in opposition, or one in service of the other, but together. The contribution of *A Seeing Place* by Wideström is relevant to both designers and design research in service of exploring the complexities of physical and virtual spaces. The model facilitates theoretically the connection between physical and virtual space. As a deeply transdisciplinary piece of research, *A Seeing Place* is a valuable model established in philosophy, semiotics, hermeneutics, linguistics, cognition, and aesthetics. It is intended to be utilized in furthering our understanding and development into the VR industry, from a variety of perspectives.⁵⁸

A Seeing Place as a model for investigating how the current understanding of architecture translates poorly from the physical to the virtual, falling short of addressing how the specific relationship from user/actor to architecture shifts in perception while mediated by VR. However, the metaphor of *Stage* lends itself as a strong foundation for relating our current understanding of viewership to architecture, and the creation of meaning. Stage will be explored further as a core concept in the framework *Architecture as Setting the Stage*.

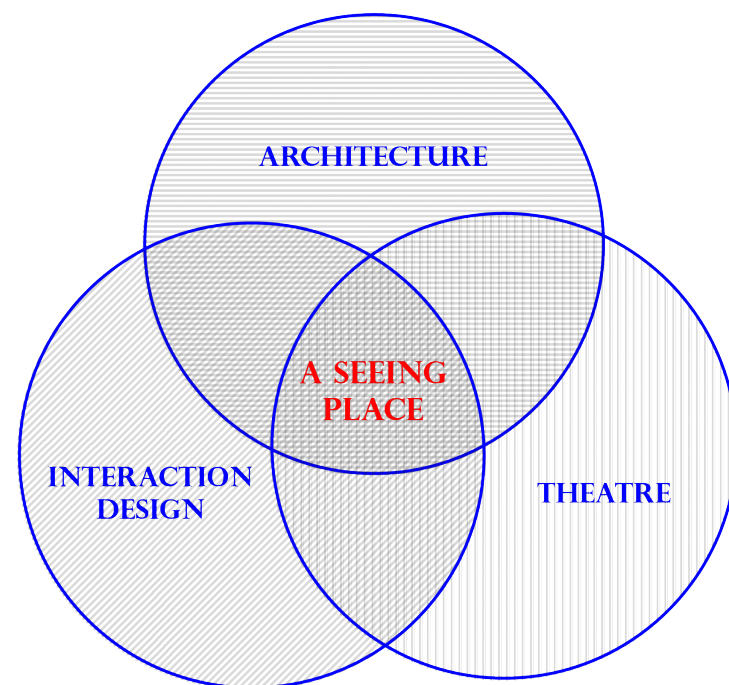


Fig. 11: Recreation of Wideström's diagram describing the intersection in the thesis *A Seeing Place*.

By author.

⁵⁷ Josef Wideström, "A Seeing Place: Connecting Physical and Virtual Spaces" (2020), 15-24.

⁵⁸ Wideström, "A Seeing Place," 128-132.

PART 2:

DEFINING THE FRAMEWORK

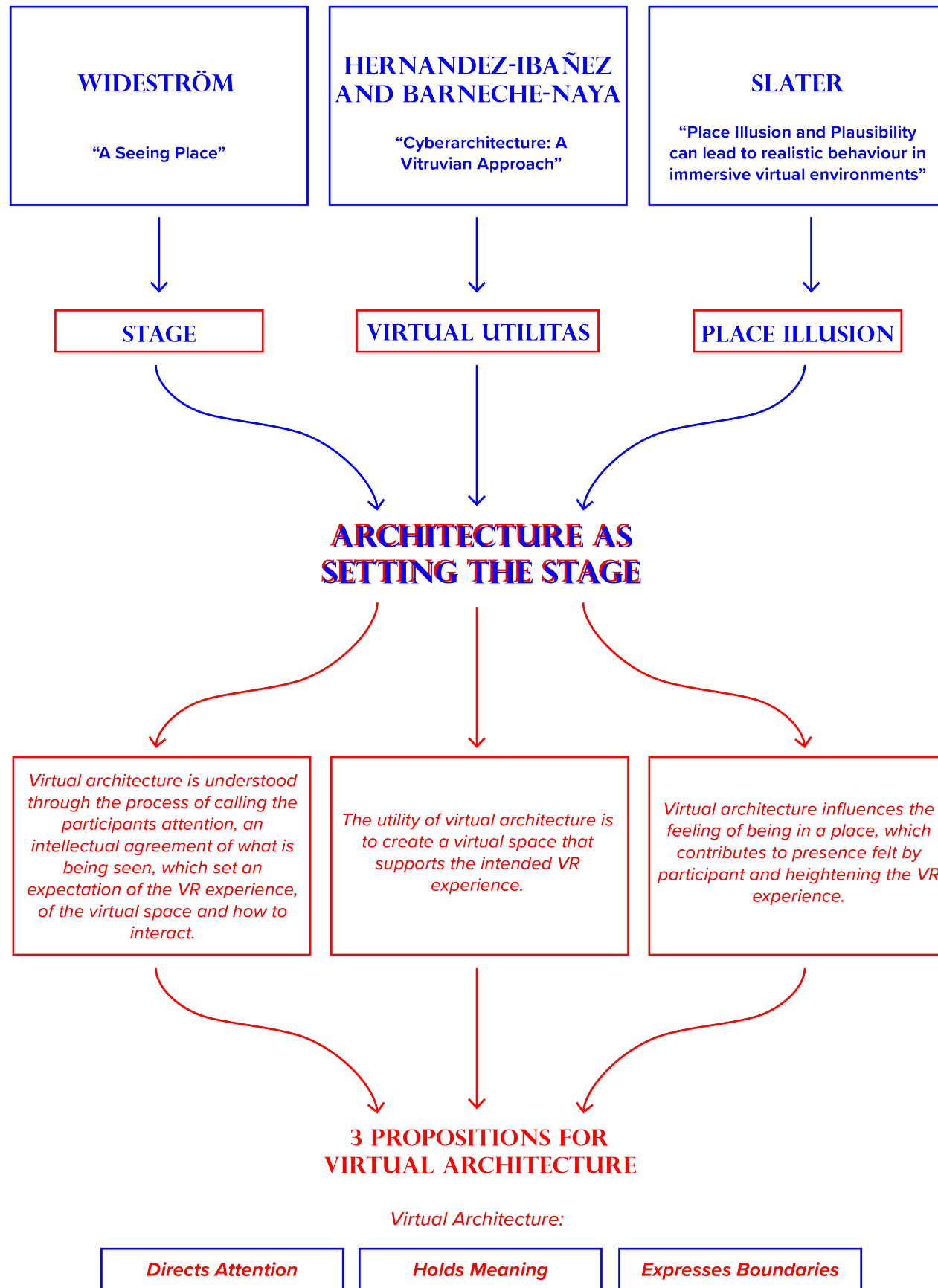
THE FRAMEWORK

WIDESTRÖM'S METAPHOR OF STAGE

**HERNANDEZ-IBAÑEZ AND BARNECHE-
NAYA'S**

SLATER'S PLACE ILLUSION AND PRESENCE

**3 PROPOSITIONS FOR ARCHITECTURAL
DESIGN IN VIRTUAL REALITY**



THE FRAMEWORK

Architecture as Setting the Stage is a conceptual framework that can be used to understand the functionality of architecture in a VR experience. *Architecture as Setting the Stage* addresses the utility of architecture in a VR space – to know what we are designing for. As the context changes from physical to virtual, architecture’s core principles must be re-interpreted. By synthesizing the key concepts from Wideström’s *Stage*, Hernandez-Ibañez and Barneche-Naya’s *Virtual Utilitas*, and Slater’s *Place Illusion* we can identify a conceptual framework for virtual architectural design that centers *presence* as a defining factor in a successful VR experience. Each concept will be discussed in detail in the following chapters.

The framework builds upon the work of Wideström’s conceptual metaphor of *Stage*, which connects how participants grasp virtual space and feel the experience.⁵⁹ *Architecture as Setting the Stage* emphasizes the influence of architecture on the VR experience. *Stage* is powerful in the communication of the attributes of virtual space in relation to our preexisting understanding of physical space. Virtual space is the *Stage*. The *Stage* metaphor equates architecture to the practice of scenography, the design of ‘setting the stage’. This emphasizes concepts of agreement, attention, expectation, and experience as central concepts to how an experience in virtual space is perceived.⁶⁰ Through the understanding of *Stage*, it aids in analysing the role of architecture in virtual space as it connects practices of space-making in the physical realm to space-making practices in the virtual.

STAGE IS THE PLACE OF UNDERSTANDING AND EXPERIENCE THROUGH ATTENTION, AGREEMENT, AND EXPECTATION.

The framework encompasses the concept of *Utilitas*, from Vitruvius’ *Vitruvian Triad*, recontextualized by Hernandez-Ibañez and Barneche-Naya in their *Virtualitas*. *Utilitas* addresses a building’s utility, its function, and its commodity. Hernandez-Ibañez and Barneche-Naya address the three core concepts of the Vitruvian Triad and offer their conceptions of how those pillars morph with virtual architecture. This

Fig. 12: Framework Architecture as Setting the Stage and associated concepts. By author.

⁵⁹ Josef Wideström, “A Seeing Place: Connecting Physical and Virtual Spaces” (2020), 72.

⁶⁰ Wideström, “A Seeing Place,” 82.

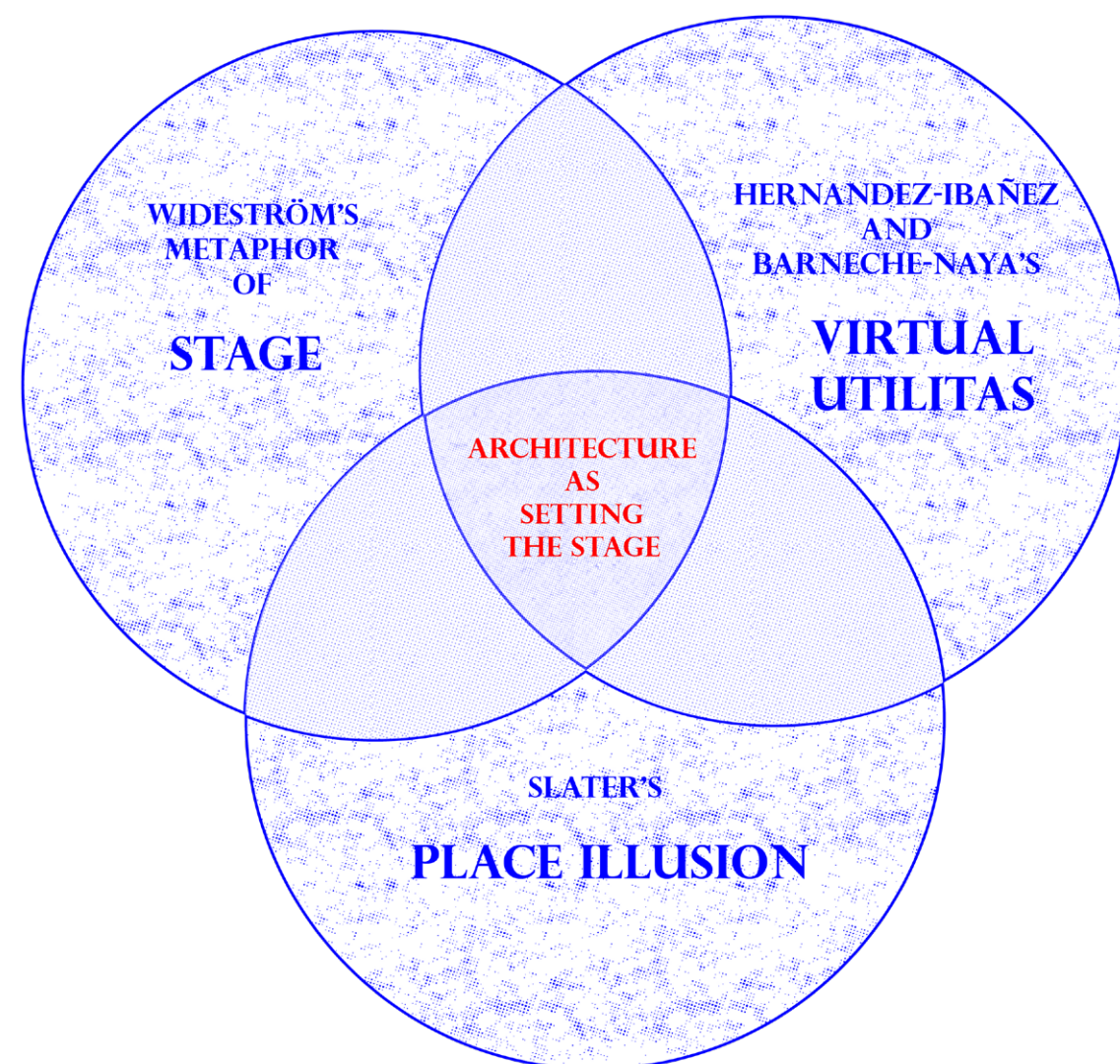


Fig. 13: The domain of the thesis through the intersection of three main concepts.
By author.

research extends their *Virtualitas* framework and focuses in on the *Utilitas* of virtual architecture. The functionality of architecture should be considered, responded to, and adequately addressed in the design of the building. A rethinking of *Utilitas* for the virtual starts with the question: What is architecture asked to do? *Architecture as Setting the Stage* positions the utility of architecture in a VR space to be support of the intended experience. The intended experience being what the objective the VR experience has – whether it is to evoke an emotion, provide a game objective, or display a sensational journey, or otherwise stated by a creator or team of creators.

VIRTUAL UTILITAS OF VIRTUAL SPACE, OF VIRTUAL ARCHITECTURE, IS TO SUPPORT THE INTENDED EXPERIENCE.

Place Illusion, proposed by Slater, is the illusion of being in the place depicted in the VR (“being there”) despite the sure knowledge that this is not the case. It is a major factor in creating *presence*.⁶¹ *Place Illusion* relies heavily on how the environment is presented to the viewer, and how it interfaces with other elements in the virtual space that contribute to the overall VR experience.⁶²

Place Illusion as the set on the stage extends both concepts into language that begins to connect architectural ideas. Like the purpose of scenography in a play, the stage gives space to actors to support the narrative. The stage is framed by the set. The set is uniquely design or adapted for a specific play and theatre by the set design, in collaboration with the direction and other designers responsible for light, sound, and costumes. To *set the stage* speaks to Slater’s *Place Illusion*. In a *Place Illusion*, attention is called for and agreements between participant and the space are made.

PLACE ILLUSION IS THE SET IN WIDESTRÖM’S METAPHOR OF STAGE.

The role of architecture is to aid in creating a *Place Illusion* by ‘setting the stage’. *Stage*, *Place Illusion*, and *Architecture as Setting the Stage* all center *presence* as the goal for creating a successful experience.

ARCHITECTURE AS SETTING THE STAGE UTILIZES WIDESTRÖM’S METAPHORICAL CONCEPT STAGE TO EXPLORE HOW ARCHITECTURE CONTRIBUTES TO CREATING PRESENCE IN VR EXPERIENCES.

61 Mel Slater et al., “A Separate Reality: An Update on Place Illusion and Plausibility in Virtual Reality,” *Frontiers in Virtual Reality* 3 (2022), <https://doi.org/10.3389/frvir.2022.914392>.

62 Mel Slater, “Place Illusion and Plausibility Can Lead to Realistic Behaviour in Immersive Virtual Environments,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 364, no. 1535 (December 12, 2009): 3549–57, <https://doi.org/10.1098/rstb.2009.0138>.

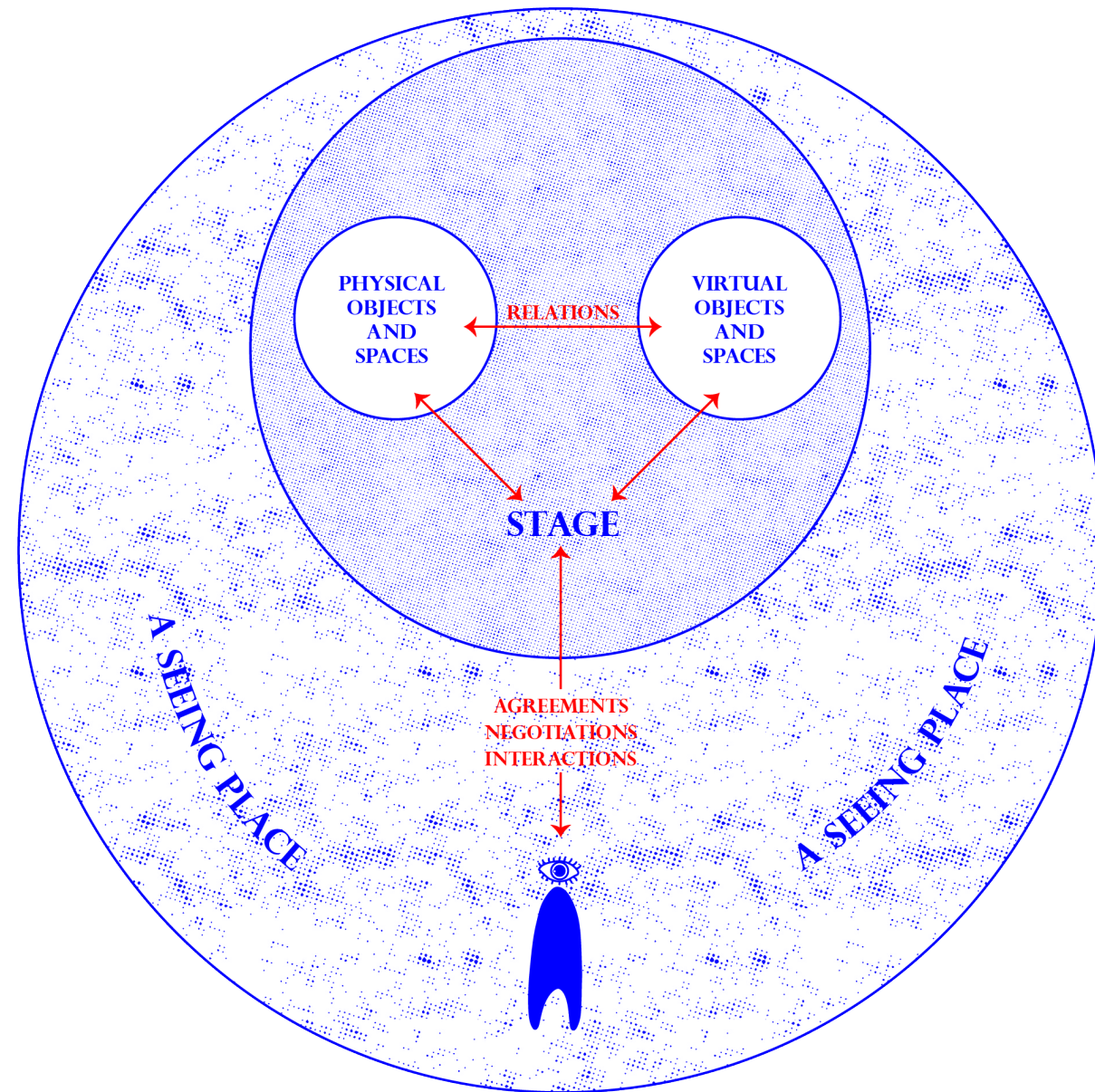


Fig. 14: Recreation of Wideström's diagram of A Seeing Place.
By author.

In the following chapters, the concepts, and definitions of Wideström, Vitruvius, and Slater will be examined further to further understand the construction of the conceptual framework *Architecture as Setting the Stage*. Through centering *presence* and the relationship between participant and space, the framework informs the speculation of three propositions for architectural design in VR:

Virtual architecture directs the attention of the participant in VR.

Virtual architecture holds meaning.

Virtual architecture is the perceptual expression of boundaries.

These three propositions serve as tangible examples of how architecture *sets the stage* using language that relates to both virtual and physical architectural design. The propositions are a speculative application of the conceptual framework and are not a comprehensive description of the influences of virtual architecture.

The propositions will be further examined, and then applied through an analysis of the chosen case study of narrative VR experience *The Book of Distance* by Randall Okita.⁶³ Through *Architecture as Setting the Stage* and the three propositions, *The Book of Distance* shows itself in my experience and retelling to be a project that has a profound understanding of the VR medium and consideration for virtual architectural.

⁶³ Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR, https://www.nfb.ca/interactive/the_book_of_distance/.

WIDESTRÖM'S METAPHOR OF STAGE

Wideström's work is an investigation of the relations between virtual and physical space in search of a unifying design concept. He uses the metaphors and concepts of *Space, Place, and Stage* as a way to explore and investigate concepts of agreements, interactions, and experiences – concepts fundamental to understanding virtual and physical space. *Stage* is an important concept that breaks down how we interact with a VR space. *Stage* employs the familiar metaphor of the physical stage to link how we understand and utilize stage in theatre to how we can understand VR spaces.

Wideström's research delves into three sections of theoretical development before presenting his own theoretical framework of *A Seeing Place*:⁶⁴

Transdisciplinary and relations to philosophy of nature,
virtual and physical space and place,
and
the stage metaphor.

The theories presented are then explored and investigated through the analysis of seven cases of projects in which the author had participated from 2005-2019.

The dissertation addresses three leading research questions, on different levels of abstraction. The questions are as follows:⁶⁵

RQ1: What are the relations between physical and virtual space?

RQ2: How do metaphors support conceptualization and implementation of the relations between physical and virtual space?

RQ3: How can a common place for physical and virtual spaces be

⁶⁴ Josef Wideström, "A Seeing Place: Connecting Physical and Virtual Spaces" (2020), 17.

⁶⁵ Wideström, "A Seeing Place," 20.

formed in the practice of design?

The work comes together in the concept of *A Seeing Place* as a model that includes physical space, virtual space, the actor, and the stage metaphor in one gestalt. The contribution of *A Seeing Place* by Wideström is relevant to both designers and design researchers in the field of developing and exploring the complexities of physical and virtual spaces. *A Seeing Place* provides a design context for complex physical-virtual design problems and allows for their conception, not in opposition to, or one in service of the other, but together. The model facilitates a theoretical connection between physical and virtual space.⁶⁶

A Seeing Place is a model that has strong potential for investigating how our understanding of architecture translates from the physical to the virtual. The theatre is a place for seeing, a place for drama. It is a place in which you can experience magic. The stage is where the magic takes place. On the stage people, places, things, and time can exist differently. On a stage, we see actors. On a stage, we have a set. On a stage, our attention is captured. On a stage, a different reality is born. To understand a stage, is to understand virtual space.⁶⁷

Stage is defined as the following:

STAGE: A PLACE FOR AGREEMENT, ATTENTION, AND EXPERIENCE, WHERE PEOPLE HAVE DIFFERENT ROLES, INTERACTING WITH PHYSICAL AND VIRTUAL SPACES.⁶⁸

The metaphor⁶⁹ of *Stage* lends itself as a strong groundwork for relating how architecture is understood through perception, and how those understandings can be applied to virtual architecture.

ATTENTION: THE AWARENESS ON SOMETHING, TO THE EXCLUSION OF OTHER STIMULI.

To get someone to understand, their attention must be held. The act of looking is not the same as seeing – the difference being in the attention of the viewer. There is no universal tactic for attracting and keeping someone’s attention; it is an art form

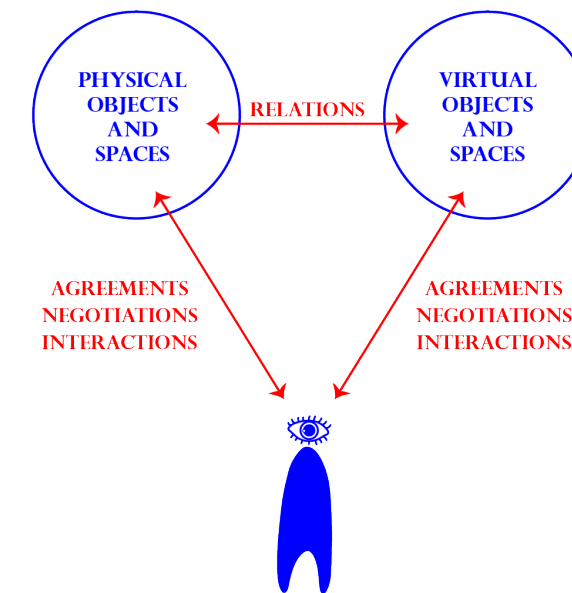


Fig. 15: Recreation of Wideström’s diagram of interactions and relations. By author.

in itself, one well practiced in theatre. Once attention is held, then the negotiation between the seer and what is being seen can begin, and an agreement formed.

In a VR experience, our attention can be captured and directed through a variety of mechanisms, including lighting, sound cues, movement of actors, displayed text and more. The perceptible material of the virtual space also has a large influence on how attention can be manipulated – this is when the realm of architectural knowledge overlaps. The architecture of the virtual space can influence how a participant in a VR experience moves through space – objects that create the virtual space have the responsibility of way finding and sign posting. Architectural objects significant to a VR experience for way finding can call the attention of the viewer through significant scale, materiality, colour coding, or taking the shape of a significant object relevant to the narrative.

Attention of the VR participant must be maintained to ensure immersion into an experience; however, attention can also be directed intentionally through virtual architecture.

AGREEMENT: THE NEGOTIATION AND UNDERSTANDING BETWEEN SEER AND WHAT IS BEING SEEN.

The agreement is the intellectualization of what is being seen. If what is being seen on stage is quite simulative of a physical place or thing, then this process is straight

SPACE → HUMAN CONNECTION → PLACE → AGREEMENTS AND METAPHORS → STAGE

66 Josef Wideström, “A Seeing Place: Connecting Physical and Virtual Spaces” (2020), 20.

67 Wideström, “A Seeing Place,” 72-75.

68 Wideström, “A Seeing Place,” 80.

69 Wideström argues that metaphors are a method of invention and creation, a way to relate physical and virtual space in a unification in a hermeneutic sense. He cites cognitive linguist George Lakoff who explains metaphorical language as a way to conceptually map one mental domain to another. Conceptual metaphors allow for concepts to be understood in terms of another. In virtual space, there currently exist metaphors used to describe our interaction within virtual space that are distinct from physical space. Paul Ricoeur’s analyses on metaphor break down into the form of metaphor, the sense of metaphor, and the metaphor reference which shows the transition from semiotic to semantic to hermeneutics. These descriptions and analysis of metaphor show that metaphors have the capability to cognitively relate complex concepts, thus allowing us to understand a new perception of the world.

-forward.⁷⁰ For example, if a real bookshelf is used within the set of a stage, then it is easily agreed upon that what is seen is a bookshelf, and that its roles and behaviours as a bookshelf will maintain. If an image of a bookshelf is painted on board use within the set of the stage, then it can be agreed upon that it stands in for the actual object. We agree that both are bookshelves, and both hold the same meaning, and deliver the same expectation of how it interacts with the stage and experience.

VR works similarly. An object in a virtual space is not the physical thing the 3D model represents, however its likeliness embodies the potential use or meaning of the object – like the bookshelf. A participant in VR goes through a process of negotiation between themselves and what they see in a virtual space to understand the context they are in, and an agreement is made. This can also be understood on a macro level of environment and context. If the virtual space presented has beige mounds and a blue sky, a participant in that environment can understand and agree with the presented experience that they are in a desert-like environment. With agreement and understanding of what is being seen, then the VR experience can unfold with little confusion.

EXPECTATION: THE BELIEF THAT SOMETHING WILL HAPPEN.

Expectations formed through attention and agreement, can be met, or broken. The expectation being met or broken contributes to new experiences and new understandings.⁷¹ This is how drama unfolds on a stage through all the elements of theatre and stage being communicated to the seer of the stage. If one assumes that they are on solid ground in a VR experience, but then steps somewhere in which they fall through the floor – that breaks their expectation of solidity for a floor. This can result in a shocking experience of suddenly falling through the air which could absolve utilized in an experience intentionally. However, if unintentional, and the participant was not meant to fall through the ground, then it can break the immersion of the player and lead to confusion since their understanding and expectation was not met. Understanding the expectations a participant forms with the virtual space is an important way to ensure proper immersion and coherence for the participant but can also be used to the benefit of the experience to create shocking moments.

Wideström posits a conceptual difference between space and place, that space has a perceptible tangibility while place is the human connection, interaction, feelings, and experience that is associated with a space. Spaces are described as structures that can be defined by both objective measures and subjective perceptions. These concerns apply to physical and virtual spaces equally. Wideström extends the concept of space connected to place by introducing the *Stage* metaphor. Place becomes the linking concept between space and stage.⁷²

70 Josef Wideström, “A Seeing Place: Connecting Physical and Virtual Spaces” (2020),72-75.
 71 Wideström, “A Seeing Place,” 18.
 72 Josef Wideström, “A Seeing Place: Connecting Physical and Virtual Spaces” (2020), 36, 67.

The model given is as follows:

Stage is a space for agreement, attention, expectation, and experience, which are crucial in understanding and creating a sense of *presence*.⁷³

The metaphor of virtual space as *Stage*, the investigation of attention, agreement, expectation, and experience are relevant concepts that have deep connections to how architecture influences a participant’s experience, and in turn supports the feeling of *presence* within a virtual space. Like a stage, virtual space is able to communicate things and experiences that are more than real.⁷⁴

STAGE: THE PLACE OF UNDERSTANDING AND EXPERIENCE THROUGH ATTENTION, AGREEMENT, AND EXPECTATION.

As a deeply transdisciplinary piece of research, *A Seeing Place* is a valuable model drawing on philosophy, semiotics, hermeneutics, linguistics, cognition, and aesthetic, that can be utilised in furthering our understanding and development into this field.

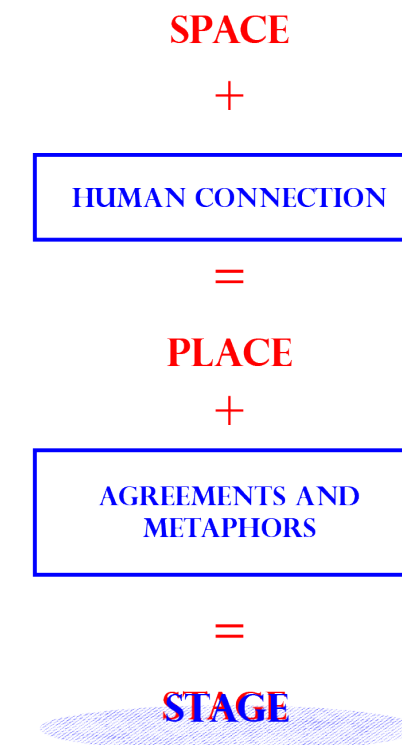


Fig. 16: Recreation of Wideström’s diagram, the creation of Stage. By author.

73 Wideström, “A Seeing Place,” 68.
 74 Wideström, “A Seeing Place,” 82.

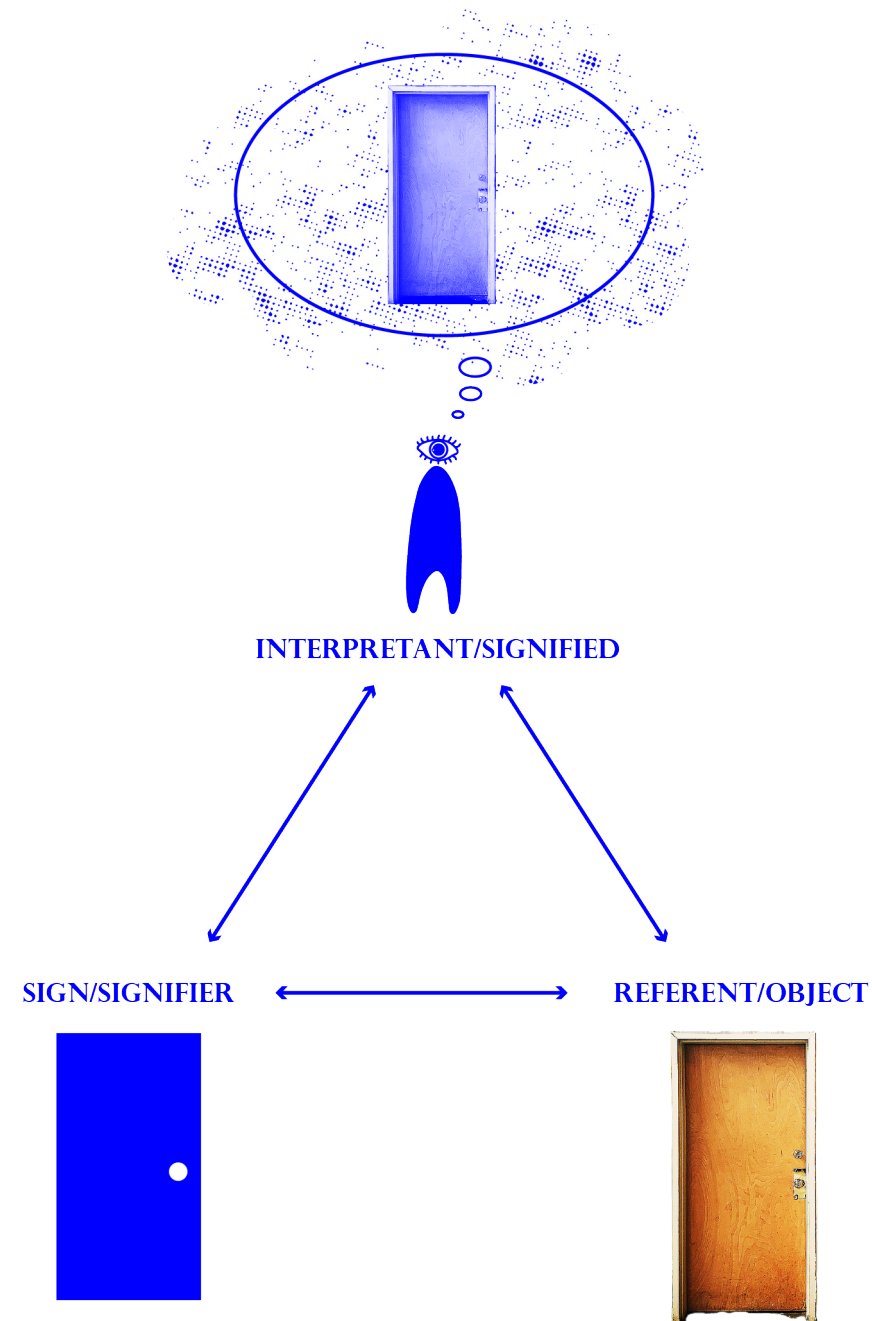


Fig. 17: Peirce's concept of Sign Relations.
By author.

MEANING IN STAGE AND ARCHITECTURE

The *Stage* is a conceptual metaphor that relates our understandings of physical to the virtual. An important aspect of both stage and virtual space is there is the intrinsic meaning in what we see. In VR we perceive architecture through seeing but create meaning through the intellectual process of sign relations. Wideström brings visual semiotics into his metaphor, primarily allying himself with the theories developed by Charles Sanders Peirce regarding *sign relations*.⁷⁵ Communication in visual semiotics describes the process in which ideas can be transferred from the author to the viewer through visual signs received by the interpretant.

Peirce's basic premise is that signs consist of three inter-related parts: a sign, an object, and an interpretant. This triad of semiotics is a way to describe the internal intellectualizing and understanding of converting what we see into what it means.⁷⁶ As Peirce explains:

*"I define a sign as anything which is so determined by something else, called its Object, and so determines an effect upon a person, which effect I call its interpretant, that the later is thereby mediately determined by the former."*⁷⁷

The sign, or the signifier, is what we see that signifies to an object. It is the representation of the object. The object is what is being signified, or what is being represented. The object is not always a physical object but a concept or idea. The interpretant is the understanding that we have of the sign/object relation. The interpretant provides a translation of the sign. In this model of sign relation, all three entities are mutually interdependent.⁷⁸

The set of the stage are rarely exact simulation of real life, but a combination of signifiers to actual objects and places. The viewer of the sign interprets it, and relates it to the object, thus creating an understanding of what is being shown to them. For example, a tree on a stage may not be the actual object that we understand as a tree. On stage there may be a painted image of a tree, or shadows of a tree projected onto a backdrop, or even a sign that simply is labeled 'TREE'. These are all signifiers to the object tree, and the audience viewing the stage become the interpretants. Through the act of seeing, the negotiation between viewer and stage can come to an agreement that what is being presented is a tree.

Architecture has conditioned a variety of signs embedded into the vocabulary of its built forms.

⁷⁵ Josef Wideström, "A Seeing Place: Connecting Physical and Virtual Spaces" (2020),62-64.

⁷⁶ Albert Atkin, "Peirce's Theory of Signs," ed. Edward N. Zalta and Uri Nodelman, 2023, <https://plato.stanford.edu/archives/spr2023/entries/peirce-semiotics/>.

⁷⁷ Charles S. Peirce, *The Essential Peirce*, ed. Peirce Edition Project, vol. 2 (Indiana University Press, 1998).

⁷⁸ Atkin, "Peirce's Theory of Signs."

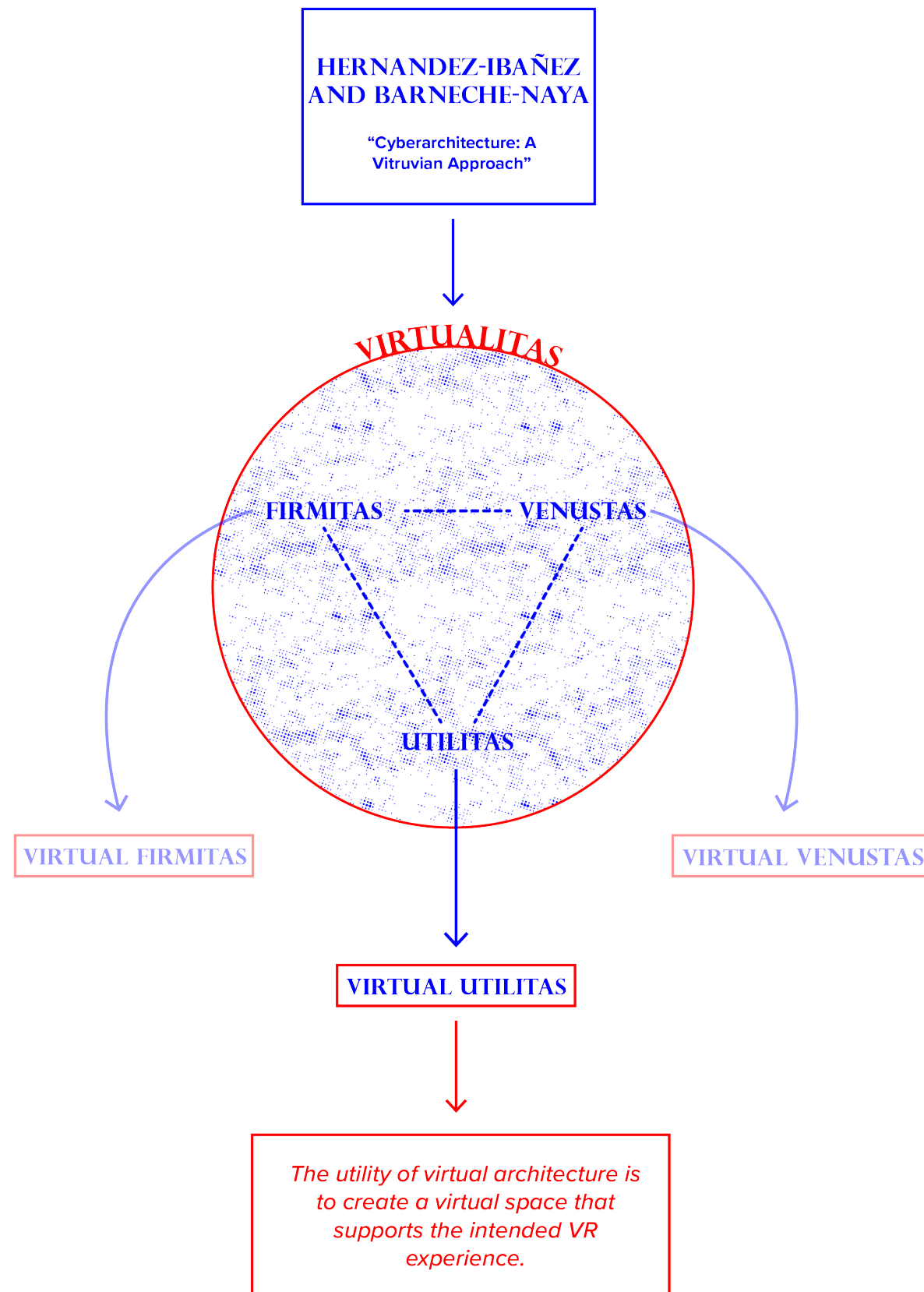


Fig. 18: Luis A.Hernández Ibáñez and Viviana Barneche Naya's Virtualitas to Virtual Utilitas. By author.

"[T]heory in architecture, according to Vitruvius, is a semiotic theory, inasmuch as in architecture, as in any other science, two things are noticed: that which is signified and that which signifies."⁷⁹

The most fundamental idea of semiology and meaning in architecture is that any form in the environment is capable of holding meaning. When people perceive their environment, it is inevitable that they attach meaning to the forms in the world.

"[M]an has certain inborn dispositions to expect recurrent patterns, he is always asking the environment questions."⁸⁰

Intuitively, sign relations are a significant way in which people make sense of the world and the spaces they occupy. From this perspective, the way in which we interact with both physical and virtual spaces is similar. This is a key concept in understanding how we make agreements with the spaces we interact with, as described in the Stage metaphor. When we make agreements and understanding through sign relations – meaning is tied to the space and what we see, transforming the virtual space to a virtual place.

When discussing architecture in virtual, there are no actual objects, no physical architecture. Everything we see in virtual space is a signifier to an object. The relationship between that which signifies, and that which is signified influences our understanding of space, thereby influencing behaviours, interactions, and reactions. A door in virtual space is not an actual door but signifies a door. A door signifies an entrance or exit into another space. A locked door signifies a place we cannot go. An open door signifies a welcoming in. The door is the architecture, and the door is telling us *something*.

The door in this example is a stand in for any architectural object in a space. In understanding that we will react to what we see, we can intentionally imbue meaning in virtual architecture by anticipating the relations to the signifier – like the door.

⁷⁹ Pierre Pellegrino, "Semiotics of Architecture," in Encyclopedia of Language & Linguistics, ed. Keith Brown, 2nd ed., vol. 11 (Oxford: Elsevier, 2006), 213.

⁸⁰ Charles Jencks and George Baird Joint Author, Meaning in Architecture. Edited by Charles Jencks and George Baird (New York, G. Braziller (1970, C1969), 1970):18.

HERNANDEZ-IBAÑEZ AND BARNECHE-NAYA'S VIRTUAL UTILITAS

The Vitruvian Triad by Vitruvius is a simple three-word formula, *firmitas*, *utilitas*, and *venustas*, that possesses a unique simplicity that has been applied and stretched to works of architecture, theoretically and practically, to unify the process of understanding architecture in all its translations.⁸¹

When translating architecture from the practice and context of physical space into virtual space – this fundamental understanding is disrupted. What is strength and structure when laws of physics and the natural elements no longer apply? What is the utility of architecture when shelter is not a primary function? How is beauty observed in the landscape of a virtual medium? Therefore, with the translation of architecture from physical to virtual, the underlying concepts of architecture must be translated as well.

In the 2012 conference paper *Cyberarchitecture: A Vitruvian Approach* by digital architectural researchers Hernandez-Ibañez and Barneche-Naya, they investigate how three fundamental conditions of the classic Vitruvian Triad are applicable, affected or changed in the virtual. Their work introduces the concept of *Virtualitas* which describes the changed description of the triad *firmitas*, *utilitas*, and *venustas*.⁸² This contemporary redefinition of the Vitruvian Triad considers virtual architecture to go beyond only aesthetic or perceptual value. The *Virtualitas* proposed by Hernandez-Ibañez and Barneche-Naya considers the fulfillment of the classic requirements of architecture, which positions this new triad as a theoretical framework for analysis in studying virtual architecture.⁸³ The approach of recontextualizing established architectural theory in *Cyberarchitecture* is successful in communicating the need for considerate thought and analysis for virtual architecture, as well as effectively proposing in architectural language their framework for thinking about that translation.

81 Saul Fisher, "Philosophy and the Tradition of Architectural Theory," *The Stanford Encyclopedia of Philosophy*, (2016): 1, <https://plato.stanford.edu/entries/architecture/tradition.html>

82 Luis A. Hernández Ibañez and Viviana Barneche Naya, "Cyberarchitecture: A Vitruvian Approach," in *Proceedings of the 2012 International Conference on Cyberworlds, Cyberworlds 2012*, 2012, 283–89, <https://doi.org/10.1109/CW.2012.48>.

83 Ibañez and Naya, "Cyberarchitecture: A Vitruvian Approach."

AEDIFICATIO	Related concepts	Real World Architecture	VIRTUALITAS
FIRMITAS	Stability	Application of physical laws.	Physical laws are optional.
		Selection of inner structure and basement.	Building stability is more related to computer stability; avoiding overloading machine and network resources.
		Design of constructive details to stand against external actions.	Protection of design against unauthorized modification.
	Constructive systems and processes	Architect: design. Builder: construction.	Architect: design and construction. Architect and/or Programmer: interaction.
		Complex constructive processes.	Modeling > Texturing> Lighting > Programming interactivity
	Materials selection	Materials selected for visual appeal, protection and durability.	Material selection based on appearance only. All visual aspects of RW materials can be emulated. New material properties: Mutability, multimedia and procedurality.
	Terrain	Terrain influences the building design.	Terrain can be designed to fit building needs.
	Durability	Aging, decay and wearing.	Aging by means of obsolescence, incompatibilities through versions, broken links.
		Shelter for atmospheric agents. Security against external aggressions.	Unnecessary. Access control. Closure against malicious activities
	Economy	Construction units (number of bricks, cubic meters of concrete, etc)	Economy of data. Amount of vertices, polygons, size of textures, etc.
Energy (electricity, fuel, manpower).		Bandwidth, CPU and GPU use, cost of modeling and programming.	
Maintenance of materials and systems.		Maintenance of server and network.	
UTILITAS	Program	Living.	Virtual residence. Personal space.
		Leisure.	Games. Social casual activities and relationships.
		Business and work.	e-Business, telecommuting.
		Exhibition.	Virtual exhibits and museums.
		Transport.	Teletransport integrated into virtual buildings.
	Spatial Organization	Public space – Private space.	Public-private-personal spaces.
		Fora.	Meeting places, game lobbies.
		Topological qualities of building space: open, closed, centric, directional, articulated, etc.	Same plus new capabilities derived from new geometries, mutability, weightlessness, practically limitless dimensions and teleportation.
	Conditioning	Function – Form relationship.	Empowered by adaptability of shape of building elements to functions, both static and dynamically.
		Antropometry and Ergonomics.	Avatar sizes not necessarily in the human limits or not necessarily human-like at all. Design to support new actions, i.e. flying.
	Environment	Domotics.	Every aspect of the building is intrinsically programmable.
		Installations and systems.	Lighting control. Multimedia control. Data flow control.
	Ecology	Relation with landscape.	Construction of landscape.
Orientation to Sun and winds.		Control of Sun and wind.	
VENUSTAS	Ecology	Environmental and visual impact.	Control of contents exposed. Fitting to in-world local building trends and customs.
	Composition rules	Order, proportion, symmetry, modulation, rhythm, etc.	Control of objects and data left behind by users.
	Space qualities	Waste treatment. Recycling.	Research of new composition rules and relations.
VENUSTAS	Formal languages. Styles	Expressivity of materials, light, color, distance, size, direction.	Spaces that produce sensations and feelings through seeing and hearing. Different perception of variables such as close and far, up and down.
		Expressionism, Rationalism, Postmodernism, Minimalims Deconstructivism,	New emerging concepts: "Liquid Architecture", "Transvergence", "Cybrid". Styles still to consolidate.

Fig. 19: Adapting the Vitruvian triad to Virtualitas
Luis A.Hernández Ibáñez and Viviana Barneche Naya. "Cyberarchitecture: A Vitruvian Approach." In Proceedings of the 2012 International Conference on Cyberworlds, Cyberworlds 2012, 287, Table 2. Adapting the Vitruvian triad to Virtualitas.

AEDIFICATIO	CONCEPTUAL QUESTION	Related concepts	Real World Architecture	VIRTUALITAS	
FIRMITAS	WHAT DOES ARCHITECTURE NEED TO BE?	Stability			VIRTUAL FIRMITAS
		Constructive systems and processes			
		Materials selection			
		Terrain			
		Durability			
		Protection			
		Economy			
UTILITAS	WHAT IS ARCHITECTURE ASKED TO DO?	Program			VIRTUAL UTILITAS
		Spatial Organization			
		Conditioning			
		Environment			
		Ecology			
		Composition rules			
		Space qualities			
VENUSTAS	WHAT IS THE AESTHETIC OR APPEAL OF ARCHITECTURE?	Formal languages. Styles			VIRTUAL VENUSTAS

Fig. 20: Adapting the Vitruvian triad to Virtualitas, Version 2.
By author.

In the table entitled *Adapting the Vitruvian triad to Virtualitas* – their framework for the translations is stated. The table breaks down the three classical concepts into their related concepts, then to their manifestations in physical architecture, and the final column offers the translation, or recontextualization, of those concepts in virtual space.⁸⁴ To clearly link specific examples of the elements of virtual space to direct physical architectural examples is a success in itself, coherently relating the physical to the virtual. Although the proposed table is not all encompassing of every example of phenomena, it is an example in how we might break down these more abstract Vitruvian concepts into categories applicable to virtual space and architectural knowledge.

The mappings offer an understanding of virtual space and its functions; however, the *Virtualitas* table would benefit from some clear language incorporated at the more abstract level on the left-hand side of the table.

To understand how architecture is translated into the virtual, the questions posed by the fundamental concepts of the Vitruvian Triad must be translated first. This results in the following questions as to how architecture behaves in a virtual world:

Firmitas “What is the strength of architecture?” becomes:

WHAT DOES ARCHITECTURE NEED TO BE?

Utilitas “What is the utility of architecture?” becomes:

WHAT IS ARCHITECTURE ASKED TO DO?

Venustas “What is the beauty of architecture?” becomes:

WHAT IS THE AESTHETIC OR APPEAL OF ARCHITECTURE?

To rephrase the core abstract concepts of the triad allows for a wider consideration of their meanings. They are quite large questions, and there are a number of perspectives that could be taken to begin answering them. However, these are questions that are not meant to be answered directly, but are the scaffolding for constructing a theory, a framework, for understanding and communicating architecture in virtual space. The frameworks and answers shift and twist as you look through different lenses of discipline, technology, and changing definitions.

It is at a conceptual level that these principles are translated, in the fundamental understanding of the triad. Translating the granular concepts in the column ‘Real World Architecture’ supposes a one-to-one relationship with how the physical architecture concepts translate into the virtual. The result of their ‘*virtualitas*’ reads more like a list

of suggestions of design ideas or considerations and lacks the universality that the Vitruvian Triad offers. By adding another column to Hernandez-Ibañez and Barneche-Naya *Virtualitas*, their conclusions offered in the last column are not discounted – but better supported.

With this modified framework of the *Virtualitas* in mind, the questions of *virtual firmitas*, *venustas*, and *utilitas* are further investigated and offers ideas to the answers to their respective questions. However, this research will focus primarily on the question of *utilitas* in the virtual: what is architecture asked to do? The proposed answer to the question is deeply incorporated into the conceptual framework that comes from this research, *Architecture as Setting the Stage*.

84 Ibañez and Naya, “Cyberarchitecture: A Vitruvian Approach.”

VIRTUAL FIRMITAS

“The firmness: Grouping the concepts derived from stable and durable construction. Involving the derived aspects of the construction processes and systems, the selection of materials and terrain, strength, and durability, as well as protection against the elements and aggression and a rational use of necessary economic and energy resources in construction and maintenance. Extrapolating these concepts of real-world architecture to the virtual world should be considered along the following lines.”⁸⁵

- *Cyberarchitecture: A Vitruvian Approach by Hernandez-Ibañez and Barneche-Naya*

Firmitas presented in *Cyberarchitecture* frames the firmness of virtual architecture as it relates to the processes and systems of virtual space. This lends itself to the fundamental principle behind *Firmitas* of *what architecture needs to be* – relating to its construction functional qualities.

Virtual Space is a medium. Like any medium, it has qualities, traits, and lends itself more strongly or weakly to certain applications. It is fundamental that we critically analyze and understand the medium of Virtual Space for its proper and optimized use. The frictions of the technologies used to create VR spaces gives strict limitations to how space can be created, with its own complications and compromises. These frictions include constraints in graphics rendering, skill limitation in terms of understanding the program and coding, and managing model assets, materials, and more.

Hardware considerations encompass the capability of the workstation and the functionality of the controllers and other motion tracking hardware. Most importantly, there are new aspects of design to consider as the interaction between viewer and space is different in the medium of virtual reality. How a user sees and moves through the space is mediated through technology which introduces factors that must be considered. These include interaction methods, the interaction, the movement of the user, and the grounding of user. ‘Best practices’ of design practices evolve as innovation occurs and technology changes. In addition, each engine or hardware environment presents unique technical challenges and limitations. There are many resources available for software developers and designers that detail these ‘best practices’ related to the specific software with which they are familiar. The insights drawn from these both acknowledge an understanding of the back-end of a VR experience, as well as the effect it has on the user experience.

The technical limitations of our available technologies are in the realm of virtual design and must be kept in mind when imagining possibilities within contemporary VR using existing technology. However, as technology changes, so will these constraints. Thus, in the conceptual, we must not limit our ideas to our current technology landscapes and their limitations.

⁸⁵ Ibañez and Naya, “Cyberarchitecture: A Vitruvian Approach.”

VIRTUAL VENUSTAS

“Beauty: Vitruvius refers here partly to the capacity of Architecture to produce aesthetically pleasing sensations that in contemporary context would be generalize to sensations of any kind, provided they are infused with intent and meaning.”⁸⁶

- *Cyberarchitecture: A Vitruvian Approach by Hernandez-Ibañez and Barneche-Naya*

Venustas is the beauty of architecture and the aesthetic. The classical rules of architectural composition, based on relationships of spatial elements that form physical architecture, have historically informed us of what ‘beauty’ means. Order, symmetry, rhythm, and modulation are examples of compositional elements. However, within more contemporary theories and practice of architecture, those rules and classical orders have been challenged, alongside the very definition of beauty. At its core, *venustas* holds the question:

WHAT IS THE AESTHETIC OR APPEAL OF ARCHITECTURE?

In the virtual, beauty and the aesthetic of architecture are as subjective as they are in physical form. To translate *venustas* into the virtual, it is not merely a matter of defining new ‘rules’ or categories of aesthetic, or the science of what is appealing to the eye. Actually, the main translation from physical to virtual is in how we perceive the architecture, and how the mediating technology affects its appeal. To experience virtual space, and virtual architecture, our perception is mediated by some sort of technology. In current day, the technology VR uses is the HMD. How we are looking and seeing is mediated through a screen, and no matter how immersive or realistic an experience can seem, the process by which we are seeing is different from viewing in the real world.

In current VR standards, there are many design guidelines based on how the human body reacts when looking at a screen. Depth becomes difficult to judge, field of view and viewable distance has limitations, resolution is dependent on technical constraints, and ‘cybersickness’⁸⁷ is a common side effect.⁸⁸ If we are overwhelmed, or cannot see properly what is being represented, then the beauty cannot be known. To understand how we see beauty in virtual architecture, we must first understand how we see and perceive the architecture.

⁸⁶ Ibañez and Naya, “Cyberarchitecture: A Vitruvian Approach.”

⁸⁷ *Cybersickness is a motion sickness-like experience in a virtual reality which is visually induced. It is caused by confusion and a mismatch in sensory communication.*
Alexis D. Souchet et al., “Design Guidelines for Limiting and Eliminating Virtual Reality-Induced Symptom,” 2, <https://doi.org/10.3389/fpsyg.2023.1161932>.

⁸⁸ Souchet et al., “Design Guidelines for Limiting and Eliminating Virtual Reality-Induced Symptoms and Effects at Work: A Comprehensive, Factor-Oriented Review.”

VIRTUAL UTILITAS

“Utility: Brings together the concepts related to the capacity of the building to satisfy a program and the method by which this is carried out. Fulfilling the Utilitas is the requirement that more deeply influences the way in which space in the construction is organized. Different uses give place a different spatial organization and, in that sense, virtuality brings uses unknown in real world architecture. Other aspects relative as this compliance is carried out are in this category, such as: adaptation to the environment, the conditioning of the building and the environmental impact of the construction.”⁸⁹

- *Cyberarchitecture: A Vitruvian Approach* by Hernandez-Ibañez and Barneche-Naya

Hernandez-Ibañez and Barneche-Naya break down *Utilitas* into the categories of program, spatial organization, conditioning, environment, and ecology. These are then further broken down into more specific subcategories that architecture considers when designing. Under program, the principles defined are not radically changed or redefined in their translation of *Utilitas*. Living becomes virtual residence/personal space, leisure becomes games, and exhibitions become virtual exhibits and museums.

Utility of architecture relates to the use of the building, and the program it is intended to support. At times, those programs or uses have specific and prescriptive needs from the architecture, and the need from the architecture is flexible. There is overlap between virtual space and physical space in what the space is being used for – namely a space for gathering and socialization. However, many uses of space with which we are familiar with are deeply tied to the functions of our physical world and selves. When translating ourselves into a virtual space – what are the uses of virtual space?

Virtual space and physical space are both space. Both have the potential to be anything we know space can be. However, the virtuality of the space fundamentally disrupts the conventional understanding of *Utilitas*.

Utilitas asks the question: what is architecture asked to do? In physical space this speaks to the related concepts in the *Virtualitas* chart, concepts well known to any student of architectural design. It is driven by the ability to fulfill a proposed utility of shelter and space creation driven by one or more of the related categories proposed.

In virtual space, what is architecture asked to be? What is the utility of virtual space? The utility of virtual space is to experience. That experience is not up to the architect to define nor is it defined solely by the architecture. However, supporting the intended experience that is contained within or communicated by the virtual space is what architecture needs to be. *Utilitas* of virtual space, of virtual architecture, is the experience.

VIRTUAL UTILITAS: UTILITAS OF VIRTUAL SPACE, OF VIRTUAL ARCHITECTURE, IS TO SUPPORT THE INTENDED EXPERIENCE.

The intended experience referenced in this definition of *Virtual Utilitas* holds a similar level of abstraction and meaning as program holds for physical architecture. The architect does not always have a say in the intended program that a space is asked to fulfill. Both program and the intended experience entail and expectation of use and an expectation of experience – and it is the role of the architect to respond to those expectations through the construction of the space.

Without a specific ask, or a particular example, ‘program’ and ‘intended experience’ can leave the definition of *Utilitas* to be underwhelming or unclear. However, when applied to a specific ask, a specific program or experience, then this specificity can be responded to when this responsibility is assigned to the architecture. This is the richness of architectural design, in practice and in theory, as when activated by a proposed program, or a proposed experience, the design decisions come alive.

89 Ibañez and Naya, “Cyberarchitecture: A Vitruvian Approach.”

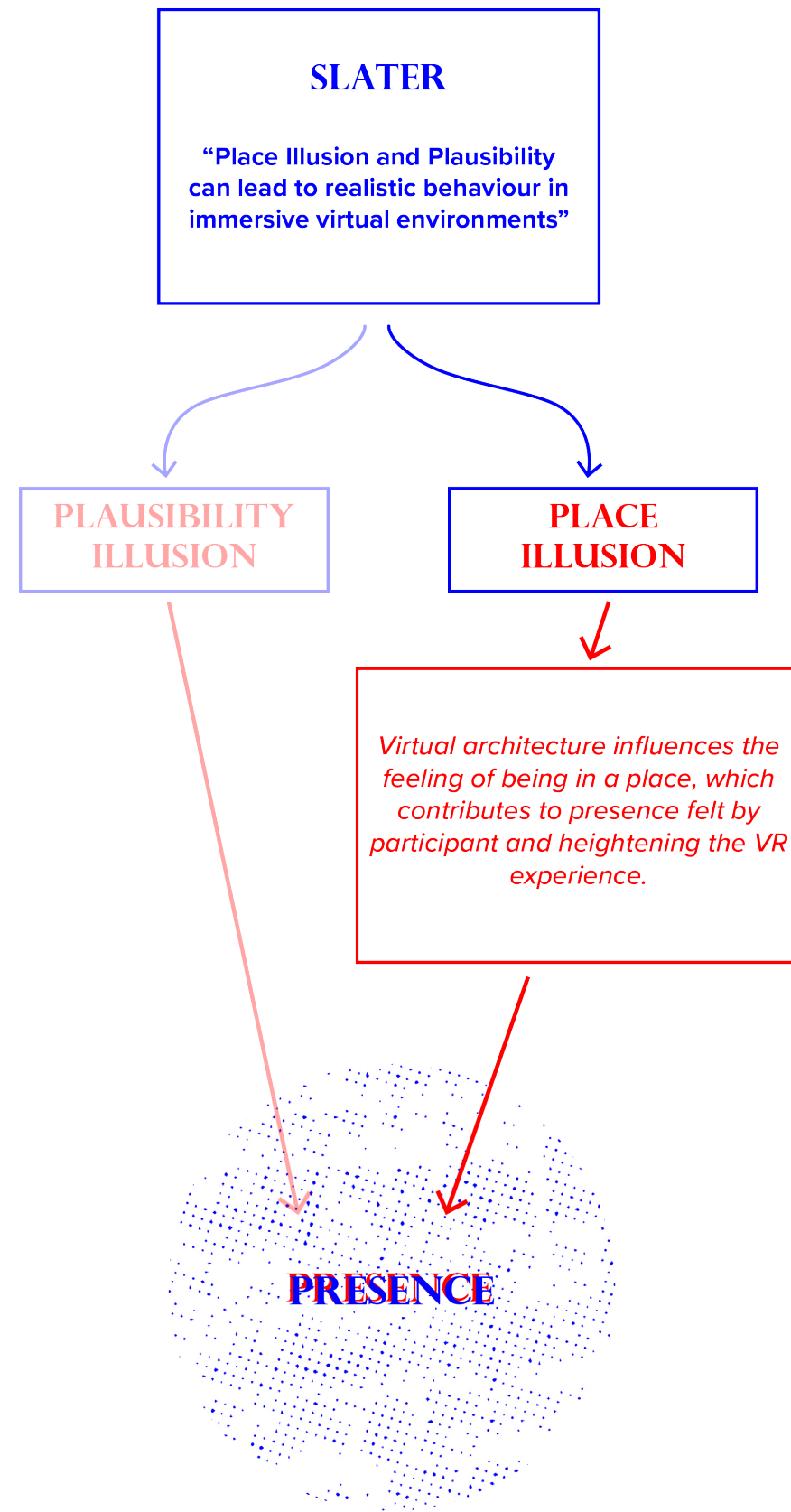


Fig. 21: Slater's Place Illusion relating to presence.
By author.

SLATER'S PLACE ILLUSION AND PRESENCE

To what end are we designing? This perspective is foundational in any design guideline. Of the variety of contexts, qualitative factors, artistic values, or other criteria through which a VR experience could be evaluated— *presence* is an interesting and complex qualia that has continuously been sought after in both VR practice and theory.

With ongoing development and technological advancements, modern VR technology is set apart from other interfaces by its ability to create *presence* in a user. Being able to feel *presence* in a non-physical environment is quite magical and has drawn many industries to this technology for its ability to replicate this real world feeling. However, simply putting on a VR headset does not ensure that you will experience *presence*. Without a full understanding of the particularities of our interactions with technology – *presence* can be difficult to achieve or even evaluate. Studies have shown that a greater degree of immersion, resulting in a greater feeling or *being there* in a virtual space has a positive effect in a user's performance, communication, and collaboration.⁹⁰ From the perspective of a user-centric experience, *presence* is imperative for a successful VR experience.⁹¹

PRESENCE IS THE KEY FACTOR FOR A HEIGHTENED VR EXPERIENCE.

⁹⁰ Mel Slater and Anthony Steed, "A Virtual Presence Counter," *Presence: Teleoperators and Virtual Environments* 9, no. 5 (October 2000): 413–34, <https://doi.org/10.1162/105474600566925>.

⁹¹ Stefan Weber, David Weibel, and Fred W. Mast, "How to Get There When You Are There Already? Defining Presence in Virtual Reality and the Importance of Perceived Realism," *Frontiers in Psychology*, vol. 12 (Frontiers Media S.A., May 6, 2021), <https://doi.org/10.3389/fpsyg.2021.628298>.

The term “*telepresence*” was coined by American cognitive and computer scientist Marvin Minsky in 1980 in reference to teleoperation systems use for manipulating remote physical objects.⁹² Heim in the glossary of *Metaphysics of Virtual Reality*, 1997, defines telepresence as “Operations carried out remotely while the user remains immersed in a simulation of the remote location”.⁹³ *Presence* has become the shortened term and is defined as the sense of being in a mediated environment; it is the sensation *being there*.⁹⁴

Although there is a lack of a commonly accepted definition of *presence* within the research community for human and technological interactions – the term *being there* is often used to describe *presence*.⁹⁵ *Presence* can also be described or quantified as the extent in which one’s attention is allocated to the mediated environment rather than to the immediate physical environment.⁹⁶ Immersion and presence are often confused, however immersion is associated with the technical aspects of VR while presence is an experiential quality that can be achieved in VR with the aide of immersion.⁹⁷

PRESENCE: THE SENSATION OF BEING THERE IN A MEDIATED ENVIRONMENT THROUGH THE ALLOCATION OF ATTENTIONAL RESOURCES PERCEIVED PHYSICALLY AND PSYCHOLOGICALLY.

Presence is a subjective experience that may manifest differently in each individual, meaning it is not an experience that can be described in absolute, objective terms; however, there are factors that influence the evocation of *presence*. *Presence* is the result of two factors: perceptual and psychological immersion.⁹⁸

Perceptual immersion lends itself to how well perceptible senses of the physical world are blocked out for the user to perceive the virtual experience. With VR being a highly immersive media, it disconnects the user from the surrounding physical world by blocking out as much perceptible stimuli as possible – most prominently visual stimuli. In VR, perceptual immersion presents itself in the more technical aspects of the technology and the hardware used. Physical immersion depends on the feeling or lack of feeling of physical stimuli such as visual, audio, and haptic. This is done through the apparatus used in the VR tool, such as a helmet, goggles, headphones,

vests, gloves, hand controllers, omnidirectional treadmills, amongst other hardware. Many studies show that a multisensory VR experience showed positive reaction in the participants sense of *presence*; however, there is little in-depth research on how more stimuli, such as haptic, olfactory, taste cues and audiovisual, incorporated into a VR experience can further affect *presence*.⁹⁹

Psychological immersion lends itself to what degree the user is mentally absorbed in the experience. Although a perceptual and psychological immersion have an interdependent relationship, psychological immersion relies heavily on the content and coordination of the VR experience and space presented to the participant. To achieve psychological immersion, we look to the work of Mel Slater in his conception of *Place Illusion*.

Slater names two types of illusion that influence psychological immersion and *presence*: *Place Illusion* (PI) and *Plausibility Illusion* (Psi). If the illusion presented is lucid enough – a user will react in agreement with it, making the virtual, real. It is these aspects of illusion that create psychological immersion, thereby supporting *presence*.¹⁰⁰

Place Illusion is the illusion of being in the place depicted in the VR (“*being there*”) in spite of the sure knowledge that this is not the case.¹⁰¹ There are a number of factors that make up a PI. Slater identifies that a PI is created and maintained when perception in VR from their body follows the same rules and logic as in physical reality. This means that when a head turn occurs, the displayed images and auditory changes would match with that movement. For our brains to process and perceive a PI, even if visually it is something that could never be seen in reality, it must be perceived as if it in reality.

Plausibility illusion has a similar principle in the alignment of body and mind, as it relies on the virtual environment responding to those actions of the participant in a plausible manner, and the environment responding and acting in accordance with itself in a way that meets the expectations of the participant.¹⁰² Another descriptor of the factors that influence Psi is “coherence”. For an illusion presented in VR to be perceived as real, or almost real, then the interactions and between actors within a VR experience must be coherent to the user; it must ‘make sense’. For either illusion to come to fruition, it remains true that the attention of the participant in VR must be held for psychological immersion. For an illusion to work, greater mental absorption

92 Marvin Minsky, “Telepresence,” *OMNI Magazine*, June 1980.

93 Michael Heim, *The Metaphysics of Virtual Reality* (New York: Oxford Univ. Press, 1993).

94 Jonathan Steuer and Byron Reeves, “Defining Virtual Reality: Dimensions Determining Telepresence,” *Journal of Communication*, vol. 42, 1992, <http://www.cyborganic.com/>.

95 Weber, Weibel, and Mast, “How to Get There When You Are There Already? Defining Presence in Virtual Reality and the Importance of Perceived Realism.”

96 Steuer and Reeves, “Defining Virtual Reality: Dimensions Determining Telepresence.”

97 Michael Wilkinson, Sean Brantley, and Jing Feng, “A Mini Review of Presence and Immersion in Virtual Reality,” in *Proceedings of the Human Factors and Ergonomics Society*, vol. 65 (SAGE Publications Inc., 2021), 1099–1103, <https://doi.org/10.1177/1071181321651148>.

98 Alison McMahan, “Immersion, Engagement, and Presence,” *The Video Game, Theory Reader*, 2003, 77–78.

99 Miguel Melo et al., “Do Multisensory Stimuli Benefit the Virtual Reality Experience? A Systematic Review,” *IEEE Transactions on Visualization and Computer Graphics* 28, no. 2 (February 1, 2022): 1428–42, <https://doi.org/10.1109/TVCG.2020.3010088>.

100 Slater et al., “A Separate Reality: An Update on Place Illusion and Plausibility in Virtual Reality.”

101 Mel Slater, “Place Illusion and Plausibility Can Lead to Realistic Behaviour in Immersive Virtual Environments,” *Philosophical Transactions of the Royal Society B: Biological Sciences* 364, no. 1535 (December 12, 2009): 3549–57, <https://doi.org/10.1098/rstb.2009.0138>.

102 Slater et al., “A Separate Reality: An Update on Place Illusion and Plausibility in Virtual Reality.”

into the illusion than the physical world must be achieved.¹⁰³

PLACE ILLUSION: THE ILLUSION OF BEING IN THE PLACE DEPICTED IN THE VR DESPITE KNOWING THAT IT IS NOT REALITY.

PLAUSIBILITY ILLUSION: THE ILLUSION THAT WHAT IS BEING PERCEIVED IN VR IS HAPPENING DESPITE KNOWING THAT IT IS NOT REALITY.

Despite both *Place Illusion* and *Plausibility Illusion* being a fascinating and complex phenomenon that contributes to *presence* with many technical and cognitive factors contributing – the illusion is grounded on what is visually perceptible. This is where architecture plays a role.

For a PI or Psi to be successful in evoking *presence*, what is being seen in the virtual environment has a large influence on that process. People use context clues from their environment to ground their understanding and expectations in a situation. The details of the visual expression of virtual space play a significant role in setting participant expectations to be met or broken. This creates the basis of the illusion – which may go on to be further strengthened and evaluated through interactions between the experience presented in VR and the participants.

Meaning is formed and understood through the visual semantics presented. Like on a stage, a viewer takes in what is visually presented to understand the experience. Before any interaction or drama, the viewer is already making connections, understandings, and expectations from what they see. These meanings become facts that mentally construct the *Place Illusion*, and a sense of connection; the sense of being there.

ARCHITECTURE IN VIRTUAL SPACE CONTRIBUTES TO PLACE ILLUSION.

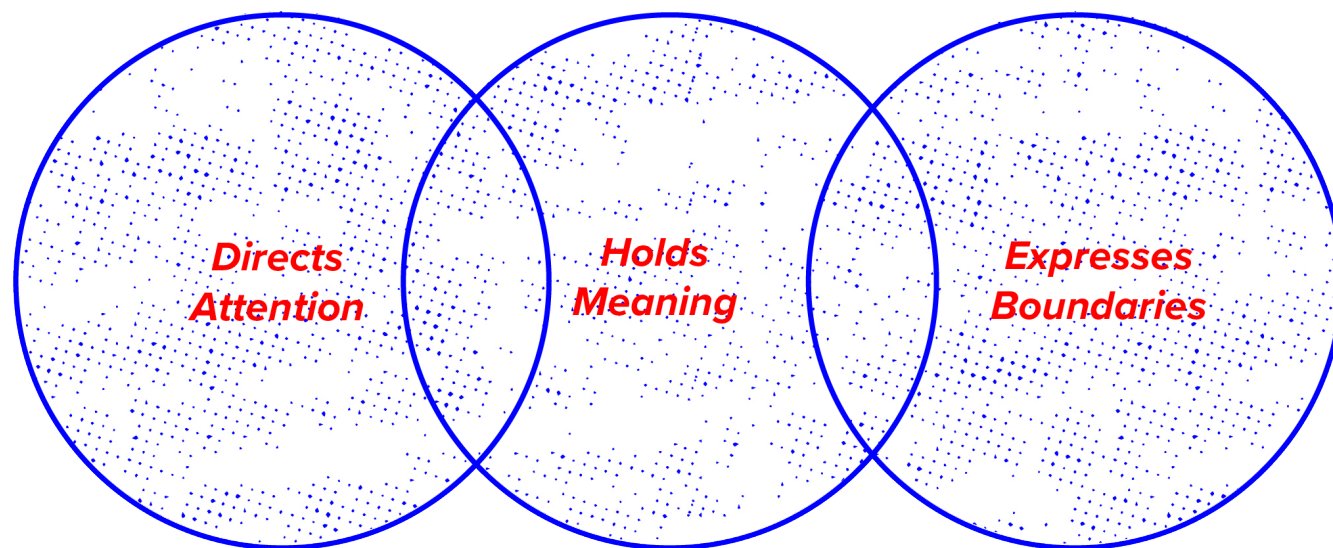
Architecture in a virtual space draws the attention of the viewer and is the basis of *Place Illusion* and plausibility illusion in VR – if done well, architecture will contribute to the participant's feeling of *presence*.

103 Slater et al., "A Separate Reality: An Update on Place Illusion and Plausibility in Virtual Reality."

ARCHITECTURE AS SETTING THE STAGE



3 PROPOSITIONS FOR VIRTUAL ARCHITECTURE



3 PROPOSITIONS FOR ARCHITECTURAL DESIGN IN VIRTUAL REALITY

Architecture as Setting the Stage synthesizes *Stage*, *Virtual Utilitas*, and *Place Illusion* around the central goal of supporting the feeling of *presence* in a participant experiencing a VR space. The three concepts have overlapping concepts that weave together to create this conceptual framework. *Architecture as Setting the Stage* positions virtual architecture as having influence on a participant's feeling of *presence*, allowing for a heightened VR experience.

Virtual architecture is able to influence a participant by being a major contributing factor in the construction of a *Place Illusion* – the illusion of being in a place that is not reality. Virtual architecture is the backbone in creating an illusion of a place in VR. It is the environment, the objects, and the materiality of virtual reality. Depending on the VR experience intent, the place must be constructed in a way that is coherent with that experience. The place of the experience does not need to be highly rendered or simulative for the illusion of place to be created for a participant – abstract forms or a high use of stylization of the materials in a VR space can be used to create and communicate (signify) the place of the experience. What is important is that the virtual architecture, in whatever form it takes, must be coherent enough – give meaning, provide way finding or sign posting, and give an environmental setting – to support the intended experience. This is fulfilling the *Virtual Utilitas* – what virtual architecture is asked to do – in a VR experience.

Virtual Utilitas is a foundational guiding concept in the conceptual framework *Architecture as Setting the Stage* because it describes an important facet of architectural design in virtual space, one that speaks directly to the creation of presence. Although all of the concepts of Vitruvian Triad translated into the virtual by Hernandez-Ibañez and Barneche-Naya's *Virtualitas* are significant and work together to complete the full understanding of the function of virtual architecture in VR, *Virtual Utilitas* is the concept that can be difficult to understand on its own yet is a key concept in connecting the concepts of *Stage* and *Place Illusion*. *Virtual Utilitas* grounds the understanding of virtual space as *Stage* and virtual architecture's role in *Place Illusion* by considering what the objective of virtual architecture is in relationship to creating an experience in VR.

Fig. 22: 3 Propositions for Architectural Design in Virtual Reality
By author.

To understand how virtual architecture communicates *Place Illusion* in VR and can

best fulfill its *Virtual Utilitas*, the metaphor of *Stage* works to conceptualize how we perceive and form our understandings in VR. If we do not understand how we intellectualize and form understandings in VR, then virtual architectural design would fall short in successfully achieving *Place Illusion*. Our understanding of virtual space, virtual architecture, and *Place Illusion* comes from the process of attention being called and an agreement as to what is being perceived. As per the Wideström's metaphor of virtual space being a *Stage*, attention and agreement of virtual space then creates an expectation of what is to come – setting the participant up for the VR experience.

Therefore, the architecture sets the stage for a VR experience. Virtual architecture works to create a place in which the participant can better understand and better be immersed a VR experience – influencing the potential for the feeling of *presence* in the participant, and fulfilling the utility of architecture.

Architecture as Setting the Stage centers the concept that virtual architecture has influence on a participant's feeling of *presence* in a VR space. Through this lens, I speculate that virtual architecture has the capacity to direct attention of a participant, hold meaning understood by a participant, and express boundaries in a VR space.

Through the lens of the conceptual framework *Architecture as Setting the Stage* – three propositions for how architecture VR can contribute to the evocation of *presence* in a participant are offered in this research. They are:

VIRTUAL ARCHITECTURE DIRECTS THE ATTENTION OF THE PARTICIPANT IN VR.

Virtual architecture directs the eye of the participant to areas where attention is required. The solid void relationship of physical architecture is translated to a transparent opaque relationship, as visual information is the main determinant in understanding virtual space. The architecture cannot be too visually overwhelming to the point where it detracts from the intended experience, yet it must be interesting enough to draw and maintain the attention of the participant.

Attention is a key factor in the metaphor of *Stage* as it is needed for a participant to form a connection to what they are seeing.

When architecture leads you somewhere, when a space opens up, leads to a focal point, or frames a view, we expect to see something – to experience something.

VIRTUAL ARCHITECTURE HOLDS MEANING.

With virtual architecture there are no actual objects. Everything we see in virtual space is a signifier to an object. Meaning between object and reference becomes relevant to how a participant interacts with a VR environment.

The agreement process is a negotiation between the participant and the visual

information they receive. This negotiation is one of intellectualizing the visual information and creating relational meaning. As discussed previously, Pierce's theory of sign relations plays an important role in understanding how meaning is communicated through visual signs. Relational meaning and how it works is a by-product of the architecture; however, how meaning is disseminated through architecture needs to be considered and directed intentionally.

Everything we see in a virtual space is a sign that holds meaning not in being, but in relating to its physical world twin, or referenced concept. Although we cannot predict what meaning each individual will discern from a virtual space, the architect can design with intent.

VIRTUAL ARCHITECTURE IS THE PERCEPTUAL EXPRESSION OF BOUNDARIES.

Architecture defines how boundaries in a virtual space manifest perceptually to a participant in a VR experience. Architecture, for example walls and ground, communicates to the participant where one can or cannot go in the virtual space. In creating a VR experience, you have the ability to create boundaries for the participant independently of objects in the space, meaning that there may be a 'wall' that impedes access, one that is invisible to the viewer. In most cases, when a boundary does not correspond to an object (i.e. It is invisible), it is a jarring and confusing experience, one that can break a participant's feeling of *presence*. Although a VR experience can use other means of expressing boundaries such as a text or auditory explanations, this also can break the participants immersion, also affecting *presence*.

Consider the *Stage* metaphor: boundaries of the stage are given implicitly to the audience by the actors, the director, and the stage designer. The end of a room can be delineated with a line on the ground, which can be understood by the audience if the actors respond to it accordingly. The set and the actors - all pieces of a performance - work together to form an agreement between the viewer and what is being viewed. This agreement is a result of a negotiation between the audience and the performance. In a VR experience, the same agreements between the participant and the space they see are constantly being made.

Boundaries in the material world manifest in architecture – a closed door, a chain link fence, or a solid wall are all boundaries that we all know and respond to. To enhance *presence* for a participant in VR, architecture can be used in context of the environment or narrative presented to communicate boundaries to the participant. It is the architect of the virtual space that can craft how a participant navigates through a space and around boundaries while maintaining a functional and wonderful experience.

The three propositions above are a speculative application of the conceptual framework developed, and work as a frame of reference when analyzing virtual architecture in VR.



So, why am I in a cave?

An emotional reaction to a world is strong method by which the feeling of presence can take grip a participant in VR; however, achieving presence is not an easy task. The cave is an easily understandable and minimalistic architecture in virtual space, one that evokes an emotional reactions.

The cave can be used as an architectural type in which the three propositions can be extracted.

The cave has the ability to easily direct attention, pointing a participant to a specific opening or visual mark.

The cave clearly delineates boundaries, as the walls encasing the participant are perceived as solid material.

The cave has an associated meaning to feelings of isolation, of being beneath ground, of being 'within'.

Through its simple yet profound architectural form, the cave exemplifies how virtual environments can focus user attention, delineate spatial boundaries, and evoke emotional responses. These attributes are crucial for fostering a sense of presence, making the cave a straightforward example of how architecture influences the creation of presence in a participant.

Caves make us feel something – as if we are *there*.

PART 3:

APPLYING THE FRAMEWORK

INTRODUCING THE EXPERIENCE

ENTERING THE EXPERIENCE

THE END

CONCLUSION

THE BOOK OF DISTANCE: INTRODUCING THE EXPERIENCE

“In 1935, Yonezo Okita left his home in Hiroshima, Japan, and began a new life in Canada. Then war and state-sanctioned racism changed everything—he became the enemy. Three generations later, his grandson, artist Randall Okita, leads us on an interactive virtual pilgrimage through an emotional geography of immigration and family to recover what was lost.”

The Book of Distance (2020) is a single player narrative driven room-scale¹⁰⁴ VR experience that exemplifies captivating storytelling through VR, created by the Canadian artist and film maker Randall Okita, and developed with the National Film Board of Canada (NFB).¹⁰⁵ This short form 30-minute VR experience has been the recipient of a number of VR, XR, new media, and film awards and selections. This experience is available through the gaming platforms Steam, Meta, and Viveport and is supported on a variety of VR headsets.¹⁰⁶

The experience is guided by Randall with his voice and virtual embodiment inviting you to bear witness to his grandfather’s immigration journey from Hiroshima to Canada, through moments of beauty and hardship. The story is a linear retelling of an immigration story, and also the story of how Okita has been trying to make sense of the life of his grandfather through the creation of the project.¹⁰⁷ An important distinction is made in how he presents the linear narrative; this is not merely a documentary style retelling of the past, but a story told through memories of a man, brought to life by his grandson. The writing of the story skillfully integrates moments of touch and interaction, providing a feeling of being alongside the people in the story. You are asked not to experience the realities of the story, but to feel as if you are living the memories.

¹⁰⁴ Room-scale is a design paradigm for VR in which users can freely walk around a play area. This contrasts with a standing/seated design paradigm, in which the experience is designed for the participant to not move through the space, and interactions are either at arms length, or other movement mechanics are introduced.

¹⁰⁵ Randal Okita and David Oppenheim, “‘The Book of Distance’ Press Kit,” National Film Board of Canada, January 3, 2020, <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.

¹⁰⁶ Okita and Oppenheim, “‘The Book of Distance’ Press Kit.”

¹⁰⁷ Okita, “The Book of Distance.”





There are four spaces in this VR experience from which the story is told. The first is the space where the story of Randall's grandfather, Yonezo Okita, is told through changing scenes and moments in time. The second is the space in which the conversation between Randall and his father is held. Third is the space of the narrator Randall, in which he frames his point of view and his experience in the act of story telling. And fourth is the space that the participant occupies in this experience and story.

The four spaces of the story overlap and bleed into one another, mirroring the style of personal storytelling with each space holding different moments in time. The virtual architecture in the spaces use different design approaches to communicate the time, feeling, and experience attached to each space in the narrative. Within this VR experience the three propositions that I have identified through the framework *Architecture as Setting the Stage* are exemplified.

The next passages are the retelling of my own experience in *The Book of Distance*. To be able to speak to the *Virtual Utilitas* of virtual architecture in a VR experience, I focus on the retelling of my reactions, observations, and feelings in response to *The Book of Distance* to communicate my own experiences of *presence* and identifying the instances where architecture works to identify the three propositions: calling and directing attention, holding meaning, and expression of boundaries.

The Book of Distance by Randall Okita is a beautiful and moving work of VR storytelling. It brought me to times and places I had never been before. Through the lens of *Architecture as Setting the Stage*, I was not only able to experience the impactful narrative but to appreciate the craft of the space that supported it all.



Fig. 23: Image from The Book of Distance press kit, edited by author. (previous page, top) Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.

Fig. 24: Image from The Book of Distance press kit, edited by author. (previous page, bottom) Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.

Fig. 25: Image from The Book of Distance press kit. (facing page, top) Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.

Fig. 26: Image from The Book of Distance press kit. (facing page, bottom) Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.

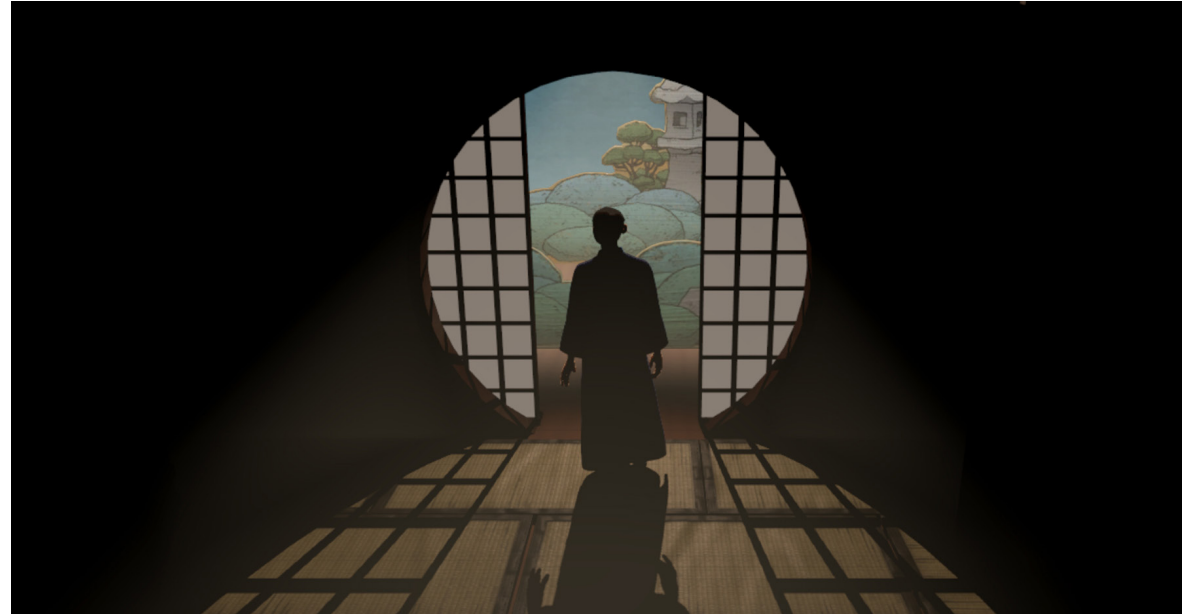
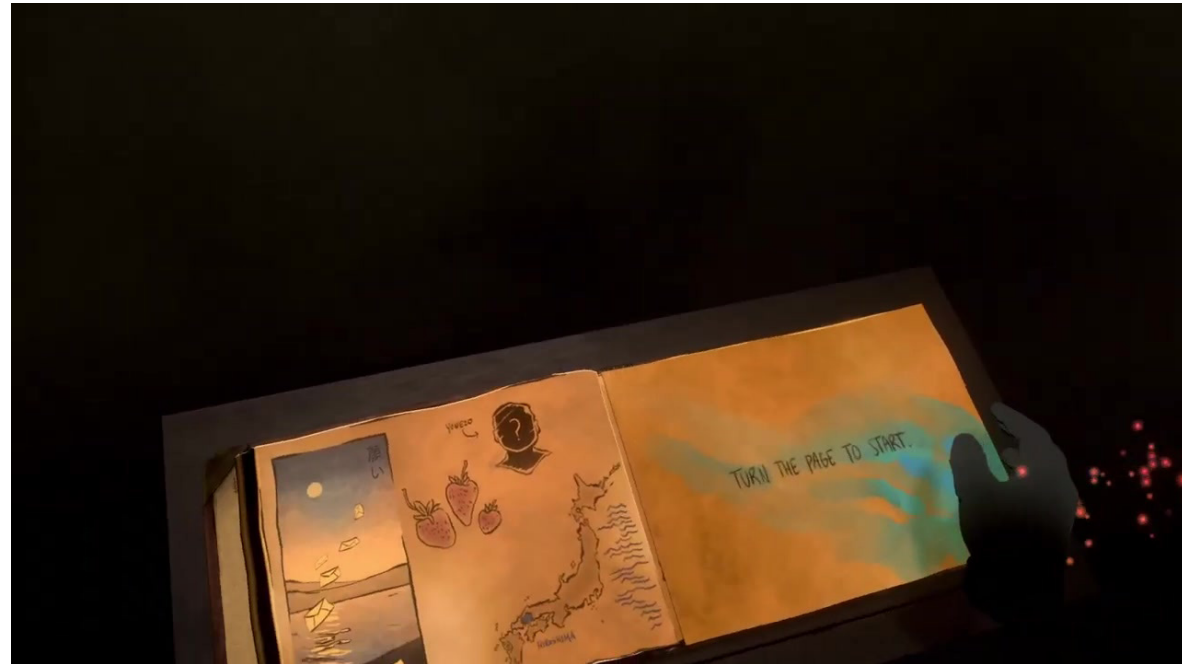


Fig. 27: Image from The Book of Distance press kit. (Top image)
 Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.
 Fig. 28: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR..



Fig. 29: Image from The Book of Distance press kit. (Top image)
 Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.
 Fig. 30: Image from The Book of Distance press kit. (Bottom image)
 Randall Okita, and David Oppenheim. "The Book of Distance' Press Kit." National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.



A spotlight reveals itself through dusty air, drawing my attention to a weathered photo album sitting atop a podium. I feel like I am in some undefined location and the darkness feels deep. Yet around me are curtains highlighted by streaks of dim spotlights, like the backstage of a theatre. The book beckons my hands, so I flip through the pages. A note addressing me as 'the time traveler' can be read on one of the pages. Light particles gather and silently entice my hands to touch the photos that gently float off the page. These photos are real photos. Real as in they look to be artefacts from someone's life, presented unaltered, for me to see. A horseshoe sits on the page next, not a photo but a three-dimensional object. A voice from the darkness gently tells me that the images are of his grandfather, and the picture of the kid throwing horseshoes, that's him, Randall. He invites me to throw the horseshoe to my left. I look and see a new spotlight revealing a patch of sandy ground, and a short post in the ground. Beyond the sand is a grey curtain. I throw the horseshoe at the post in the sand.



Fig. 31: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 32: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.



In the opening scene of *The Book of Distance*, I am introduced to the beginnings of the narrative experience and to our narrator, Randall. The beginning of any VR experience is particularly important as it typically orients the participant to the space and gradually introduces the participant to the mechanics of interaction in the VR space – as those can vary from experience to experience.

Looking around in this first scene, I discern two major aspects of the virtual space based on its architecture: the kind of space that I am in, and the space in which I – the participant – am meant to occupy.

CALLING AND DIRECTING ATTENTION

The spotlight drawing my attention to the podium and book are within reach of the place in which you begin the experience. The illuminated book introduces the narrative, showing photographs central to the story that Randall is telling about his relationship with his grandfather. The podium allows the book to be at the proper height for my disembodied hands, with the spotlight directing attention to it. The combination signifies to me that these objects in the virtual space are meant to be interacted with.

MEANING IN ARCHITECTURE

My understanding of the type of space I am in is communicated by the objects I can see around me and sets my expectations for what is to come in this virtual space. Although darkness mostly occupies this scene, curtains are illuminated in the distance telling me that I am in a theatre like space. The red curtains I associate with thick velvet materials used in stages and theatre. A few objects are lit by direct spotlights, landing on the podium in front of me and later a portrait just beyond it. The spotlights further enforce my feeling of being in a backstage space. This understanding and expectation of the virtual space established by the architecture of my context are further confirmed with strong references to Japanese wood block theatre, evident to those familiar with this form.

EXPRESSION OF BOUNDARIES

The podium, part of the architecture in this scene, implies a boundary of where I can interact in the scene as a participant. Although this is an experience in which I could physically walk around – a “room scale” VR experience - in a way that would translate to movement in the VR space, I can tell that I am meant to stay in front of the podium. This is the space of the participant for this VR experience.

Beyond the podium, Randall speaks to me, and portraits become illuminated, introducing family members, but the podium stands between myself and them. The podium, an item in which one typically stands behind, acts to allow for interaction with the book for the participant but also sets the boundary and expectation for the place of the participant.

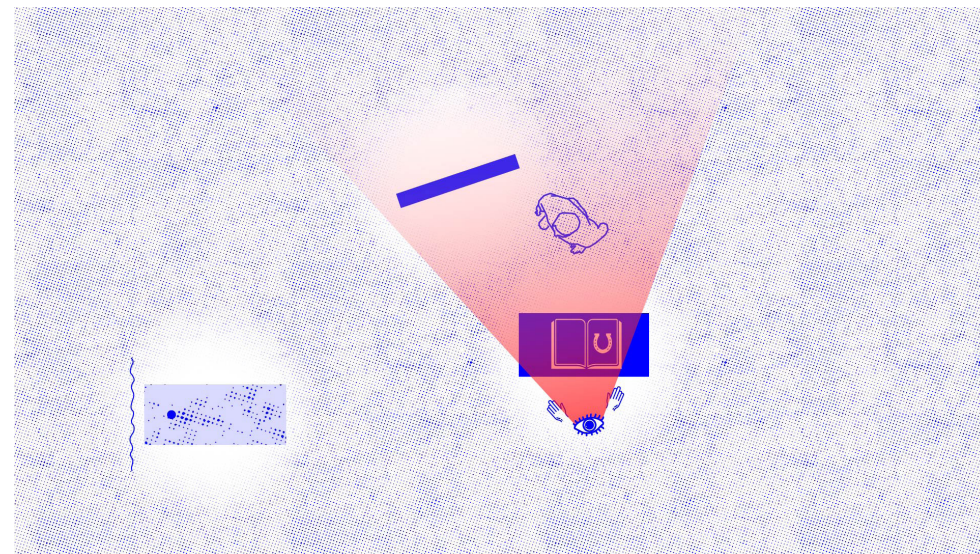


Fig. 33: Screenshot from *The Book of Distance*.
 Randall Okita, “*The Book of Distance*,” 2020, National Film Board of Canada, SteamVR.
 Fig. 34: Diagram of scene from *The Book of Distance*
 By author.



Finally, the horseshoe toss that I am asked to participate in also sets the precedent of moments of interactivity that extend and affect the virtual space. The small toss familiarizes me with how to interact with the virtual space using my VR hardware of an HMD and hand controllers. Although a visually simple virtual space, with a lot of black void between objects, I still feel drawn in. I feel grounded in a theatre-like space of storytelling. I feel invited. I throw the horseshoe towards the patch of sand, not out of obligation to move the narrative forward, but because I feel; engaged in this storytelling space, and I become an active participant in the story.

The stage has been set along with my expectations and intuitions that will guide me through this narrative.

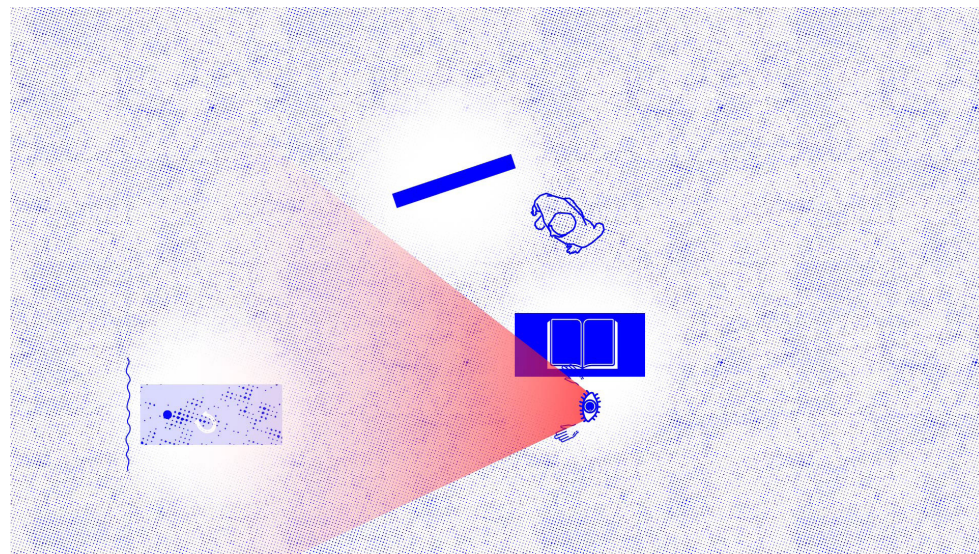


Fig. 35: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

Fig. 36: Diagram of scene from The Book of Distance
 By author.



Randall introduces me to his father, and as he gestures to the left, a corner of a room is illuminated. I turn to look. The space is only articulated by two walls, with three windows framing a painterly scene of flowers and sky. There is a wood table surrounded by five matching chairs. It feels simple, it feels warm, it feels like a home. A man with glasses sits at the head of the table and his voice comes through. A recording of a call between Randall and his father plays while my attention is engaged on the scene of the quaint dining room. The two debate the details of Yonezo's age when he left Japan. My attention is drawn to Randalls movement, as he moves towards the framed portrait of the main characters of the story, the Okita family. Beside the image of Yonezo in the photo, his age is crossed out and fifteen is written in. I turn back to look at the dining room. The dining room is no longer there, darkness takes its place for now.



Fig. 37: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 38: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.



CALLING AND DIRECTING ATTENTION

The space of the interview is a static space that appears during the conversation between Randall and his father. The architecture that creates this place is minimal, yet effective. The simple two walls and table, personality given through wood paneling on the wall matching the table with an orchid in its center. This space appears, unchanged, whenever the interview is heard. The corner of the room both gives a visual association to the snippets of conversation between Randall and his father, and keeps my attention focused and within the experience.

EXPRESSION OF BOUNDARIES

The use of this corner set works to draw attention to the words spoken in the conversation. It is beyond my space of interaction, the space of the participant, and the darkness separates where I stand and where the floor in the dining room space begins. It almost feels like I am looking through a window, or into a memory – I am not meant to interact, but simply witness here.

MEANING IN ARCHITECTURE

Although the figure and objects are unmoving, the simple gesture of giving a space to attach to the story being told to helps to absorb the meaning of the words being spoken. Although the full room is not articulated, and I am not immersed in that space, I do not need to be immersed, to feel the intended effect. The table, the chairs, the articulation of the walls and windows, is enough visual information to discern the type of place it is, and the meaning it has in this story. This corner of a dining area, perhaps a kitchen, gives the impression of a place in which Randall's father lives.

By showing the room, it is Randall inviting me in to experience the conversation with them. It gives a place to the story, like a face to a name.

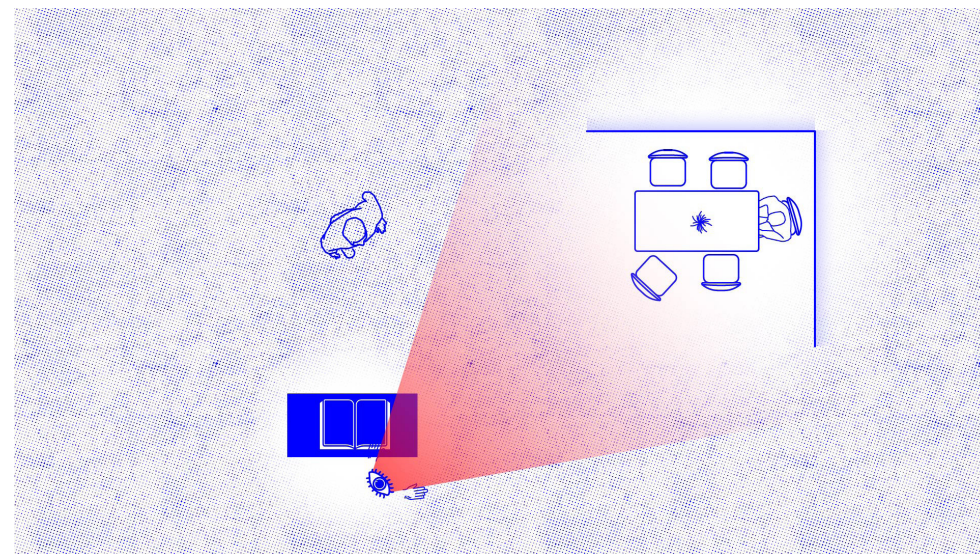


Fig. 39: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 40: Diagram of scene from The Book of Distance
 By author.



My eyes follow a young Yonezo walking across the space, and to my left a room slowly illuminates with his presence. Randall wonders what Yonezo's home in Hiroshima looked like, as a scene of a warm living area with tatami mats and a circular window emerges. The room has a warm glow, it feels friendly – I feel welcomed in watching this scene. Figures loiter near the window and to the sides, as my focus is set on Yonezo. He writes letters abroad, and Randall slides the same desk in front of me. I mirror the actions of Yonezo, and a little girl excitedly hands me a paintbrush. I am acting alongside Yonezo – maybe I am acting as Yonezo – connecting myself to the home in front of me. I paint to reveal letters and paintings. I mimic the actions of packing the belongings of Yonezo, as Randall speaks to me and wonders;

“How did it feel to leave the only home he knew, for a place he could only imagine?”

I wonder where I will be transported next, as I pack away the photographs, clothing, camera, and other belongings of Yonezo. I feel like I am touching his belongings, and understanding a bit more about who he is – through the possessions that will go with from his home. This warm yellow room with a girl bouncing around brings a smile to my face – this is a happy place that I am in. I see Yonezo bow goodbye to his family members, as the warm light in the room fades away. The warmth is gone, as Yonezo says his final farewell to the little girl – and the now cold spotlight fades away.



A railing is pulled across in front of me by Randal, ducking down as he moves across the space, and my eyes follow him. When I look back up, the scene has changed beyond the railing. Yonezo is with me to my left and places the suitcase on the ground. The Okita family stands on a dock, simple house structures are layered in front of one another fading into green mountains in the background, like paper craft. The sky is bounded by a perfect arc, and the edges of the scene blur into the darkness. Waves are between the dock and the railing. They look like they are cut from wood and painted – I can see glimpses of mechanisms that sway the waves rhythmically side to side. I know this is moment of the past, but the play-like imagery reminds me that this is still a recreation of imagination. Did this moment happen exactly like this? It is the essence of a goodbye, before embarking on a journey across the sea. I look over to Yonezo, leaning on the railing, looking at the sea. Behind me are dimly lit seats of the wooden boat where I am standing, a lifebuoy to my right. I look back at the family on the dock, they are waving. Yonezo is still looking into the waters beyond the railing. The family still waves.

I wave back. Yonezo waves too.

Fig. 41: Image from The Book of Distance press kit. (Top image)
Randall Okita, and David Oppenheim. “The Book of Distance’ Press Kit.” National Film Board of Canada, January 3, 2020. <https://mediaspace.nfb.ca/epk/the-book-of-distance/>.

Fig. 42: Screenshot from The Book of Distance. (Bottom image)
Randall Okita, “The Book of Distance,” 2020, National Film Board of Canada, SteamVR.



The space of the journey is one spectacle as it changes in front of you, bringing you through time and places alongside Yonezo. As the space changes you find yourself in a new place, and in a different time – like shifting between memories in your mind’s eye.

CALLING AND DIRECTING ATTENTION

The space of the journey uses architecture to set the stage and draw your attention forwards. When the focus is on the journey, the level of detail and lighting is used to call your attention to the scene that plays out in the journey, and the space that it takes place in. When Yonezo is in the house in Hiroshima, it is a warm place that centers him in the home. The focal point of the set is a round window, depicting a stylized rendition of the outside location. Figures doddle on the edges of the lit scene, where the room fades out of existence into the darkness. The architecture does not overwhelm the sense, and it does not fully invite me in. Behind me, there is nothing to define the outer edge of this place, or where I am located in this place. However, I do not even think to look behind me as my attention is focused on the home in front of me.



Fig. 43: Screenshot from The Book of Distance. (Top image)
 Randall Okita, “The Book of Distance,” 2020, National Film Board of Canada, SteamVR.
 Fig. 44: Screenshot from The Book of Distance. (Bottom image)
 Randall Okita, “The Book of Distance,” 2020, National Film Board of Canada, SteamVR.



Fig. 45: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 46: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

EXPRESSION OF BOUNDARIES

When Randal pulls the railing in front of me, it delineates the formation of a new place that Yonezo and myself are in. As the light returns to reveal the new scene in front of me – his family waving from a dock – I look around to my surroundings. To my right, a lifebuoy hangs on a wooden post. Further behind me, a row of wooden seats. In front of me, the railing that Yonezo leans on as the waves beyond the railing move side to side. These few elements define the space I am in – a ferry boat. The few architectural elements that surround me on our side of the railing, define the distinct space that we are in, traveling on a moving boat as the scene changes in front of us. The railing itself is a clear divide of the space of the journey – beyond the railing the place is changing, and we will soon find ourselves elsewhere. But on our side of the railing, the piece of architecture that grounds us, feels unchanged. Until the set changes again.

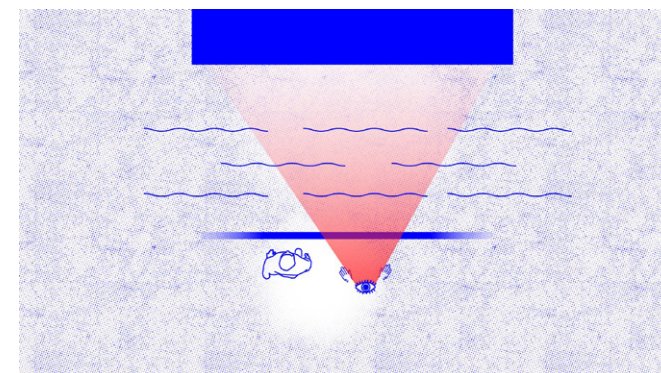
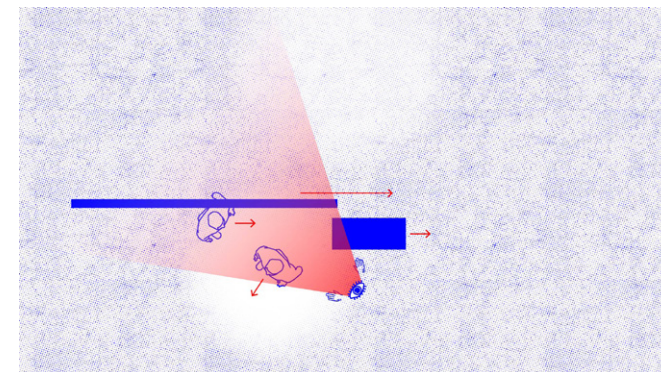


Fig. 47: Diagram of scene from The Book of Distance
 By author.
 Fig. 48: Diagram of scene from The Book of Distance
 By author.



Fig. 49: Screenshot from The Book of Distance. (Top image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 50: Screenshot from The Book of Distance. (Bottom image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

MEANING IN ARCHITECTURE

The meaning in the architecture that sets the stage for these moments in the journey are expressed in their stylization. The space of the journey is constructed through the virtual architecture stylized in the spirit of minimalist theatre and Japanese woodblock prints. The waves that represent the sea look to be wood panels, cut, and painted as sets of waves. Attached to them, I can see the mechanical arms that are attached to each wave, moving them up and down. The decision to recreate and show stage machinery like a wave machine reinforces these direct references to theatre.

The simple representations of people and places, the artistic renditions, and real-world artefacts incorporated all gracefully come together to give life to the story. The reference to Japanese culture visually alongside the narrative pays homage to their cultural identity, and its importance throughout the story.

In this narrative, Randal is trying to reconnect with his own culture through his grandfathers story – but it is a story of being stripped of your humanity because of where you came from. Behind the choice to represent the journey in a style upholding Japanese art and theatre, brings with it the important meaning of proudly displaying your culture – something Yonezo was punished for.

However, it is not the reference to stage or set that drew me to this project or made it a valuable candidate for this case study. It is the experiences capacity to tell a story of places through time through narrative and immersive spatial construction around the participant – around me.



A light falls on the figure of Yonezo as he is lead away from his family and home. A moment ago, I was at the bright dining room table of the home he had built for his family.

The wooden walls of house surround me – pictures and the items I had packed in the suitcase are now displayed on a bookshelf. The wall that should be to my right is not there, and I can see out into the porch and the land beyond. Figures lounge on the porch. It feels like an extension of home, connecting the land to the feeling of home I see inside. I help pass food out to the family sitting at the table, strawberries from their farm I saw earlier. This is the house that Yonezo built from the ground up, but it is also the home in which he has made a successful and happy life.

I feel the personality, warmth, and pride in that place.

But the mood shifts. It is grey and cold. RCMP officers are now on the porch, grey and faceless. I watch the scene as Yonezo pleads with one officer, while in the now dark house his wife and children hold each other close. The home, once warm and lively, is now dark with a dim warm light in one corner. I look behind me at the home, and nothing that I can see has changed, but the life is gone. Yonezo's wife and children are taken away, walking away the lifeless house into the darkness. Yonezo is taken the other direction.

The world fades around him and me. White flecks fall onto the ground from above, turning the nothingness into a barren snow-covered ground. Grey silhouettes of mountains fade in as the confining background of the scene. Grey figures wander in the grey atmosphere. It is all colourless. A metal lever in front of me, the light particles gather again calling me to pull it.

I pull it.

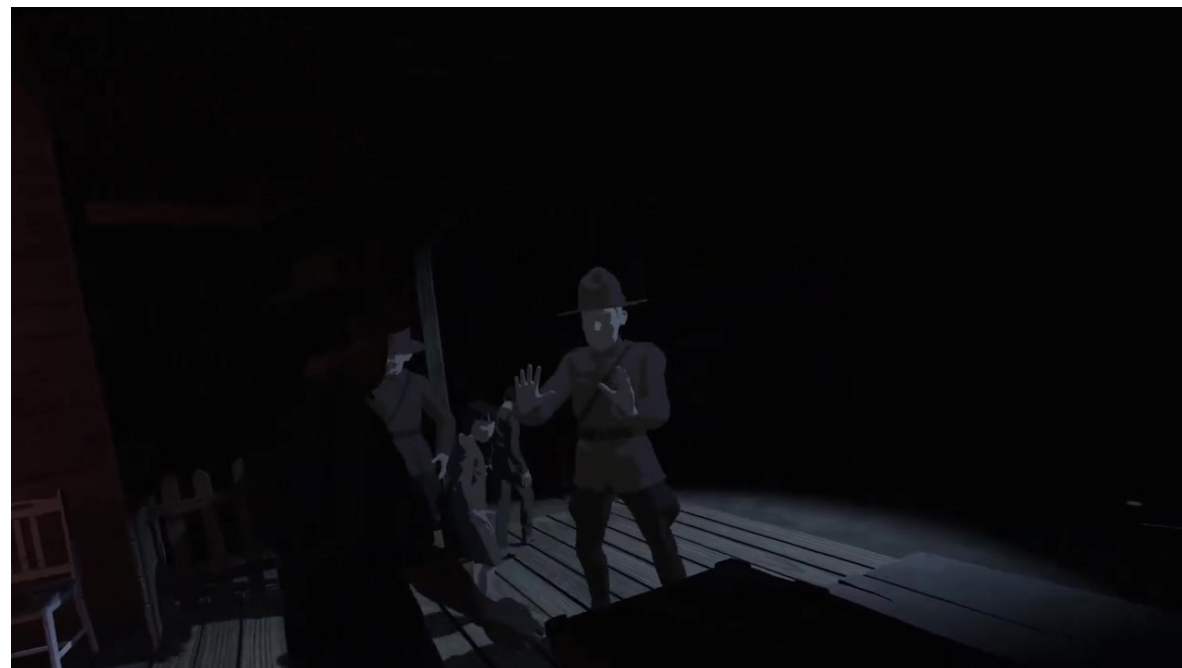


Fig. 51: Screenshot from The Book of Distance. (Top image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 52: Screenshot from The Book of Distance. (Bottom image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.



Fig. 53: Screenshot from The Book of Distance. (Top image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 54: Screenshot from The Book of Distance. (Bottom image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

CALLING AND DIRECTING ATTENTION

As backdrops, furniture, and human figures move in synchronization in and out of lit views, your attention is called to and from scenes passing through time. The level of detail embedded in a constructed place that appears to you catches the eye and keeps you looking for more. In the family home you watched Yonezo and his wife build, the walls and shelves display personal items recognizable from when Yonezo packed his suitcase, and images of the happy family.

The scene waits for you to take it all in – time slows down as the space defined grabs your attention through the detailing of the home. This is starkly different to when the scene shifts to the dreary camp. Little detail to the environment and the figures in the background are grey shadows. Yonezo and the fence that delineates his confinement – the participant on the other side – are the only things detailed in view. Your attention is brought specifically into focus to this moment, and to this person.

EXPRESSION OF BOUNDARIES

The scenes within the house are the most enclosed sets in the experience, as most scenes have some architecture that depicts a room or a backdrop that fade into black around the edges. Here I feel the most involved in the space, as the warm atmosphere of the home is all around me. The walls of the house being articulated give a feeling of being inside – but not just inside the structure, but inside the moment. The walls as boundaries make me feel enclosed, and safe – as a home should. One wall is purposely not articulated. Where there should be the wall with a front door it is open, and I can see the porch outside and the trees as the backdrop. The porch and the land are an extension of the home, and the decision to allow for sight lines to extend to the exterior communicates that. Here, it is the lack of the expression of boundaries that works to communicate meaning and a feeling, even if it is not a simulative portrayal of the architecture.

MEANING IN ARCHITECTURE

The set of the house, Yonezo's home, maintains through the shift of this scene. The moment of domestic bliss in the house is felt when helping in passing the food Yonezo and his wife provide to their children. The items that decorate the home transform what could have been just a house – a place of shelter for the family in this new country – to a place that is recognizable as their home. The personal objects of Yonezo that I recognize from when previously packing his belongings in an earlier scene are tucked into place, on bookshelves and drawers. This home is the place the family has made for themselves – both in the fact they constructed, but also in act of place making. This transforms the meaning of the set seen; it acts as more than a backdrop to the scene that gives a location to the moments shown. I feel the warmth of the home when, with the lighting and colours seeming reminiscent to the atmosphere of the home in Hiroshima. The house shows a level of success in the immigration story. It

represents a place that they have made that is an extension of themselves in settling, and the moments shown to me allow me to feel the life that they have made that the home embodies.

As the time passes, the set of the home remains. When the atmosphere grows cold and dark, the officers appear on the front porch and the home is still shown behind me, as I face to see Yonezo plead with the officers. The home now is the same as before, but only a dim, warm light illuminates a part of it. The choice to keep the home as the set in this scene reminds me that it is not just the house or the land that the Yonezo is forcibly removed from, but the life he created for himself.



As the barb wired fence raises from the ground, a result of my action, Randall walks into the now wired off space. He tells me about how he struggles to tell this part of the story.

"I get lost at this point sometimes. I don't know how to show this moment."

He has no documents and no pictures. It is a moment Yonezo did not want to be remember. Randall paces in the scene, alongside his grandfather.

"I'm trying to find a way to see him here. To stand with him."

To my right, Randall has moved out of the snowy compound and a spotlight shines on him looking at a bulletin board. The board is peppered with squares of various size and colour – they look like maps, papers, sticky notes, and photos. A sign above says "Randall's Office" 2019. This is the space and time of Randall, the perspective of which has shaped the telling of this story. It is in this space, outside of the time Yonezo is in and outside the space I am in, in which he wonders aloud:

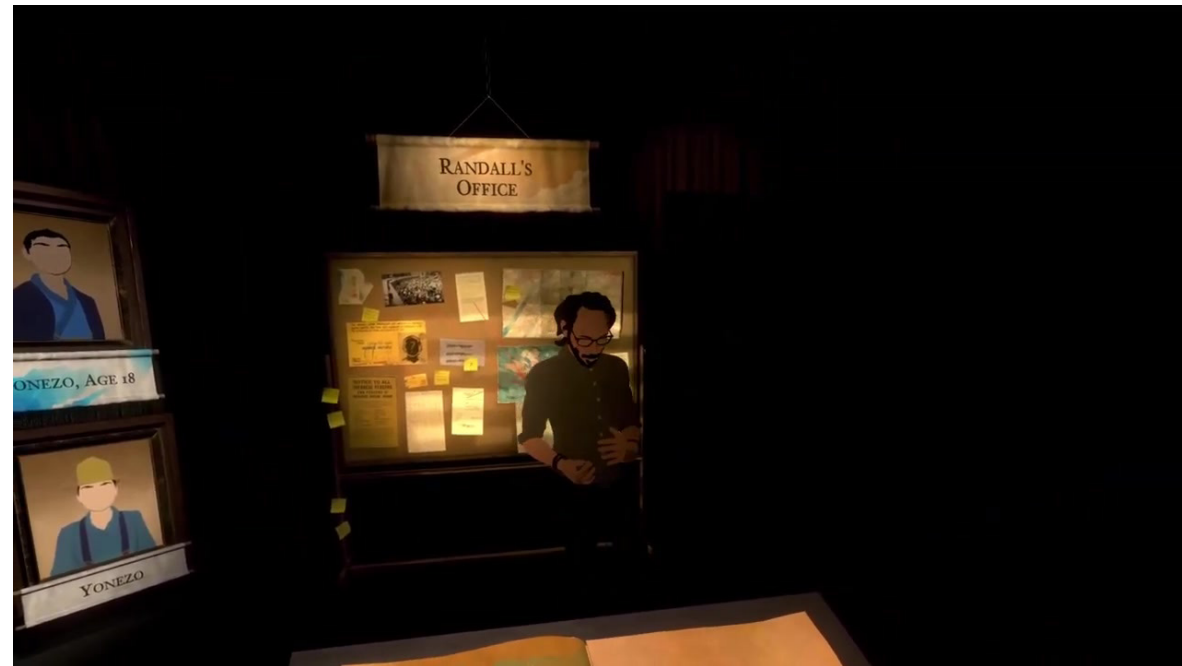
"Who gets to tell us where to stand - on one side of a line or another? Whose safety gets to be more important than another? Whose fear gets to separate families?"

This is the representation of the space where Randall has pieced together his grandfather's story. The singular architectural element of the bulletin board is the visual manifestation of Randall as the creator of the story. The story being told is both about Yonezo's immigration from Japan to Canada, and simultaneously the story of Randall finding the pieces of his grandfather's story.

The bulletin board with its maps, photographs, and red string signifies the work done in resolving this mystery. Randall does not need to tell me how hard it was getting the facts right, or the timeline in the right order to be able to honestly portray the story. The complexity of the story exists in the story as it is being told and is symbolized in Randalls bulletin board from 2019.



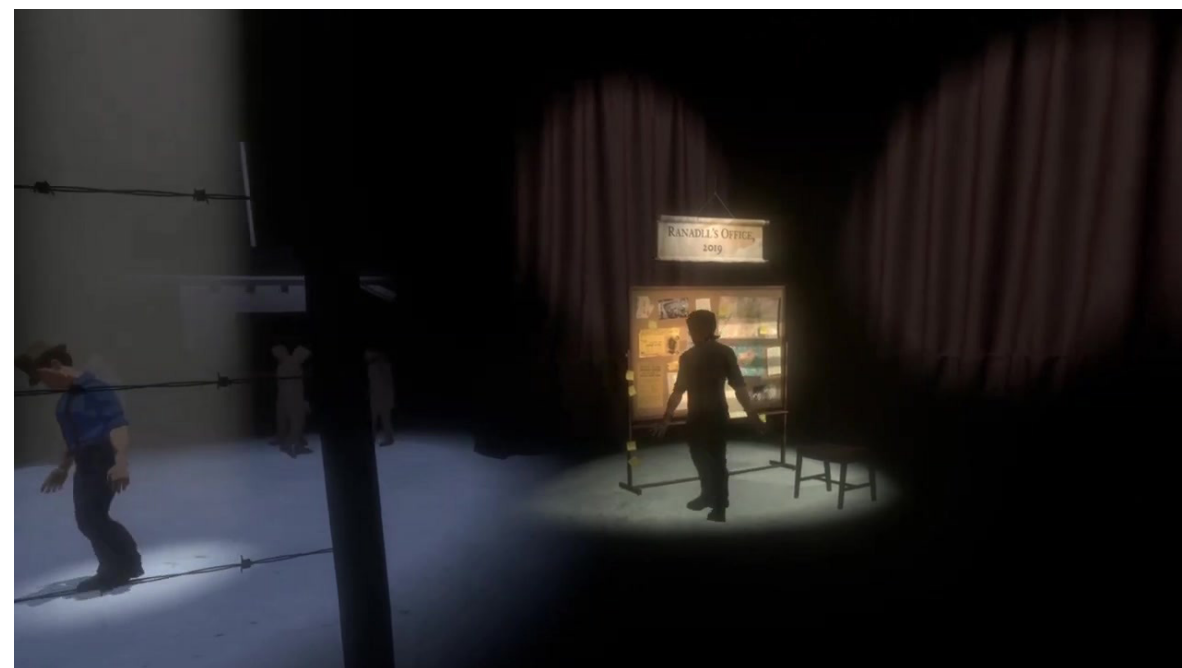
Fig. 55: Screenshot from The Book of Distance. (Top image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 56: Screenshot from The Book of Distance. (Bottom image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.



Lastly, the space of narrator is the space in which Randall has assembled his grandfather's story. This space is defined through the symbol of a bulletin board, revealed alongside Randall when his own voice, and his own story, merges into the narrative. The story recounts Yonezo's immigration from Japan to Canada, and simultaneously the story of Randall finding the pieces of his grandfather's story. When Randall appears in this distinct space, there is little direct reference to this time and place beyond the dated sign of 'Randall's Office'.

This space works with minimal yet effective effort with the simple architectural object of the bulletin board and the interplay with light. The bulletin board as an architectural object that appears alongside Randall establishes the time and space from which Randall is speaking in this narrative. When the bulletin board is hit with a spotlight, it indicates that the words you hear from Randall are his own thoughts, from that place and that time in 2018 when he was piecing this story together. As spaces change with the set of the architecture, it is evident that the space of Randall with his bulletin board is distinctly apart from the other three spaces.

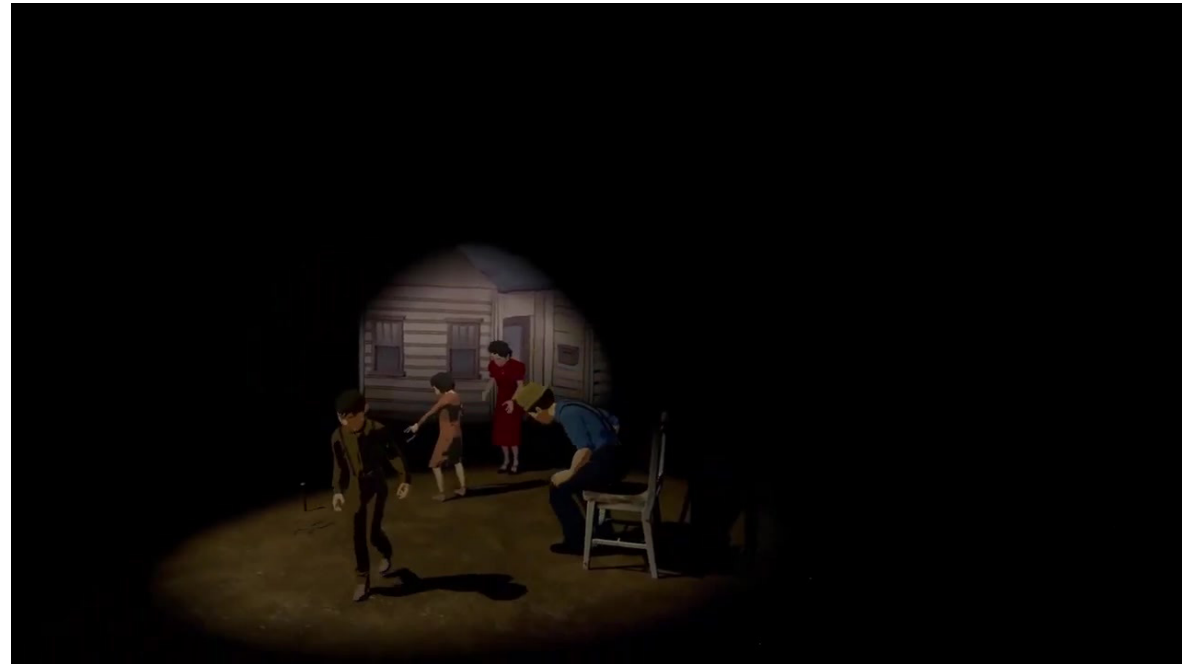
The bulletin board as a singular object achieves all three of the proposed propositions. It focuses your attention by giving visual detail and texture to the time and space Randall is speaking from with notes and artefacts pinned to the board. The bulletin board is a symbol, an abstraction, of the work and artefacts that Randall has collected and pieced together to bring his grandfathers story together. It represents Randall's work in coming to the story of Yonezo, but it also represents his place in the larger narrative being told. The bulletin board grounds Randall in his space, gives a sense of scale to his body, and delineates a space that is unique to the narrator.



The choice to include this piece of architecture in this set strengthens the message of this multigenerational story. Randall is an actor in this experience, he has chosen to make his voice and presence clear through a model of himself actively participating in the changing of the scenes. However, the decision to create a space in which Randall appears gives context to the time and place he created this project. This story is as much about places as it is about people. Randall's Office – the bulletin board – is where the story of his grandfather emerged for him.

Fig. 57: Screenshot from The Book of Distance. (Top image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 58: Screenshot from The Book of Distance. (Bottom image)
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

THE BOOK OF DISTANCE: THE END



Yonezo sits back on a chair, after showing his son and daughter how to play horseshoes. The young boy wanders towards me and looks off to the right. The dining room appears again, with Randall's father standing now. Lastly, Randall appears in front of his bulletin board – now amassed with more sticky notes than before. Randall recalls how the life his grandfather built for his child then shaped how Randall's father would build a life for him. Even without his voice, I can see the generational connection in this moment. The spaces in which this story was created and told, all existing simultaneously. They are shown as they exist inside of Randall. The story of three generations is shown as one. The architecture of each time and place come and go, but always inviting me into the memories. As I occupy the fourth space of this experience, the story lives with me now too.

A note floats in front of me, a letter to Grandpa from Randall. I take the note.



Fig. 59: Screenshot from The Book of Distance. (Top image)
Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
Fig. 60: Screenshot from The Book of Distance. (Bottom image)
Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

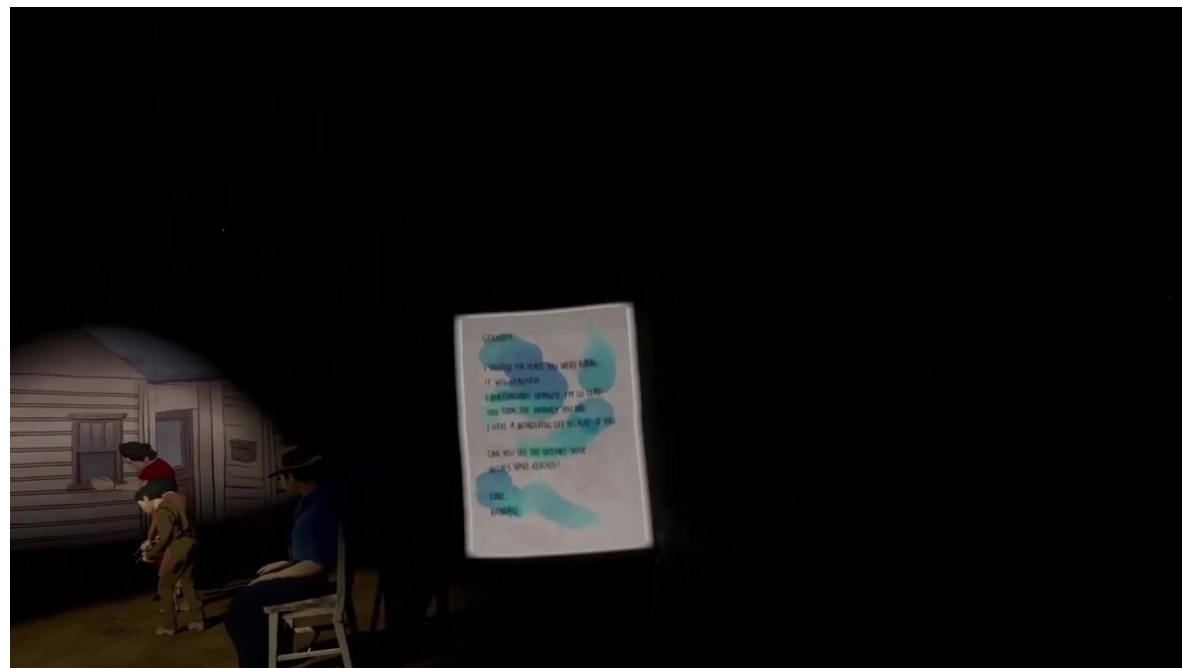
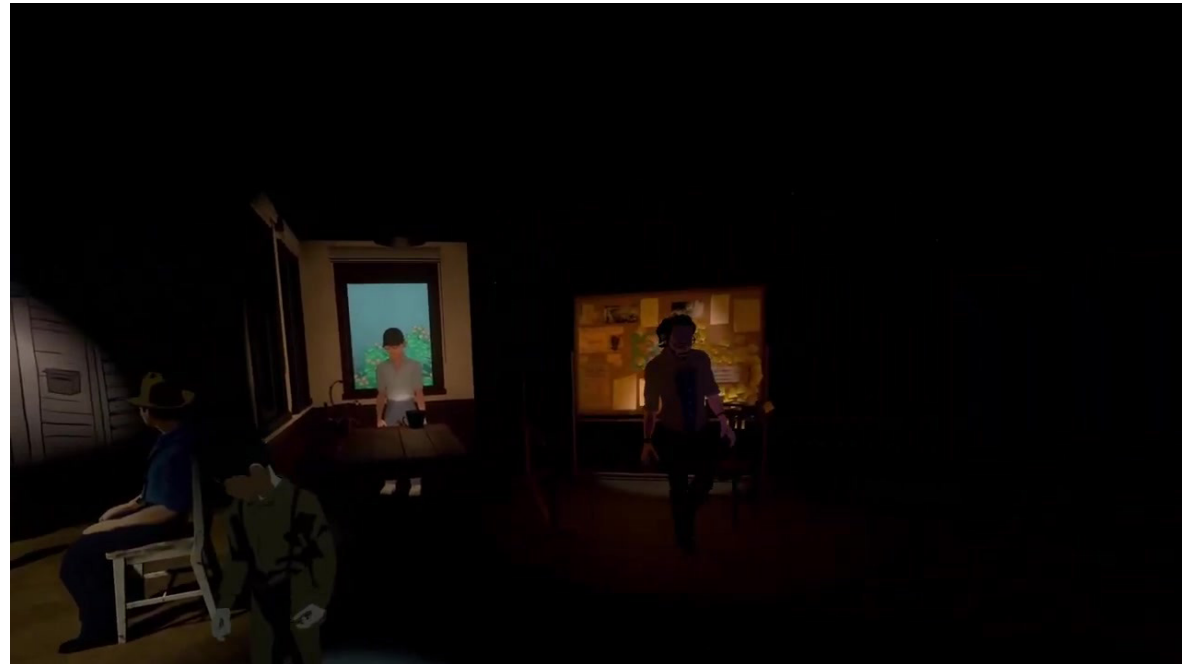


Fig. 61: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 62: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

Here, in the last moment, I am so drawn into the story and experience that I begin to feel emotional. My own relationship with my cultural identity and my family's immigration story plays a part in this connection – especially in moments where Randall speaks directly about his relationship with his grandfather. However, the power to move me emotionally in such a way was achieved through more than just the story alone.

The architecture of the virtual spaces presented in *The Book of Distance* was achieved and it set the stage for an emotionally charged experience. Through the experience, what you see are not just spaces, but they become places as the narration weaves itself into the virtual place making right in front of you. The stylization and intentionality in the scenes at times allows your mind to fill in the granular details – making the story come alive. At times, you are enveloped in the family home, at the dinner table, the architecture immersing you in the memory. At other times, you are on the other side of the boat railing or barbed wire fence, separated from the space of Yonezo. The VR medium was exceptionally considered in how the virtual spaces immersed the participant, with architecture that captured attention while expressing spatial understanding and meaning. All this occurred while seamlessly working with the pacing and voice orchestrated by Randall Okita, guiding you along.

By employing the conceptual framework *Architecture as Setting the Stage*, we gain a deeper understanding and dissect how virtual architecture is utilized to narrate stories of various times and places. The beautiful experience that is *The Book of Distance* initially may fill you with awe, wonder and emotions – but through the lens of the framework how this is achieved is rich and beautiful in itself. The craft of the narrative and the themes of placemaking are embedded in the decisions of how each scene is present – how the stage is set. *The Book of Distance* was analyzed through the three propositions informed by the conceptual framework, drawing the connection between the implementation and use of the virtual architecture, and its results in conveying the emotional story of Yonezo's story, his family's story, and Randall's story. The result is a feeling of *presence* in myself as the participant – made evident by my emotional response and attachment. This story stayed with me, and the experience inspired me.

The architecture called and directed my attention, inviting me into scenes to connect with the journey being unfolded. At times this was done through surrounding me in the sets being created and acting as one of the actors in the story. At other times, the spaces were defined with few objects, allowing me to focus on only what was necessary for understanding the place and the story. Through choreographed movement of the architecture, level of detail in objects and textures, and the architectures interplay with light; the architecture that creates the space works to capture and maintain the attention of the participant.

The architecture expressed boundaries between the different places in different times. The space of the participant, the space of the interview between Randall and his father, the space of Yonezo's journey, and the space of Randall – where the story came together. Although there is little to no movement from the participant – as it was designed that way – boundaries still play apart in delineating difference from space to



space, as well as from time to time. The architecture distinctly marks the space of the interview and the space of Randall's office – emerging from the darkness unchanged. When you hear the interview and see the corner of the dining room with Randall's father – it is clearly indicating that the space is in a different location and time then of the scenes in Yonezo's journey. The expression of boundaries in this case is to coherently delineate different places when the narrative allows for them to overlap – which intentionally embodies the themes of the multigenerational story.

The architecture conveyed meaning which added to my understanding, alongside the words being spoken and the actors moving in the scene. The curation of the scenes did not overwhelm the sense or distract from the storytelling. Each included item, backdrop, and detail included worked together to give the essence of the place, with important elements highlighted that drew on the story. The virtual architecture of each scene creates more than the virtual space to view and interact within – it creates a place. From space to place, meaning is assigned to the architecture – to the set. Meaning is negotiated and agreed upon in the context of the story being told, combined with the participants own associated meaning of the signs being perceived. There is a depth in the places that come from the meanings associated.

The Book of Distance as a VR experience felt successful in communicating the impactful story at full force because of how immersed, how involved, how I felt like I was within these memories – because I felt present. That is how the virtual architecture works harmoniously to tell this story – and I was moved to tears.



Fig. 63: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.
 Fig. 64: Screenshot from The Book of Distance.
 Randall Okita, "The Book of Distance," 2020, National Film Board of Canada, SteamVR.

CONCLUSION

Our lives are becoming increasingly entwined with the virtual, and with accompanying technological advancements, VR has emerged as a prevalent medium for immersive interaction and habitation. If we understand that the traditional task of architecture is to shape our physical spaces, then this understanding should extend to our virtual space.

Architecture as Setting the Stage posits a framework with which architects can conceptualize how architecture serves immersive VR experiences in eliciting a feeling of *presence*, an essential aspect of an effective VR implementation. In particular, the concepts of *Stage*, *Virtualitas* and *Place Illusion* have been determined to provide important perspectives for VR design, emphasizing presence.

In VR, *presence* is the genuine sensation of being in a mediated space, achieved through the allocation of attentional resources perceived both physically and psychologically. *Presence* is achieved through a high degree of immersion presented by VR and is influenced by the coherence and effectiveness of the VR illusion of place. *Presence* is vital to VR, as it defines the quality of a participant's experience, leading to increased engagement, emotional involvement, and stronger sense of connection in a VR space. *Presence* is how a virtual space becomes a virtual place.

Architecture as Setting the Stage positions architecture as being the set of a virtual space - which is understood as a *Stage* as per Wideström's metaphor. Architecture creates and defines the space in which the VR experience takes place. The craft of the illusion of place has influence on the level of immersion felt by a participant, and therefore impacts the evocation of *presence*. This is the domain of virtual architecture. How architecture creates *Place Illusion* successfully to impact presence in a participant is by considering the *Virtual Utilitas* - the utility - of the virtual architecture. Depending on the VR experience that is being designed, the fulfillment of Virtual Utilitas will look different per VR project. *Architecture as Setting the Stage* states that architecture has the influence and responsibility of crafting a place illusion that effectively supports the intended VR experience - thus setting the *Stage* for the drama, creating a place illusion, and eliciting a sense of presence in the participant.

Wideström's concept of *Stage* describes how we perceive and interpret visuals in virtual space, likening it more to how an audience perceives a theatrical production

on stage, as opposed to how we perceive and understand things in our daily lives. *Stage* adapts the concepts of attention, agreement, and expectation to explain how we understand virtual space.

Hernandez-Ibañez and Barneche-Naya's concept of *Virtualitas* reinterprets the classical Vitruvian triad of *firmitas*, *utilitas*, and *venustas* for application to virtual architectural design. This contemporary redefinition acknowledges virtual architecture as encompassing more than just aesthetic or perceptual value. *Virtual Utilitas*, informed by *Virtualitas*, positions the utility of virtual architecture as needing to support the VR experience, namely through the creation of *presence*.

Architecture supports the intended VR experience through the creation of a virtual place that fosters *presence* in the participant. *Place Illusion*, a concept coined by Slater, emphasizes that it is necessary that a coherent and convincing *Place Illusion* is needed to create a feeling of *presence*.

These three concepts, *Stage*, *Virtual Utilitas*, and *Place Illusion*, have been adapted and synthesized into the framework Architecture as Setting the *Stage* which considers the virtual context of architectural design, and the importance of *presence* in VR.

Virtual architecture design should strive to create a place where participants can enhance their understanding and immersion in a VR experience, thereby supporting the creation of *presence*, and fulfilling the utility of architecture. Architecture sets the stage for a VR experience.

Informed by the created framework, this thesis asserts three key propositions as essential aspects of virtual architecture that strongly impact the creation of a virtual place. The three propositions are examples of how virtual architecture influences a VR experience and are explored as design considerations for how architecture works in the virtual. They are:

Calling and Directing Attention: Virtual architecture can direct attention of a participant, to help ensure the participant's attention is kept within the experience and directed to important moments in the VR experience.

Expression of Boundaries: Virtual architecture is the perceptual expression of boundaries in a VR experience – which is important for navigation, way finding and maintaining the coherence of the *Place Illusion*.

Meaning in Architecture: Virtual architecture holds meaning in how it is perceived. The imagine of the virtual architecture, whether simulative or abstract, communicates meaning how the participant perceives it and understands it.

This thesis then explores the utility of Architecture as Setting the *Stage* through a documented case study of the VR experience *The Book of Distance* created by Randall Okita. Through this lens, the three propositions of how virtual architecture

impacts the creation of a virtual place, and the feeling of *presence* is examined first through an experiential report and followed by an analysis.

In this case study the experiential passage describes my personal reactions and feelings while immersed in the VR experience, highlighting my engagement, emotional response, and feelings of *presence*. A subsequent analysis of this experience then identifies the specific aspects of the virtual architecture that work to create such effects, following the three propositions explained in this work.

The result of this research is a series of examples categorized under the three propositions of how the virtual architecture in *The Book of Distance* utilized architecture to support the emotional and engaging experience.

For example, in *The Book of Distance* virtual architecture called and directed my attention by engaging my eye with high levels of detail rendered in the architectural elements of the space, such as the house of Yonezo. In that moment of the experience, the detail of the house including realistic textures, personal items of Yonezo, and a fully enclosed space brought my attention inward to the focal point of the scene - the dining table with the family. This enhanced my engagement and understanding of the VR experience, thus feeling connected with the narrative.

The virtual architecture expressed boundaries using key architectural objects recognizable as delineating spaces. In some moments, the boundaries were direct and recognizable, like using a boat railing or a fence to separate Yonezo or myself from the place beyond. In other moments, the boundaries of place in *The Book of Distance* were communicated through narrative objects and light. For example Randall's bulletin board showed in moments where his own story comes into the narrative, and is an architectural object that in itself expresses a place and boundary.

The virtual architecture communicated meaning through an intentional curation of architectural objects used to define each place in each scene. The architecture highlighted, like in the room of Randall's father, in its expression of style and level of detail suggesting the meaning of the place in the narrative. The choice to depict the room as two walls, a table, and some simple textures gave enough visual information to assign meaning to the place - a home.

Triggering specific human emotions is quite difficult, as many reactions are subjective and unique to a specific person's lived experiences. An emotional reaction to a world is a strong method by which the feeling of presence can grip a participant in VR. For example, the cave is a form of virtual architecture - it is a stage that encapsulates you in its architecture.

VR offers the potential to inhabit extraordinary experiences, and well thought out architectural design can influence how we connect to and engage with those virtual spaces - making them feel like places.

REFLECTION AND OUTLOOK

This research approaches how architecture knowledge can be applied to the creation of VR spaces, considering VR not as a tool to be incorporated into the contemporary discipline, but as a unique medium for interacting with virtual space. With the rapid evolution of VR technology, the question of who defines our virtual worlds and how they are being constructed are not issues of the future, but of our present.

The landscape of VR and the emerging industry is in a state of flux as it finds its footings. The inherently interdisciplinary nature of VR research, due to its multifaceted technological aspects, makes it challenging to fully understand its applications and practices through the lens of any single discipline—each contributes its unique strengths and limitations.

Approaching VR design research from an architectural perspective introduces the challenge of navigating and integrating several disciplines. A basic understanding of hardware and software involved in VR function is necessary to grasp the technical constraints of contemporary VR technology. With video games and game engines dominating the development of VR software and applications, best practices for VR environments that consider user interaction and ergonomics are developed with the video game industry.

Additionally, research from cognitive psychology and neuroscience is vital as it delves into how we perceive these virtual spaces and the responses they elicit. The immersive nature of VR raises ethical and social questions that require the input of those educated in those fields. Ethical issues regarding data privacy and psychological impact for example should be considered within VR research and innovation. Accessibility is folded into those issues as well, as questions of who gets to create our VR spaces, and who is able to access them are underlying the use of these new technologies.

Architects can and should contribute to the creation of our virtual worlds. However, architectural design in VR faces a number of challenges when considered in the contemporary landscape of the VR industry. The wondrous nature of VR in concept and in practice is alluring for a participant as well as a designer. There is a particular challenge in the balancing act of wondrous awe and grounded simulation that is needed for a VR experience to be effectively engaged with – a challenge that is unique to the medium. Designing for an experience that is unlike something we can create in the physical world yet ensuring that it is still understandable to the user to a hard balance to grapple with – and escapes the scope of the framework in this thesis. As discussed in this research, architectural expertise does not translate in a simple one to one relationship to the virtual, which means for an architect to engage with virtual architectural design more education and understanding is needed. An example of further knowledge needed for an architect is that one must have a basic understanding of the tools and technologies being used – such as the engine being used to model and render, and the VR headset or system being used. The framework Architecture as Setting the Stage engages and encouraged collaboration between architects, VR developers, user experience designers, and psychologist engaged with VR for the sake of engaging VR spaces.

When engaging with this research, it had the potential to go down a number of directions within the intersection of VR and architecture. However, my own interest in story telling and placemaking lead me to pursue the intersection of how we see space, and how we understand space in the virtual. The framework in this research aims to center principles of architectural design, leveraging the expertise and knowledge from the discipline, in conjunction with psychological research into our cognitive response to virtual places. The framework and its propositions are offered as a way to see and understand places in VR emphasizing architectural design considerations. It is not a singular perspective or solution to constructing VR spaces – but ultimately an engagement with how architectural design plays a role in our VR experiences.

After all, presence is subjective. It is the underlying challenge in this research and others that pursue the evocation of presence. Presence is difficult to quantify, an issue that arises often on the side of scientific research endeavors, and it is difficult to evaluate. This thesis approaches the evaluation of presence through my own first-person account of the experience *The Book of Distance in VR*, describing the emotional response evoked throughout. There were moments where presence was felt, and emotional responses were evoked on a spectrum of intensity. Although presence was not constantly internally recognized or felt at the same intensity throughout the experience – the method of the case study intended to highlight key moments where emotional evocation indicated a feeling of presence in myself. However, this analysis of presence is still subjective.

The thesis aims to contribute to the ongoing discourse around virtual space design in VR, the importance of designing for presence, and how we can understand it. By engaging the three concepts of Stage, Virtual Utilitas, and Place Illusion the framework has potential to contribute to the development of standardized guidelines for architects to design for VR. Guidelines that are able to be understood by trained architects as well as other designers engaging with VR creation would aid in the creation of consistent virtual infrastructure. Consistency in our VR spaces fosters the creation of universally understandable and accessible VR experiences. To better understand how the architecture and materiality in a VR experience influences our experience, means we could improve both existing and new applications of VR to be more immersive, engaging, and effective. The application and use of VR varies greatly and across many disciplines – being able to engage a participant further in a VR experience is universally useful.

As VR technology further develops – it is impossible to know how it will change and its potential to be integrated into our daily lives. In a future where immersive virtual spaces become common, accessible, and interconnected – it is important that the virtual infrastructure is being created alongside the virtual experiences in support of immersive engagement. Immersive habitation of virtual spaces has the potential to become the next wave of media and virtual interaction – and it is important we consider how we will be creating these new typology of spaces. Like architectural, philosophical, and scientific thinking of past, it is important consider and create these conceptual frameworks to better understand how the potential impact on our lives.

Architecture as Setting the Stage offers language and insight relevant to creating virtual places in VR. For designers delving into virtual space design, the research presented in this thesis offers valuable insights into designing VR spaces to enhance the sense of *presence* in a participant. A key message of this thesis research is that while architectural knowledge is applicable to VR space design, architectural design thinking must be reconsidered and adapted to be in line with the priorities of its new virtual context. To overlook the expertise of the architect, and the discipline, is to neglect the knowledge and history of how our physical world has been shaped historically.

Let us ask ourselves, sooner rather than later, how are we shaping our virtual places?

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GLOSSARY

AR: Augmented Reality, a view of the real world—physical world—with an overlay of digital elements.

CAD: Computer-Aided Design

CYBERSICKNESS: Cybersickness is a motion sickness-like experience in a virtual reality which is visually induced. It is caused by confusion and a mismatch in sensory communication.

HMD: Head Mounted Display, a wearable device that included small display screens near both eyes, often within a headset or helmet-like device.

IMMERSION: a perception of being submerged in a virtual space more so than the physical world.

MX: Mixed Reality, a view of the real world—physical world—with an overlay of digital elements where physical and digital elements can interact.

NEAR EYE DISPLAY: High resolution screens placed very close to the eyes to create a virtual image in the field of view of one or both eyes.

PLACE ILLUSION: the illusion of being in the place depicted in the VR despite knowing that it is not reality.

PLAUSIBILITY ILLUSION: the illusion that what is being perceived in VR is happening despite knowing that it is not reality.

PRESENCE: the sensation of being there in a mediated environment through the allocation of attentional resources perceived physically and psychologically. This definition is what is used in the context of this thesis.

RETICLE: a graphic element or marker displayed in a user's field of view, typically in the center of view. This can aid in navigation and interaction in VR.

ROOM-SCALE: a design paradigm for VR in which users can freely walk around a play area. This contrasts with a standing/seated design paradigm, in which the experience is designed for the participant to not move through the space, and interactions are either at arms length, or other movement mechanics are introduced.

SPACE: An entity constituted by the relations between objects and formed by structure. Space exists without observation but appears through human interaction. This definition is what is used in the context of this thesis.

THE VIRTUAL: that which is so in essence but not actually so. Almost or nearly as described, but not completely or according to strict definition.

TROMPE L'OEIL: Trompe l'oeil is French for 'fool the eye' and denotes the painted representation of a three-dimensional scene, rendered in such a way that from a particular viewpoint the scene looks to be three dimensional.

VIRTUAL SPACE: a perceivable and digital non-physical space. This definition is what is used in the context of this thesis.

VR: Virtual Reality the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. Alternatively, a highly immersive medium that mediates perception of a 3D environment through computer hardware and software.

XR: Extended Reality, an umbrella term encapsulating Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), and everything in between.