

Architecture in Virtual Game Worlds

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Abstract

Developments in digital technology and information networks have changed our perception of distance, scale, and location. Interconnected devices, such as computers and smartphones, allow us to communicate and access media anywhere, anytime. Physical and virtual have become inseparable, which has also changed the way space is experienced. A person can be physically present and at the same time immersed in the digital world.

Digital spaces have become an integral part of everyday life and virtual games are one of their most popular manifestations. Essentially, virtual games are a form of interactive media where interaction occurs in a representational space. Virtual worlds seem infinite as they are not bound by any real-world limitations. However, games are created for a very precise purpose, namely play, and game environments are meant to support that purpose.

The purpose of the thesis is to discuss the similarities and differences between architecture and virtual game worlds. Like stage props and film sets, game worlds draw on the built environment, but they serve a different function than real buildings. Unlike theater and cinema, however, games give the audience the freedom to explore and wander in a fictional space.

While the spatiality of virtual games is most evident in the three-dimensional environments they represent, it also encompasses the social structures of the player communities and the physical spaces in which the games are played. In the end, both buildings and virtual worlds can be thought of as spatial structures that organize and shape human activity.

Tiivistelmä

Digitaalisen teknologian ja tietoverkkojen kehitys on muuttanut täysin käsityksemme etäisyyksistä, mittakaavasta ja sijainnista. Verkkoon liitetyt laitteet, kuten tietokoneet ja älypuhelimet, antavat meille mahdollisuuden kommunikoida ja kuluttaa mediaa missä ja milloin tahansa. Fyysinen ja digitaalinen sekoittuvat arjessamme, minkä seurauksena myös tilakokemus on muuttunut. Henkilö voi olla samanaikaisesti fyysisesti läsnä ja samalla uppoutunut digitaaliseen maailmaan.

Digitaalisista tiloista on tullut olennainen osa jokapäiväistä elämäämme, ja virtuaalipelit ovat yksi niiden suosituimmista ilmenemismuodoista. Pohjimmiltaan virtuaalipelit ovat vuorovaikutteisen median muoto, jossa vuorovaikutus tapahtuu todellisuutta esittävissä tilassa. Virtuaalimaailmat vaikuttavat äärettömiltä, koska niitä eivät sido mitkään reaali maailman rajoitukset. Pelit on kuitenkin luotu yhtä käyttötarkoitusta, eli pelaamista, varten ja peliympäristöjen tehtävä on tukea tätä tarkoitusta.

Diplomityön tarkoituksena on tutkia yhtäläisyyksiä ja eroja arkkitehtuurin ja virtuaalisten pelimaailmojen välillä. Kuten näyttämö- ja elokuva lavasteet, pelimaailmat ammentavat rakennetusta ympäristöstä, mutta palvelevat erilaista käyttötarkoitusta kuin todelliset rakennukset. Toisin kuin teatteri ja elokuva, pelit kuitenkin tarjoavat yleisölle vapauden tutkia ja vaeltaa kuvitteellisessa tilassa ikään kuin ee olisi todellinen.

Vaikka virtuaalipelien tilallisuus näkyy selvimmin niiden esittämissä kolmiulotteisissa ympäristöissä, liittyy se myös pelaajayhteisöjen sosiaalisiin rakenteisiin sekä fyysisiin tiloihin, joissa pelaaminen tapahtuu. Sekä rakennuksia että virtuaalisia maailmoja voidaan pohjimmiltaan ajatella tilallisina rakenteina, jotka jäsentävät ja muokkaavat ihmisen toimintaa.

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Introduction

The 20th century marked the beginning of a digital revolution that culminated in the proliferation of wireless networks. Today, computers, smartphones, and game consoles enable time- and location-independent activities. The phenomenon has blurred the boundaries between familiar spatial categories: the game machine makes the living room a space for play and the laptop transforms the café into a study. (Mitchell, 2005, p. 21)

Virtual games are the most popular form of digital entertainment. In these games, the play occurs in a representational space displayed on a visual display unit. Via input devices, the player controls a fictional character, or avatar, that acts as her visual representation in the game world. As the player immerses herself in the virtual world, she experiences simultaneously two types of spaces: physical and virtual.

According to media scholar Espen Aarseth (2001), “games celebrate and explore spatial representation as their central motif and *raison d’être*.” In three-dimensional games, play involves navigating and interacting with the virtual world and the objects placed in it. Unlike two-dimensional or text-based games, movement in three-dimensional virtual space is guided by the player’s previous experience of physical space. To support the player’s engagement, three-dimensional games usually refer to real-life environments and building types.

Game designer Ernest Adams (2003) states that there is a profound connection between game worlds and architecture. According to Adams, virtual environments are “necessarily constructed by human beings and therefore may be thought of as the product of architectural design processes.” To create a functional building or game, the creator must identify a set of problems and then solve them through design.

Game developer and a former architecture teacher Saku Lehtinen (personal communication, April 18, 2018) also notes that the design processes behind architecture and games are very similar. In both cases, multiple parameters constitute a design problem that must be solved within a limited time frame. Like an architect, a game

developer designs an experience that addresses user needs, spatial organization, different functions, sources of inspiration, history, references, technical constraints, budget, and modular structures.

Previous statements raise questions about the relationship between architecture and virtual games. The purpose of this thesis is to examine virtual game environments and identify their architectural features. Therefore, I will address the following questions:

1. Do virtual games contain architecture?
2. What are the architectural features of game environments?
3. What kind of architecture has similar features to game worlds?

The work is divided into three parts. I will first define the slightly vague terms of virtual and architecture and elaborate on the connection between architecture and virtual games. The second part, Space in virtual games, discusses the history of virtual games and their relationship to space and its depiction. I will also address the spatial experience of games in the context of phenomenological concepts and theory.

In the third and last section, Architecture in virtual games, I approach game worlds as architectural spaces and examine the extent to which they resemble the architecture of the past. I base my analysis on the framework of Alexander Galloway, in which games are interpreted as a series of different actions.

In everyday language, the games I refer to are called either video or computer games. In the consumer market, the former term is used to describe games available for gaming consoles, while computer games are played exclusively on personal computers. For the sake of simplicity, I have decided use a much broader term, virtual game, that is not tied to any particular hardware system. Also, in order to keep the scale of my thesis reasonable, I will focus exclusively on games that feature accessible three-dimensional spaces.

1. Virtual architecture

1.1 Definition of terms

Before one can discuss virtual architecture, the meaning of the term needs to be clarified. The concept of virtual is very much related to the question of existence. In his book *Metaphysics of Virtual Reality*, philosopher Michael Heim (1993) posits the word virtual simply as “[a] philosophical term meaning ‘not actually, but just as if’” (p. 160). The idea itself is not tied to digital technology as it was first introduced and frequently discussed by the medieval theologian John Duns Scotus. (Heim, 1993, p. 131)

By this definition, virtuality has been present since the emergence of writing. The book is read in a physical space, but the message it conveys exists elsewhere, beyond our observation. An early example of this idea can be found in Plato’s writings, in which he describes that our world is a lesser version of another, perfect realm, where the definitions of all things are located. The theory proposes the differentiation of two separate worlds (real and a copy), which forms the basis for virtual reality. (Grosz, 2001, pp. 77-78)

According to Heim (1993), virtual reality “pertains to convincing the participant that he or she is actually in another place by substituting the normal sensory input received by the participant with information produced by a computer” (p. 160). In this case, virtual is synonymous with illusion. The computer produces a believable image that allows the user to interact with something that is not actually there. With the use of head-mounted displays, motion controllers and body suits, the computer updates the image according to the user’s physical movements.

In this thesis, my focus is on the virtual worlds experienced by the available consumer hardware, namely computers and game consoles. While VR headsets and haptic suits have yet to make their way into the average consumer’s living room, millions of people engage daily with virtual game worlds. I will therefore use Heim’s vocabulary in a more general manner. In the course of this thesis, whenever I suggest that something is virtual, I do not limit the concept to any specific equipment of interaction. Thus, the term “virtual reality” refers to a

computer-generated simulation of the real, whereas "virtual space" refers to a representational space with which one can interact.

German architect Gottfried Semper (1989, p.102) declared that architecture consists of four separate elements: hearth, framing, earth work and enclosure. On this basis, virtual reality provides somewhat poor conditions for architecture. Digital building models do not require a hearth or structural framing, let alone earth work. Location, weather conditions, and gravity are all factors that can be added or removed by a programmer. Since the only remaining element is enclosure, virtual buildings are basically nothing but weightless surfaces. (Mitchell, 1998, p. 207)

However, architecture can be considered more than just buildings and their performance. Architect Francis D.K. Ching (1996) notes that "the physical manifestations of architecture accommodate human activity" (p. IX). By this definition, the term architecture includes the built environment as well as actions and events that take place within it. Ching's statement is supported by Yehuda Kalay (2001), who defines architecture as "the art of making places" (p. 231). According to Kalay, places guide our actions as they provide clues as to what is socially acceptable behavior in a given situation. If we understand space as a setting for activities, a place is something that emerges when that setting is given a socio-cultural context. For example, a theater and a conference hall have somewhat similar spatial attributes but there are different expectations for their use.

Against this background, a visual representation of a building does not qualify as architecture as it only replicates its external features. However, virtual game worlds are not only intended to be watched but also experienced. There is always human activity involved in games as they require the player's participation in order to operate. Historian Johan Huizinga (1970) argues that play is a fundamental human activity that is "older than culture itself and pervades all life like a veritable ferment." (p. 173) After all, music, dance, philosophy, and many other significant aspects of social life originate from

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interpersonal games and competition.

Given previous observations, I will argue that virtual game worlds are architectural. Where digital building models are recognized as tools for construction and preservation, game environments have intrinsic value. As the concepts of location and space keep evolving, I find it necessary to become acquainted with virtual worlds and the new kinds of spatial experiences they offer.

2. Space in virtual games

2.1 History of virtual games

Playing a game, as defined by philosopher Bernard Suits (2005) is “the voluntary effort to overcome unnecessary obstacles” (p. 55). During play, participants try to achieve the goal by using means that would be considered ineffective outside the game. Suits uses golf as an example: if the player's goal was only to get the ball in the hole, she would just carry it there and not use a racket. However, this is not the end in golf, as it is to complete a hole with as few strokes as possible. Players are willing to accept rules and artificial barriers because without them there would be no game.

It can be argued that the association between games and computers dates back to 1950, when the British mathematician Alan Turing introduced the concept of imitation game. During the Turing test, the participant needs to determine whether she is interacting with another person or a machine, relying only on text-based one-to-one conversation. If the participant is unable to distinguish between the parties, the machine will pass the test. (Ahl, 2008, p. 31)

In the early 1960s, members of the Tech Model Railroad Club at MIT were among the few people who had access to PDP 1, one of the first computers with a graphics display. Led by Steve Russell, the young researchers spent their downtime programming a game called Spacewar! (1962). Despite its crude presentation, the game of dueling spaceships became highly popular at those universities where PDP 1 was at hand. MIT student Nolan Bushnell saw the game's commercial potential and decided to make his own reiteration. In 1971, Bushnell's first coin-operated game, Computer Space, debuted in arcade halls. The commercial breakthrough followed only a year after with the release of the table tennis game Pong (Atari, 1972). (Lange, p. 17)

As the newly developed integrated circuits were too expensive for personal use, Bushnell decided to sell his game cabinets to amusement arcades and pool halls. Consequently, commercial virtual games were first introduced as a public pastime. The playing experience was shared with a group of people who gathered in a common space to compete, socialize and watch each other play. (Lange, p. 17)

Unlike today's lengthy and immersive virtual experiences, arcade games featured few variables and were meant to be played in brief sessions. In 1978, the arcade game *Space Invaders* (Taito) provided players with a high-score list where they could get their names displayed. The addition not only highlighted the competition aspect of the arcade experience but enabled players to distinguish themselves by obtaining a new alter ego. (Lange, p. 18)

While it is unclear who first came up with the concept of virtual game, the history of the first home console is well documented. In 1966, television engineer Ralph Baer envisioned a transmitter that could both receive and send back video signals that would influence the events on the television screen. By 1968, Baer and his team had developed a prototype called the Brown Box, a home game system in which electronic components were enclosed with a wood-grain packaging. The machine supported two controllers and allowed players to switch between eight built-in games that the developers had come up with.

In 1971, Electronics company Magnavox took interest and released the commercial version of the Brown box, Magnavox Odyssey. The success of Nolan Bushnell's *Pong* increased Odyssey's demand as people wanted a system that would allow them to play a roughly identical table tennis game at home. (Herman, 2008, p. 53-54)

By the end of the 1970s, the development and mass production of integrated circuits had transformed computers into the size of household items. Consequently, home game devices of the early 1980s were essentially programmable computers that utilized interchangeable game cartridges. Firms like Atari, Intellivision, and Coleco brought their own machines to the market, while leaving most of the game production to unauthorized third-party companies. Over time, the oversupply of games, most of which suffered from a cheap and fast production process, decreased interest, and led to a market crash by the end of 1983. (Wolf M., 2008, p. 29)

In 1983, the toy company Nintendo successfully entered the Japanese home console market with the release of Famicom. Two

years later, the machine rekindled the entire business when it was released in North America under the name of the Nintendo Entertainment System. (Wolf M. , 2008, p. 106) Where Western companies such as Commodore and Atari marketed their devices as home computers, Nintendo and its rival Sega introduced their machines solely as gaming devices. The manufacturers emphasized this by selling toy-like accessories such as light guns and joysticks to their consoles. (Flynn, 2003, p. 556)

By the latter half of the 1990s, the target audience had shifted from children to young adults, and the market was dominated by games with mature themes and violent imagery. During the 2000s, console manufacturers, such as Sony and Microsoft, began emphasizing the media and online capabilities of their products to attract a wider audience. Over time, the game machines began to merge into the domestic space like furniture, reshaping the living room organization and household interactions, as television and radio had done in the 20th century. As for today, home consoles are marketed as entertainment centers around which the whole family gathers to spend time together. (Flynn, 2003, pp. 573-574)

Where home consoles brought interactive media to living rooms, mobile devices made them ubiquitous. Although early portable consoles such as Game Boy (Nintendo 1989) were technically inferior to arcade cabinets and home consoles, they thrived because of their accessibility and relatively low pricing. (Lange, p. 19) However, the true revolution of mobile gaming did not begin until 2007, when Apple launched its first iPhone. The smartphone combined multiple functions into one device, including a camera, music player, internet browser and GPS.

In the early 2000s, the U.S. authorities had overruled the legislation restricting the availability of GPS technologies for private use. Together with the growing prevalence of smartphones, the proceeding paved the way for new types of virtual games based on a player's physical location. (Davies & Innocent, 2017, p. 3)

Location-based games redefine an existing site or urban area as a

space for play. The smartphone collects information about the player's current location and the game takes advantage of this information by combining real environments with virtual elements. In this way, the game removes established rules and encourages the player to uncover new meanings in familiar spaces. (Davies & Innocent, 2017, p. 3) In this regard, playing resembles Guy Debord's (2006) definition of "dérivé", a concept rooted in the Situationist movement in the mid-20th century. In the *dérivé*, translated literally as drifting, participants temporarily give up their customary relations and activities to "let themselves be drawn by the attractions of the terrain and the encounters they find there (p. 62)".

In addition to technical limitations, games have always been influenced by the spaces in which they are played. Where simple arcade games were played in public against other players, spatially rich virtual worlds were experienced at home. Modern mobile games, on the other hand, are designed to be played in short periods as the player commutes or walks through the city. In other words, the context of playing has always been the physical environment, and virtual games are no different from other games in this respect. The playing experience takes place not only in virtual space, but also in the real world.

2.2. The spatial experience of play

In the Ancient Greece, space was considered inherently a material concept. Plato theorized that space is something from which objects are made, just like a block of clay that can be shaped into a form. (Hugget, 1999, p. 5) In comparison, Aristotle proposed that place (*topos*) is the internal boundary of the thing it contains, in which case space would be "the sum of all places" (Norberg-Schulz, 1971, p. 10).

Around 300 BC, the Greek mathematician Euclid formalized a series of geometric rules that laid the foundation for the concept of space over the next two millennia. Euclid's formulas for calculating volumes of solids and two-point distances also continued to play a crucial role in the development of three-dimensional computer graphics. (Stockburger, 2006, p. 62)

The 17th century saw the introduction of René Descarte's coordinate system, which made it possible to determine the position of a point both in a two-dimensional surface and in three-dimensional space. (Stockburger, 2006, p. 64)

Euclid's reign ended in the 20th century with the discovery of non-Euclidean geometry and the theory of relativity. Albert Einstein's theory of relativity presented time as the fourth dimension and thus questioned the fundamentals of the geometric system. In fact, the world we see is just a three-dimensional projection of four-dimensional space. (Norberg-Schulz, 1971, p. 10)

Philosopher Michel Foucault (1984) states that the obsession with history in the 19th century has become replaced with the epoch of space. Where the medieval "space of emplacement" (p. 1) was defined by hierarchies, the modern concept of emplacement can be described as "relations of proximity between points or elements" (p. 2).

According to Foucault (1984), utopias and heterotopias represent the two modes of modern emplacement in which "space takes for us the form of relations among sites" (p. 2). Utopia portrays an unreal emplacement that references "the real space of Society" (p. 2), representing it in either inverted or desirable form. In contrast, heterotopia is an enacted utopia, a real space that holds other emplacements within it. Heterotopias can be located physically, but at the same time they exist outside of all places and are separate from the emplacements they mirror. For example, a theater stage is a single rectangular area, but it also contains separate spaces in the form of different plays.

Researcher Axel Stockburger (2006) defines virtual game-space as "the dynamic interplay" (p. 5) between five different spatial modes: the representational space, the narrative space, the physical space where the player is located, the rule space that governs the in-game actions, and the space emerging from the player's kinaesthetic connection to the game. In line with Foucault's (1984) idea, a virtual game can be thought of as a heterotopia that can "juxtapose in a single real place several emplacements that are incompatible in themselves" (p. 6).

The significance of Stockburger's model lies in the notion that the spatiality of games is not limited to their visuals. Above all, it shifts the focus to the person, the player, and her playing experience.

When it comes to the spatial experience of play, I return to the idea of the distinct natures of space and place. In his essay *Building, Dwelling, Thinking*, philosopher Martin Heidegger (1993) concludes that "[t]he way in which you are and I am, the manner in which we humans are on the earth, is *buan*, dwelling" (p. 349). Architect and phenomenologist Christian Norberg-Schulz (1985) elaborates the concept further by stating that dwelling "implies the establishment of a meaningful relationship between man and a given environment" (p. 12).

When space acquires meaning through appropriation and structuring, it becomes a place. One's identity is dependent on the sense of belonging somewhere, so to determine "being-in-the-world" is to find a place to settle within. Norberg-Schulz (1985) refers to settling as the moment when "[w]e stop our wandering and say: Here!" (p. 31). The moment of settling is preceded by the act of wandering, during which the person seeks and expands her place.

Mark Wolf (2011) describes navigation within a representational game-space as "a cyclical process which involves exploration, the forming of a cognitive map of how spaces are connected" (p. 18). The player wanders in the virtual world and explores her surroundings in search of a path that leads to a presumed destination. As she learns to operate her character, the player becomes aware of the rules and limitations that govern the game space. Above all, the player gradually apprehends the spatial layout of the game world, which in turn "aids the decision-making processes employed by the player to move through those spaces for further exploration" (p. 18).

As the player explores further, she builds a mental map where different spaces and actions are interconnected. At the same time, the player's state of being becomes customary and her view of the game world changes. The player's experience transforms a previously

unknown and inaccessible virtual space into a familiar and meaningful place.

Dwelling entails the act of building, which Heidegger (1993) considers more a necessity than a creative endeavour: “[t]his venture in thought does not view building as an art or as a technique of construction; rather, it traces building back into that domain to which everything that is belongs” (p. 347). In other words, it is in our nature to build and seek protection from the outside world.

The virtual world that undoubtedly best simulates the intertwining of dwelling and building is Microsoft’s Minecraft (Mojang, 2011). The player’s starting point is a vast natural site without a given purpose or destination. However, in order to survive, the player needs to gather materials and build a shelter for herself. After this, she is likely to expand her refuge to store materials and make room for the bed and crafting table. Little by little, the player organizes her behavior around different spatial elements so that the shelter born out of necessity begins to resemble a home. (Vella, 2019, p. 9)

As discussed by Heidegger (1993) and Norberg-Schulz, dwelling is the fundamental condition of being-in-the-world that “implies the establishment of a meaningful relationship between man and a given environment” (p. 349). While playing virtual games, the player gradually learns the structure and laws of the game world, gradually turning the fear of the unknown into a sense of familiarity. Therefore, if architecture is thought of as the art of place-making, the virtual worlds in which players reside can rightly be considered part of it.

2.3 *Representation of space*

All on-screen pictures are comprised of pixels, dots of color that each contain an individual value. The more pixels are displayed, the more detailed the image is. The archaic representation of early games stemmed partly from low resolution, but also from the computers’ limited processing power. (Therrien, 2008, pp. 239-240)

Despite running on a computing hardware, the representation of virtual space relies on well-established visual techniques that have been

utilized for centuries. (Arsenault & Larochelle, 2013, pp. 1-2) Even in early games, the seemingly abstract presentation was usually referential to real-world settings. When playing Pong, we see two lines on the screen and a dot moving between them, but the game is fundamentally a simple simulation of a table tennis match. (Therrien, 2008, p. 239)

Against this background, the believability of imitation has been an incentive behind graphics development, just as it has previously contributed to the emergence of various painting techniques. Up until the 20th century, it was expected from artists to portray the outside world as faithfully as possible. For this reason, each artist sought to refine established techniques in order to surpass the works of previous masters.

In the 15th century, the Italian architect Filippo Brunelleschi developed a system that would allow him to transfer the view of the Florentine Baptistery onto a flat plane. The so-called perspective method enabled Brunelleschi to compare his drawing with the building on an accurate scale from any distance. Since Brunelleschi based his experiment on geometrical optics, other artists were able to replicate the method. (Gombrich, 1987)

The first literary work mentioning the perspective method is Leon Battista Alberti's *De Pictura* (1435), in which he illustrates the technique with the concept of a visual pyramid. We can think that the environment emits invisible rays that meet at a certain point in the painter's eye, and any vertical section through these rays is proportional to each other. The painting represents a cut made through the invisible pyramid and thus simulates the artist's gaze at the landscape. (Gombrich, 1987)

Due to the technical limitations of the time, the early game imagery was largely based on parallel projections of the overhead, top-down, and side-scrolling viewpoints. At one point, hardware improvements enabled perspective tricks such as moving background layers. (Arsenault & Larochelle, 2013, p. 8) Arcade game *Super Bug* (Atari, 1977) was the first one to utilize the "scrolling technique" in which flat layers are programmed to slide across the

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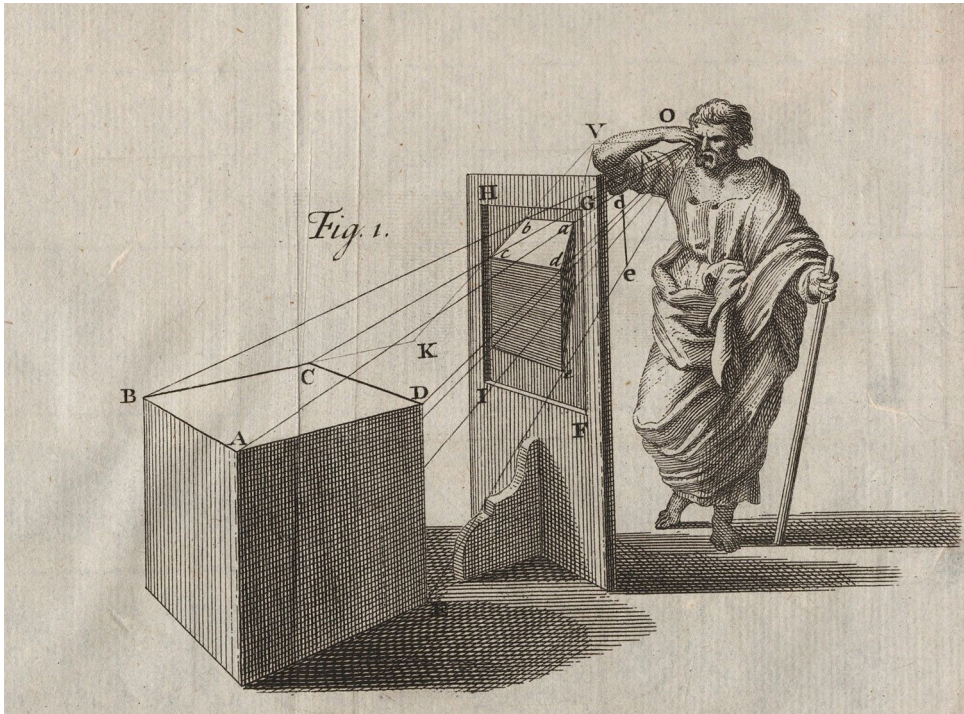


Figure 1. Leon Battista Alberti's visual pyramid.

screen to simulate movement. As each background layer moved at different speeds, the game was able to generate a basic sense of depth. (Therrien, 2008, p. 241)

In virtual games, the rendered view that shows the player's character is called third-person perspective. The viewpoint places focus on the character in the context of space, with the intention of helping the player to orient herself. In the first-person perspective, the game world is, in turn, depicted from the perspective of the game character. This type of representation demonstrates the primary vision for virtual reality: the player perceives the space as if her own body had been transferred to the game world. (Rehak, 2008, p. 187)

As early as the 1970s, with the advent of the first arcade games, developers sought ways to implement the first-person perspective. Some cabinets placed the player in a virtual cockpit to simulate the experience of flying or driving. A sense of movement was created by displaying objects in different sizes depending on their distance from the player. (Rehak, 2008, p. 189)

In early perspective games, environments were usually depicted by using simple visual metaphors. In *Battlezone* (Atari, 1980), the player takes charge of a military tank to fight enemy forces in a barren warzone. Everything from background mountains to enemy vehicles is rendered in wireframe vector graphics with no visible surfaces. In addition, the interactive elements on the battlefield are portrayed in geometric primitives, such as pyramids and cylinders. (Rehak, 2008, p. 189)

While experiments with the first-person perspective continued throughout the 1980s, the real breakthrough came in 1993 with the release of iD Software's *Doom*. In *Doom* and other first-person shooting games, the player's primary means of interaction is a barrel of a gun pointing from the bottom of the screen. Since there is no character to project yourself into, the firearm acts as a mediator between the player and the game world. (Rehak, 2008, pp. 188-189)

By the mid-1990s, three-dimensional space had become the new norm in virtual games. In these types of games, the player's

view of the game world works in the same way as Alberti's pyramid: what the player sees on the screen are essentially projections of three-dimensional objects on a two-dimensional surface.

By the time the perspective projection became mobile, the visual language of virtual games began to resemble films. The developers adopted the term virtual camera, referring to a viewpoint that could be repositioned within the game space. Like a physical camera, the purpose of a virtual camera is to select, frame and interpret its environment for the viewer. (Nitsche, 2009, p. 77)

The shared history of architecture and moving images traces back to the turn of the 20th century, when Auguste and Louis Lumière produced more than 2,000 short films that took place in cities around the world. These movies were basically treated as carnival attractions and were usually shown with accompanied live commentary. (Penz, 2003, p. 135)

In the 1910s and 1920s, the fast-paced lifestyle of big cities represented the beginning of a new modern era for filmmakers. The 1920s saw the rise of city symphony films in which various aspects of urban living were depicted as one long montage. (Penz, 2003, p. 144)

Renowned architect and theorist Juhani Pallasmaa (2001) has written about the connection between films and architecture, highlighting their shared ability to "articulate lived space" (p. 13). According to Pallasmaa, cinema is an art form most comparable to architecture because they both "create experiential scenes of life situations" (p. 13). However, based on these criteria, it can be argued that virtual games have even more in common with architecture. While cinematic spaces have cultural and emotional meanings, they can only be viewed from the outside. According to media researcher Alexander Galloway (2006), where movies are moving images, virtual games are images that "exist when enacted" (p. 2).

While virtual games draw on visual art and film techniques to depict space, their way of using space is completely unique. Instead of an artist or a cinematographer, it is the player who has control over the viewpoint.

Therefore, the player is not just a spectator, but a participant who navigates, explores, and adapts to the game world just like any physical environment.

2.4 Being present in virtual space

In 1980, artificial intelligence researcher Marvin Minsky coined the term "telepresence" to describe the phenomenon of being in a distant location via remote control technology. With his focus on teleoperated robotics, Minsky saw enormous potential in remote interaction, assuming that the tools "will feel and work so much like our own hands that we won't notice any significant difference" (p. 47).

As noted earlier, virtual games feature visual representations of spaces, and the act of playing allows the player to develop a sense of intimacy with those spaces. However, in order to argue that virtual worlds are architecture, it is necessary to prove that the player is, at least in some sense, present in the virtual world.

Edmund Husserl (2005, p. 21), a German philosopher and the founder of the school of phenomenology, distinguishes three different objects from the image:

1. the physical image
2. the representing object
3. the represented object

In his work, Husserl refers to the representing object as "image object" and the represented object as "image subject". When I see a picture, I actually look at a physical object made of canvas or wood. Still, I do not see it merely as colors and lines, but as an image (object) that depicts something. For Husserl, this something is the image subject, thing, or character that we recognize from the image.

Husserl (2005, p. 48) exemplifies the separation with Raphael's painting of the Madonna: while observing the image, he does not see a "little figure of a woman" but "the form of a sublime woman, of superhuman size." Therefore, the Madonna represents the subject that Husserl sees in the image object.

To grasp Husserl's theory, one must become acquainted with the concept of seeing-in. A picture, the physical object, is made to evoke our perception. When I look at a small facial portrait of a person, the mental image appears to me in predefined size, colors, and shades. I do not assume this person is the same size as the photograph, or that she does not have a body. The image subject is the person itself, the one I see in the image. (Husserl, 2005, p. 30)

Architectural theorist Juhani Pallasmaa's (2001) view on the experience of space is compatible with Husserl's notion. According to Pallasmaa, every perception of external space is affected by our inner mental space, "in which the experienced, remembered and imagined, as well as the past, present and future are inseparably intermixed" (p. 18). In Husserl's terms, a building is an image subject that can be depicted through variety of image objects, be it a physical structure or a series of images. Since our mind registers only the mental image, it is irrelevant what the mediating object is.

Although image-object has one definite appearance, we have "more than the one apprehension" (Husserl, 2005, p. 31). Image-consciousness is consciousness of conflict, and one of these emerging conflicts is linked to the different appearances of the subject. No matter how accurate the painting or photograph is, the subject appears in the image differently than it would appear in front of me. What then takes place, according to Husserl (2005, p. 33), is the doubling of consciousness.

Academic Nicolas de Warren (2014) states that Husserl's idea of doubling consciousness can help us approach the question of self in virtual environments. Do I recognize myself as the character that appears on the screen? Am I immersed in the virtual world even though I am controlling the character from the physical world? According to de Warren, the virtual game player projects her consciousness into the imaginary world and "discovers herself as another consciousness or life" (p. 98).

When it comes to image consciousness, de Warren argues that we don't just see something in an image, we become immersed

and imagine ourselves in the same space as the image-subject, this immersion occurs through visual and kinaesthetic sensations. This is especially evident in virtual games: I not only move my eyes and posture as I look at the image on the screen, but I also witness the motions of my other, imagined body. (de Warren, 2014, p. 110)

French philosopher Maurice Merleau-Ponty (1945) states that we experience the world through our bodies. According to Merleau-Ponty, having a body is fundamentally “to be involved in a definite environment, to identify oneself with certain projects and be continually committed to them” (p. 94) However, this body is not stationary as it can be integrated and extended with inanimate objects. When one uses a typewriter, she experiences something that is between intention and performance. Finger movements are guided by intention, yet it is not intention but our body that locates those letters during the process. In Merleau-Ponty’s (1945) words: “the subject who learns to type incorporates the key-board space into his bodily space” (p. 167)

Hannah Sommerseth (2007, p. 766) notes that Merleau-Ponty’s idea of the extended body image is applicable to input devices used to control virtual games. According to Sommerseth, virtual game worlds don't seem "real" because of their audiovisual representations, but because playing them requires physical motions. During the game, the controller becomes an extended limb that allows the player to reach from the physical world into virtual space.

In summary, by using the concepts of phenomenology, it can be argued that the player’s self is present in the game world. At one end is a controller that registers the player’s finger movements, while at the other end is a system that interprets the input and creates a visual representation of it. In other words, the controller acts as a bodily extension that creates a link between the player and the virtual world. Although the player interacts with an imaginary environment, the play takes place in the physical world and involves real motions.

3. Architecture in virtual games

3.1 *Spatial allegories*

As stated earlier, game worlds refer to the built environment and borrow spatial elements from it. To support this notion, I will present examples of physical structures that have directly influenced the spatial configurations of games.

The most obvious analogies, of course, are fields and game courts, as many early arcade games were basically archaic simulations of known sports. Titles such as Pong (Atari, 1972), Soccer (Taito, 1973) and Hockey TV (Sega, 1973) took established game spaces and transformed them into virtual representations. Whether real or virtual, a sports field consists of boundaries, field markers, and other spatial elements that together represent the rules of the game. (Totten, 2014, p. 29)

In a similar sense, the layout of a theater serves a very specific purpose as it caters to the act of performance. Andrea Palladio's Teatro Olimpico in Vicenza (1585) is an exemplary reconstruction of the classical theatre structure, where a semi-circular seating area is built around an open stage. The spatial boundary separates actors from the audience members who settle into the *cavea* and become passive spectators to the performance. (Walz, 2010, p. 227)

The theatrical experience as a whole — the role-play taking place on stage and the supposed separation between actors and spectators — relies on “the suspension of disbelief.” (Coleridge, 1817) Coined by an English poet Samuel Taylor Coleridge in 1817, the term signifies the audience's willingness to accept a fantastical premise and the temporary space it creates. Of course, surrender is only partial, and the viewer's reading of the situation oscillates between the real and the imaginary. Likewise, people who want to immerse themselves in virtual worlds are required to suspend their disbelief.

Gonzalo Frasca (2003, p. 228) likens the experience of playing virtual games to Augusto Boal's forum theater, where the audience is encouraged to take part and re-enact situations in different ways. The method helps participants identify and confront an everyday issue and then explore possible solutions to it. In a similar way, the

player finds himself in imaginary situations where actions will lead to different outcomes.

Most virtual worlds are structured like mazes and labyrinths. According to the classical definition, a labyrinth is a structure in which one twisting pathway leads to an endpoint. This is a fitting metaphor for spaces that are traversed linearly and where the player has little control over the events of the game. (Totten, 2014, p. 113) Like the rules of the game, the labyrinthine space sets the boundaries within which the player must reach a certain goal. Instead of providing the fastest possible route from one point to another, the structure invites the player to wander and explore.

In contrast, the maze consists of multiple branching paths and dead ends. The structure is inherently a puzzle where one needs to make several decisions in order to find her way around (Totten, 2014, p. 114) The maze structure has been copied and reiterated throughout the history of virtual games, evolving from *Metroid's* (Nintendo, 1986) interconnected two-dimensional geometries to the megastucture of *Dark Souls* (FromSoftware, 2011). Many of these worlds contain hidden secrets and passageways that the player unveils as she progresses in the game. In these structures, architecture is a mystery that becomes unearthed when the player explores it further.

In addition to visual representations, mazes and labyrinths also serve as metaphors for the various uses of space. In *Pac-Man* (Namco, 1981), the representational space consists of an angular maze through which the player manoeuvres a yellow circle. However, after the player completes a level, a new but more complex maze will automatically appear on the screen. The pattern repeats itself multiple times, until the player beats the game and is taken back to the beginning.

While *Pac-Man* depicts its play space as a maze-like structure, the player's progression occurs as a direct path from level to level. In other words, the game utilizes two types of spaces with which the player interacts with: a maze-like puzzle structure and a non-branching labyrinth. (Taylor, 2006, p. 101)

In recent years, game developers have adapted the metaphor of sandbox to describe virtual worlds with an open-ended structure. Usually, these games provide the player with a framework in which she can easily access various tools and activities. (Taylor, 2006, p. 100) For example, *Grand Theft Auto V* (Rockstar North, 2013) takes place in an imaginary city through which the player can wander without a definite goal-point.

However, the sandbox analogy is a bit misleading when it comes to the player's freedom. Where a physical sandbox is basically an environment with limitless possibilities, game worlds are always designed spaces. Thus, the player always makes choices within a predetermined framework over which she has no control. In *Grand Theft Auto*, the player can decide which action to take part in, but all those actions have already been defined by someone else, namely the creator of the game. (Taylor, 2006, p. 99)

In the light of the above, researcher Laurie N. Taylor (2006, pp. 99-104) prefers to equate open-ended virtual games with gardens. As Taylor points out, gardens are built as non-linear spaces, but they still guide the visitor, for example, with carefully framed views. Gardens are also used within established frameworks, reminiscent of games and their rules. Whenever a painter, cinematographer or a storyteller visits a garden, she engages in a certain game defined by the conventions of her craft.

The Renaissance era saw the emergence of hedge mazes as additional structures within gardens. What were initially linear labyrinths would become diverging mazes with varying vantage points and attractions. The labyrinth of Versailles, for instance, holds famously thirty-nine sculptures that each portray one of Aesop's Fables. (Totten, p. 114) The garden analogy seems fitting against this background as well, as in games each structure is part of a larger whole.

Game worlds tend to be compared to other designed spaces such as the playing field, the theatre, the labyrinth, the maze, the sandbox, and the garden. Given that virtual architecture is not bound by the same limitations as physical structures, none of those analogies is

hardly perfect when examined more closely. Nonetheless, exploring these similarities helps to understand the appeal of games and the spatial experiences they enable. The previous examples also raise the question of whether the game worlds are, after all, just digital extensions to past architectural typologies.

3.2 *Gamic actions*

When I start a virtual game, the screen becomes a window into a world that doesn't physically exist. According to Mark Wolf (2014, p. 333), the fictional worlds of games are comparable to the worlds we have previously experienced in literature and movies. More precisely, they fall into the category of “interactive imaginary worlds” (p. 337), along with dollhouses, board games, and the like.

Ernest Adams (2003) speaks of game space as an imaginary space that is always man-made and therefore an end-result of “architectural design processes (p. 1)”. Adams remarks that the used hardware sets a limit to this so-called ludic architecture, as games cannot reproduce sensations experienced in the physical world. On the other hand, the purpose of virtual worlds is not to imitate real-life experiences, but to accommodate and support the play activity.

According to Alexander Galloway (2006, p. 5), actions that take place within virtual games are either machine actions or operator actions. The machine actions are initiated by the computer, while the operator actions depend on the player's control. Where beating the game is related to the person's physical motions, the loss is always caused by the machine.

Galloway (2006, p. 6) argues that actions can also be distinguished according to whether they manifest in diegetic or in nondiegetic space. The terms have been adopted from film theory, but their meaning is slightly different in the context of games. Diegesis is a “total world of narrative action” (Galloway, 2006, p. 7), which in Galloway's use refers to the the play situation or scenario. In his example, the diegesis of the table tennis game Pong (Atari, 1972) consists of a table, a ball and two rackets, whereas in World of Warcraft (Blizzard

Entertainment, 2004) it takes the form of two continents separated by an ocean. In contrast, nondiegetic elements, such as menus and music, contribute to the playing experience but operate outside of the representational game space.

Therefore, according to Galloway (2006, p. 12), there exists four types of actions in virtual game worlds: operator and machine actions, which are either diegetic or nondiegetic. This interpretive framework can be illustrated by the following examples: the character's motions in the game world are considered diegetic operator acts, since they are triggered by the player. On the other hand, navigating menus and settings, although part of the play activity, is external to the game's narrative setting, making it a nondiegetic operator act. (p. 17)

What makes Galloway's model significant is that it introduces a classification system where all aspects of play can be situated. Consequently, this poses a question: what is the role of architecture in this schema?

According to Galloway (2006) "the material aspects of the game environment" (p. 12) fall under the category of diegetic machine acts. Thus, the environment can be understood as the game's *mise-en-scène*, a concept derived from film theory that translates literally as "put in the scene." Film theorist Robert Kolker (1999) suggests that *mise-en-scène* is "the use of space within the frame: the placement of actors and props, the relationship of the camera to the space in front of it, camera movement, the use of color or black and white, lighting, the size of the screen frame itself" (p. 335).

On the other hand, game worlds are not static sets, as the player often interacts with the environment for example by breaking existing structures and erecting new ones. Above all, the shape of the environment affects the player's ability to move his character, which is essentially a digital operator act.

The division is in line with Espen Aarseth's (2012, p. 131) view that the game space can be either ludic or extra-ludic, i.e. a space for play or a decorative setting. Virtual game architecture has then a two-fold nature: it plays a part in the game's visual language and evokes moods

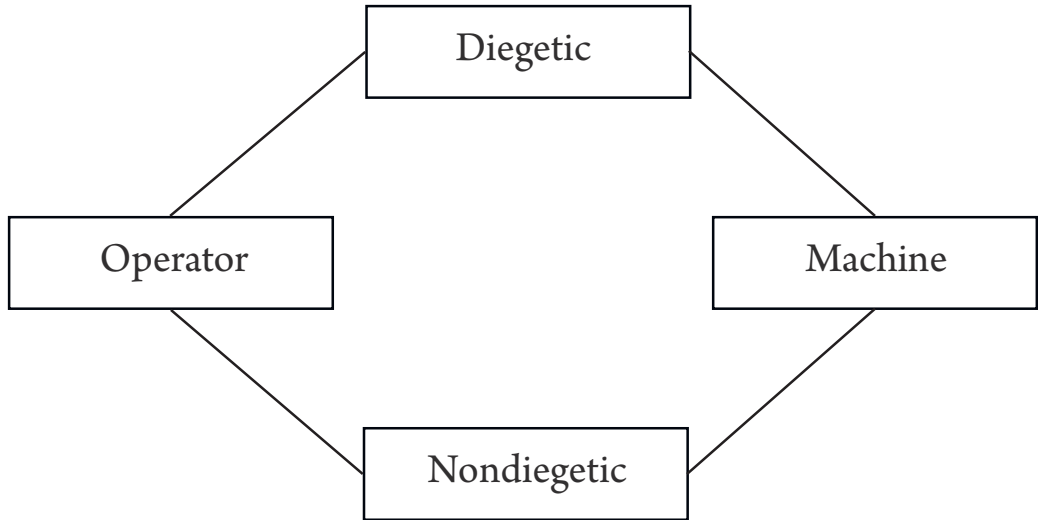


Figure 2. Alexander Galloway's four different moments of gamic action.

in the player, while at the same time its geometry governs the character's mobility. In the following pages, I will address these two aspects separately, and lastly, propose that their significance is most evident when game worlds are thought of as narrative architecture.

3.3 Traversal in virtual games

According to game designers Katie Salen and Eric Zimmerman (2003), the purpose of the rules is to “restrict and stylize” (p. 150) the actions the player performs during play. In other words, all elements that affect the player’s performance can be counted as rules. In Tetris, for example, the trajectory of the blocks is part of the game's rule set, but the background music is not.

Game designer Saku Lehtinen (personal communication, April 18, 2018) states that the player must be shown a causal link between his actions and the events of the game. For this reason, virtual games are usually based on tangible concepts such as shooting or driving that quickly tell the player if she is succeeding or failing in the game. Accuracy, speed, and number of ammunitions are examples of parameters that are easy to internalize and perceive.

Where in board games the movement of the pieces is determined by the rules, virtual games restrict the player's movement with spatial boundaries. (Adams, 2003, p. 9) Therefore, the challenge in three-dimensional virtual worlds is related to spatial awareness and navigation. In order to succeed in the game, the player must be able to navigate the game space and understand the parameters behind its functions. (Wolf M. , 2014, p. 334)

Although virtual worlds utilize familiar spatial typologies, their purpose may differ from real life. An ordinary warehouse can provide a rich spatial experience as it contains elements that directly affect the character's movement, such as long distances, hiding spots, and destructible objects. (Lehtinen, personal communication, April 18, 2018) While in urban environments square and circular areas serve as meeting spots, in virtual games such centralized spaces are typically utilized as focal points of conflict and drama. (Paterson, 2006, p. 133)

In Le Corbusier's (1960) words, "architecture is based on axes" (p. 187). Axes are lines directed towards an endpoint, so the building can be thought of as an arrangement of paths leading to different destinations. Architects also place elements outside the axes, since otherwise the experience "would be like so many people all talking at once" (p. 189).

Throughout history, the movement has been a defining factor in the architecture of places of worship and rituals. The temple architecture of the Archaic Greece was based on the shape of megaron, a long rectangular room which is entered from its shorter sides. The floor plans of these buildings followed an established pattern in which the porch (pronaos) led into a lengthy inner chamber dedicated to the deity (cella or naos). (Totten, p. 13)

In classical Greek architecture, spaces and their hierarchy were further emphasized. The arrival to the Acropolis of Athens (479 BC) was planned as a sequence of varying views. Parthenon, the temple of Athena, is first visible from a distance as one climbs the Acropolis. After passing through the entrance portico, the guest's passage continues past the Parthenon, at which point she sees it at an angle. The trail then leads the visitor around the temple, giving her a complete view of the building before entering it. As a result, the arrival is a dramatic multi-stage experience rather than a straightforward walk from one point to another. (Totten, pp. 14-15)

Buildings during the Roman empire drew on the architectural language of the Greeks but utilized more linear arrangements. Where the Parthenon placed focus on the unfolding spatial sequence, the design of the Roman Pantheon (125 AD) was based on one dominant view. Engineering achievements enabled new kinds of structural solutions, which is why arches, vaults, and domes became key elements in the interior vistas of Roman temples. Later, Christian churches adopted elements precisely of Roman architecture, using them as symbols of divinity and to emphasize the distinct positions between the clergy and the congregation. (Totten, pp. 18-20)

In the 16th and 17th centuries, the Renaissance era brought a resurgent appreciation for classical culture and science. Renaissance buildings emphasized geometrical symmetry while borrowing their structural elements from antiquity. The notable Renaissance architect Andrea Palladio based many of his layouts on Greek temples where porticos served as vantage points from which the visitor could observe her surroundings. (Totten, pp. 22-23)

The style of the late 16th century Baroque architecture was characterized by abundant ornamentation and the suggestion of movement. In France, the Baroque drew heavily on the restrained expression of the classical period, whereas the Italian Baroque took the spatial schemes of the Renaissance and reiterated them on a larger scale. In Italy, this trend led to the abandonment of "concinnitas" – a sense of organized regularity – and the focus shifted to more unrestricted and grander compositions. (Zucker, 1955, p. 8)

The original Piazza del Popolo exemplifies the early Baroque city-planning and the way it utilized unilateral movement. In 1589, at the initiative of Pope Sixtus V, the center of Rome was replanned to ease the pilgrims' navigation from one landmark to another. The square of Piazza del Popolo was designed as a trapezoid with the churches of Santa Maria in Montesanto and Santa Maria dei Miracoli placed on the longest side. Together, the two churches formed a triumphal arch, from which three straight streets departed, providing travelers with an easy route to the city's major churches. The trident-shaped layout was later reiterated all over Europe, probably most famously in the garden of Versailles. (Zucker, 1955, p. 9)

Where Piazza del Popolo and other early Baroque works were characterized by straight unobstructed sight lines, the 18th century introduced excitement and surprise as new guiding principles for architecture. The square of Piazza di Spagna (Francesco de Sanctis, 1725) illustrates how in 18th century Italy an architect was as much an urban planner as a stage designer. (Zucker, 1955, p. 12)

The triangular piazza, which branches off into five streets, marks the starting point for the Spanish Steps, the 135-step staircase leading



Figure 3. Scalinata di Trinità dei Monti (The Spanish Steps).

to the church of the Santissima Trinità dei Monti. From the Della Barcaccia fountain, the guest sets off to climb the stairs aligned on the same axis as Via Condotti, one of the five streets.

What makes the experience exceptional is the equal emphasis on the piazza and the stairs. The Spanish Steps does not only guide the visitor to the church but serves as a spatial monument on its own.

Climbing to the top is articulated through the positioning of the stair landings. After the first four sets of steps there is a large platform, where the path is divided into two branches. The staircases connect again on the next full-width landing, only to be re-separated by the curved ramps leading to the church.

Instead of a direct ascent, the transition from the piazza to the upper street level is a multi-part route, in which the direction and viewpoint shift as the visitor progresses towards her destination. Where the early Italian Baroque valued one-way traverse, the design of the Spanish Steps is founded upon a bilateral counter movement. (Zucker, 1955, p. 12)

As previous examples show, movement and lines of sight have guided the development of architecture for thousands of years. It is therefore not surprising that the creators of virtual worlds have taken advantage of some of these proven techniques. In a similar way as religious spaces were concealed to illustrate their spiritual significance, the endpoint of the game is usually layered behind several rooms through which the player needs to progress. For instance, popular role-playing games such as *The Elder Scrolls V: Skyrim* (Bethesda Games Studios, 2011) involve labyrinthine dungeons into which the player descends in search of hidden treasures.

On the other hand, it is also common for the player to be given a brief sight of a reward to pique her curiosity before she is forced to take a detour like a visitor arriving at the Parthenon. At an early stage of the first-person game *Half-Life 2* (Valve, 2004), the player is informed that her final goal is a monolithic tower called the Citadel. Over the course of the game, the tower makes various appearances in the distance, always looming a bit nearer and thus serving as an indicator of the player's progression. (Totten, p.138)

However, if one were to choose a style period that has most in common with virtual game worlds, it would probably be late Baroque. Much like Roman city planning in the 18th century, virtual experiences are based on elaborately placed stage effects. Take, for example, the genre-defining first-person shooter *Doom* (iD Software, 1993): the game's maps consist of angular, intersecting paths where the player encounters hordes of computer-controlled enemies. Instead of a line leading directly from one location to another, the route involves varying heights and directions of movement, requiring the player to constantly reorient herself. Like the Spanish Steps, the game world is not designed to provide the player with easy access to a specific destination, but to make the traversal an impactful experience in itself.

The spatial cues and tricks mentioned above are undoubtedly best used in first-person games where the viewpoint is positioned at the eye level of the player's character. In these games, the virtual camera acts as a representation of the player, so she perceives the game world like any real environment.

Coming back to Le Corbusier, in 1928 the insurance company administrator Piee Savoye and his wife Eugénie asked the architect to design them a weekend home near the town of Poissy. Corbusier was given a free hand with the plan, as long as the building contained all the facilities required by the couple. The end-result, *Villa Savoye* (1931), is an example of an architectural promenade where the spatial sequence forms a dramatic arc that the visitor experiences as she moves from one location to another. (Nitsche, 2009, p. 74)

In *Villa Savoye*, all the elements from the columns to the window mullions are instrumental to the promenade. Even the drive from Paris to Poissy plays a role as the rectangular car window frames the landscape passing by. Arriving at the villa, the car follows the shape of the glass façade and curves around the building, parking on the ground floor. Inside the house, the resident's journey continues along a central ramp that connects the floors as one uninterrupted pathway. (Gans, 1987, p. 66) The ascent reiterates the drifting

movement of the car ride, continuing all the way to the rooftop terrace, where the promenade culminates in a view of the pastoral countryside. (Bianchini, 2018)

Architect Peter Eisenman (1999) notes that the relationship between the subject and the stationary building is based on the experience of time. When a person walks inside the building, she becomes more knowledgeable about the object of architecture. In well-crafted architecture “[t]his understanding was usually ordered by a series of referents: A grid, an axis, a marche, or a promenade architecturale; that is, a sequential ordering of a series of apperceptions in the experience of space” (p. 250).

The flow of movement that defines Villa Savoye is also characteristic for virtual game worlds, especially multiplayer arenas where the movement between spaces becomes a repeating pattern. Architect and game developer Chris Carney (Carney, 2010) has shed light on his creative methods behind the layouts of Halo Reach (Bungie, 2010), a popular shooter game that utilizes the first-person viewpoint.

Carney walks us through his design process, which he says is defined by “the seven essential multiplayer design elements”: simplicity, orientation, navigation, circulation, landmarks, location of objects and iteration. The player starts the game from a random position, after which she needs to navigate through the virtual space either avoiding or searching for other players. Much like in previous architectural examples, the player’s movement is guided by “structural walkways” and “clear paths of suggested movement” (Carney, 2010). Over the course of play, the player familiarises herself with the circulation route and forms a cognitive map of the spatial sequence.

3.4 *Style of virtual worlds*

If the purpose of virtual architecture was only to support the character’s mobility, game worlds would consist of nothing but white walls and floors. But virtual environments have their own distinct styles designed to inform the player and stimulate her curiosity. While these buildings can basically defy all the laws of physics, they often contain familiar elements that evoke connotations of existing buildings. (Adams, 2003, p. 13)



Figure 4. The Lion Bas-Reliefs. By Giovanni Battista Piranesi, early 1770s.

Fumito Ueda, a critically acclaimed Japanese game designer, locates his games typically in vast empty fortresses. The stone masonry and structural patterns are reminiscent of large Aztec cities or the ancient temples of Rajasthan. But where the latter structures are filled with pictorial details and religious imagery, Ueda's fantasy castles utilize simple geometrical shapes. While these buildings may evoke associations with different cultures and architectural styles, they lack a clear, recognizable reference. (Martin, 2016)

However, the auteur has left a clue on the cover of his first game, *Ico* (Team Ico, 2001). The painting of two shadowy figures wandering next to colossal structures is, in fact, a pastiche of Giorgio De Chirico's painting *The Nostalgia of the Infinite* (1911). De Chirico's influence can also be seen in the architecture of the game itself, which features high arches and muted stone walls. Famously, the artist's surrealist works were not inspired by real life situations or buildings but his dreams and memories. (Martin, 2016)

Artist and designer Gareth Damian Martin (2016) has written about possible reference points for Ueda's work. According to Martin, another source for Ueda's visions can be found in the etchings of the Venetian artist Giovanni Battista Piranesi, and in particular his series *Imaginary Prisons* (1745-1750). Having previously produced prints depicting Roman landmarks, Piranesi was well acquainted with the language of classical architecture. Utilizing knowledge of structures and his signature methods – exaggerated scale and dramatic compositions – Piranesi created sixteen images of imaginary vaults. Common for all these etchings were stark tonal contrasts and recurring elements of high arches, winding staircases, and ambiguous machinery.

For the French writer Marguerite Yourcenar (1984), Piranesi's prison fantasies were dreams that represented the “negation of time, incoherence of space, suggested levitation, intoxication of the impossible reconciled or transcended” (p. 110). The intention behind these drawings was to reinvent rather than recreate existing architecture. Piranesi was not concerned if his scenes could pass as actual prison settings or if they made much sense functionally. Instead, the prints

were manifestations of the emotions evoked by dungeons and other oppressive spaces.

While it is easy to recognize Piranesi's influence on Ueda's eerie castle interiors, I would argue that his legacy is more prominent than just the architectural style of a few specific game environments. More specifically, the imaginary prisons and virtual games share the ability to reshape real-life references into dreamlike fantasies.

When the player wanders the post-apocalyptic world of the action-game *The Last of Us* (Naughty Dog, 2013), she visits buildings that are not designed to imitate the presence of life but its absence. The past of these rooms is suggested via spatial allusions, even though they have always been as worn out as they are in the moment the player enters them. (Gareth, 2017, p. 52) Architect Juhani Pallasmaa (2001) remarks that the everyday standardized architecture cannot evoke such intense human emotions such as "melancholy and joy, nostalgia and ecstasy" (p. 29). On the contrary, physical houses are designed to serve the mundane, not to stimulate our imagination.

Much like De Chirico and Piranesi, people behind virtual worlds utilize existing architecture to deconstruct and reinterpret its spatial elements. However, game developers are not the first ones to envision fantastical make-believe structures. The history of architecture is familiar with numerous projects that, for one reason or another, have never materialized and therefore remained permanently in the realm of imagination. In general, these projects question existing conventions, explore the limits of technology, and serve as visions for the future. With the following examples, I am going to illustrate how some of these unbuilt wonders drew on similar ideas to virtual game worlds.

Architect and graphic designer Yakov Chernikhov produced numerous architectural drawings that had very little to do with actual building plans, earning himself the nickname Soviet Piranesi. Chernikhov, a known admirer of science fiction novels and ancient myths, introduced his industrial utopia in the book *Architectural Fantasies* (1933). The series consists of compositions of different

geometric shapes, in which the distinction between structural and abstract is intentionally left vague. Chernikhov closely followed the architectural movements that took shape both in the Soviet Union and the Western World, and then reimagined their concepts in his own art. (Butterwick & Zakaim, 2018, pp. 17-23) According to Chernikhov, the artist immersed himself “in the most secret regions of invention and imagination, and discovered unknown treasures of images never seen” (Para, 1996, s. 206).

The biggest inspiration behind Chernikhov's style was avant-garde artist Kazimir Malevich's principle of non-objectivity. In contrast to traditional architectural drawings, Chernikhov created his work by using simple lines, planes, and surfaces that did not represent any recognizable subject-matter. In his first published book, *The Art of Graphic Representation* (quoted in Cooke, 1984), Chernikhov states that non-objective forms grant artists “the possibility to create a series of the most fantastic formal constructions which are not initially constrained by any direct practical application” (p. 22).

Much like Chernikhov's compositions, virtual games have resorted to geometric abstractions in their attempt to depict spaces. But where Chernikhov was consciously seeking new forms of expression, game visuals have always been subject to technical capabilities.

Vector graphics of the 1980s managed to give a sensation of three-dimensional space by using perspective techniques developed in Renaissance Italy. One example is *Tempest* (Atari Inc., 1981), a vector-based shooting game in which the player moves her character around the edges of a tube structure. Designer and programmer Dave Theurer based the idea on a recurring nightmare where unrecognizable creatures approached him from a deep pit. (Ruggill & McAllister, 2015, p. 13)

In *Tempest*, the illusion of depth is achieved with the use of one-point perspective as the pit is composed of multiple lines running toward a vanishing point. As in Chernikhov's paintings, the characters and objects are somewhat abstract, but the perspective method gives the illusion that they exist in three-dimensional space. (Ruggill & McAllister, 2015, p. 31)

In 1784, the French architect Etienne-Louis Boullée envisioned a cenotaph to serve as a funerary monument for the British physicist Isaac Newton. Newton had been one of the leading intellectuals of the Enlightenment movement that had shaped Europe in the 18th century. The Enlightenment represented the triumph of rationalism over old authorities, which was manifested in Newton's pioneering discoveries. To commemorate Newton's work in the fields of mathematics, physics, and astronomy, Boullée rejected the prominent Rococo style in favour of a pure geometric shape. The cenotaph was depicted as a monumental stone sphere that carried "the utmost simplicity, because that surface is flawless and endless" (Wilkinson, 2017, p. 73). With its 150-metre diameter, the sphere would have been the tallest building of its time, outsizing all existing shrines or cathedrals.

Boullée's strategy for astonishing his audience is utilized in virtual games whenever the player navigates through massive structures or faces overpowering obstacles. Game developer Jenova Chen (2012) explains how his idea for the adventure game *Journey* (thatgamecompany, 2012) stemmed from the realization that our modern society lacks the "the feeling of not knowing, a sense of wonder, a sense of awe, at the fact that you don't understand, at the fact that you are so small and you are not empowered."

In *Journey*, the player guides her character through mysterious environments to reach the top of a distant mountain. The details of the narrative setting are left unclear, so the player's initial feelings are confusion and isolation. However, over course of play, the player's path intersects with other players with whom she can communicate through motions and chime-like sounds. Atypical for games, *Journey* does not encourage competition but companionship between people moving towards a common destination.

Arata Isozaki's housing concept *Clusters in the Air* (1962) demonstrates the Metabolist movement's core principle that buildings should keep pace with the ever-changing modern world. As Japan experienced rapid urbanization after World War II, metabolists declared that architecture should not follow specific functions but

remain open for readjustments. Isozaki's solution for the cluttered street network was a tree-like megastructure that directed the city's growth upwards. The central structure hosted an elevator, from which the prefabricated housing modules extended outward, resembling tree branches. As it was possible to add new modules, the building would gradually grow and evolve like a living organism. (Wilkinson, 2017, p. 237)

In Isozaki's vision, urban development could be regulated by splitting the city into smaller units that are easy to organize and rearrange. The scale model of the wooden structure looks as if it was taken directly from the virtual world of Minecraft (Mojang, 2011), where the concept of modularity has been taken to extremes. In Minecraft, the entire game world is made up of millions one cubic-metre-sized blocks that players can dismantle and assemble in countless ways. Of course, the game lacks the socioeconomic thinking that was the driving force behind the Metabolist movement, but it serves as a visual representation of the reality where structures are created organically and the built environment never remains fixed.

Many visionary buildings or cities have served as counter statements to current circumstances as they provide a glimpse into a society that has solved its problems with forward-thinking design. In 1516, Sir Thomas More introduced the term utopia in his book of the same name. Derived from the Greek word *ou-topos*, meaning "no place", Utopia is described as a distant island in which people have developed the model of the ideal society. (Walz, 2010, p. 237)

Since the publication of the book, the term has become synonymous with the visionary plan of a perfect world. If the game worlds can be equated with the visionary architecture of the past, the question arises as to whether they can also be considered utopias of today.

Writer Oliver Herwig (2006) refers to malls, theme parks and casinos as dream worlds, or structures that are built as a means of enjoyment and escapism. Defined by leisure instead of function, these buildings are "a reflection of our society, its desires, and

fantasies. As such they are not utopias but play their part in the search for meaning” (p. 17).

In the same way, virtual games do not offer an idealized counter vision for society, but a predefined and optimized interpretation of it. However, this does not mean that games are empty shells without significance. Where utopian fiction criticizes and reflects the time in which it is created, games can also reveal something about the world where people seek to live out their fantasies in virtual space. (Walz, 2010, p. 337)

3.5 *Architectural narrative*

Although gaming environments often refer to real buildings, their function is completely different. Instead of performance, virtual buildings emphasize experience. During play, the player engages in meaningful interactions and compiles these events into a mental space. Similarly, in the physical world, buildings have meanings that are not linked to their structural or economic requirements but to the memories and actions of the user. This combination of signs and the spatial experience of the individual results in a certain type of narrative that can be described as architectural. (Coates, 2012, p. 14)

According to researcher Gonzalo Frasca (2003), virtual games should not be approached as representations but as an “alternative semiotical structure known as simulation” (p. 1). Instead of the simulation itself being a sign, it produces signs that reflect the defining behavior of its reference. For example, a photo of a car can describe its shape and color, but I can’t make it drive or collide. However, the racing game gives me control of an imaginary vehicle, meaning the playing experience simulates driving.

In contrast to Frasca, some scholars consider digital games narrative devices that should be studied and analysed using established literary theories. Labeled as narratology, this approach positions virtual games in the same group as literature, cinema, and other forms of storytelling. The notion can be traced to Professor Jane Murray’s book *Hamlet on the Holodeck* (1997), in which she frames games as

participatory narrative medium that holds “potential for telling stories about whole systems” (p. 259). Murray praises virtual media and games precisely because of their narrative potential since “[1]inear media, such as books and films can portray space either by verbal description or image, but only digital environments can present space that we can move through” (p. 79).

The narrative, derived from the Latin word *narrare*, refers to an ordered series of events narrated by the narrator. Narrative is one of the four forms of discourse, the other three being presentation, argumentation, and description. When sorted into narrative, the events form a simplified sequence that can be reiterated and transferred to other formats. (Coates, 2012, p. 15)

In a sense, games have always had a certain narrative dimension, even in the pre-digital era. Monopoly (Hasbro, 1935) can be seen as a story of won and lost finances, while chess represents a struggle between two armies. However, media researcher Henry Jenkins (2004, p. 121) notes that people who participate in games are primarily concerned with play, not the underlying narrative context.

As for their narrative potential, Jenkins (2004, p. 121) proposes that virtual games convey stories in a similar way to architecture. For him, game devices are fundamentally space-generating machines, and the supposed narrative takes shape as the player navigates, explores, and maps the virtual world. The story aspect is therefore directly linked to the game’s spatial structure.

The narrative as a linear series of events poses a challenge to spatial storytelling. Where the story is based on momentary events, architecture represents a permanent and static structure. For this reason, narrative in architecture emerges as a nonlinear “framework of associative meanings” (Coates, 2012, p. 17). This means that elements of physical space contain hidden intentions that are triggered by one’s own actions and experiences. These intentions are usually quite subtle and open-ended, and they can be perceived as an invisible layer that lies above and in addition to the object’s function.

In this respect, the built environment is always narrative, regardless of context. The skyscraper in the financial district serves a specific function, but at the same time we read it as a symbol of power and wealth.

Personal experiences also play a role in the process. As a person navigates their environment, she builds a cognitive map where spaces intertwine with past events and social connections. These maps help one to locate memories and place them on a timeline. The mundane suburban house is remembered primarily as a childhood home and the street corner as a site of an accident. (Coates, 2012, pp. 13–14)

Naturally, narrative is most evident in the type of architecture that relies heavily on symbolic content. Each part of the Gothic cathedrals, from the long windows to the sculptures and ornaments, contains a symbolic layer that tells the story of God. (Coates, 2012, p. 18) In the plan of Eero Saarinen's Trans World Flight Center (1962), the narrative of flight has been converted into a concrete structure. Where the shape of the roof resembles a bird's wings, its ascending curves indicate the experience of flying. As a modernist monument, the terminal also tells the story of engineering expertise overcoming the laws of nature. (Coates, 2012, p. 34)

According to architect Nigel Coates (2012, p. 125), there exists three types of methods for narrative-driven architecture: binary narrative, sequence narrative and biotopic narrative. Henry Jenkins (2004, p.123), in turn, argues that narratives can arise from virtual environments in four ways: through evocative associations, enacted narratives, embedded narrative information, or emergent narratives. By comparing these models, it is possible to identify their similarities and deduce how well they move from one media to another.

In binary narrative, an everyday element is given a parallel identity to heighten its presence. This is a common technique used in restaurants that express their cultural origins through food and ornaments. Because the intention behind this practice is to create an atmosphere and enrich the experience, the customer is not expected to believe in the illusion. (Coates, 2012, p. 129)

Binary narrative is also utilized in amusement park attractions and other spaces whose appeal is based on known stories and traditions. Jenkins (2004, p. 123) describes such an environmental narrative as evocative because it seeks to evoke audience's memories through familiar imagery. This is a common feature in virtual games that are known to draw narrative content on previous storytelling formats like film and literature. For example, Jenkins mentions how the action game American McGee's *Alice* (Electronic Arts, 2000) provides an unexpected interpretation of Lewis-Carroll's *Alice Wonderland* novel. The book's absurd but charming fantasy world has been turned into a sinister landscape with violent encounters. The impact of the game's narrative environment thus relies on the player's previous knowledge of the original story and its locations. (Jenkins, 2004, p. 123)

Referencing prior works of architecture and other media was one of the defining factors of the postmodern movement introduced by Robert Venturi and Denise Scott Brown in the 1960s. Postmodernists were particularly interested in the so-called low-brow architecture, such as the city of Las Vegas and the Disney World theme park, the latter of which Venturi described as "a symbolic American utopia." (Goldberger, 1972) Take, for example, Michael D. Eisner Building, where structural elements are given two additional meanings alongside their function. The dwarf-shaped pillars of the façade refer directly to Disney's first feature film, *Snow White and the Seven Dwarfs* (1937), while evoking associations with atlantes used in the Classical architecture. (Totten, p. 277)

In architecture, spaces can be organized on a specific route that links various situations together, each with its own spatial identity. This technique is typically used by art curators and landscape gardeners, but it is also found in places along urban paths and driveways. Just a drive through the city with its multiple conjunctions and turns can form a narrative. A similar but more controlled sequencing takes place in theme park rides, where the visitor moves on rails along a route from which she cannot deviate. Airports represent another type of attraction designed around sequential movements, in this

case departures and arrivals. The linear paths of passengers continue to branch into cafés, stores, and other activities, all of which represent smaller sub-narratives. (Coates, 2012, pp. 144-146)

According to Jenkins (2004, p. 6), the previous examples fall into the category of enacted narrative. In the context of virtual games, a story refers to a string of narrative events that the player either performs or witnesses. Goals and conflicts set the framework for spatial stories that developed through actions, that is, when the player moves her character in virtual space. So instead of a predefined plot structure, games can convey messages by utilizing the player's spatial experience

In *Max Payne* (Remedy, 2001), the narrative progression is conveyed through separate chapters, each introducing a new environment for the player to explore. The player's character, a former NYPD police officer, begins his journey from a derelict subway station, after which the story takes him to fictional Federal and Art Deco buildings. Eventually, the last chapter takes place in a glass-clad modernist skyscraper, where the character needs to climb to the roof to reach the game's thrilling finale.

Jenkins (2004, p. 9) argues that games can also have embedded stories that the creator blends into the game's environment. This narrative information is communicated through objects and spaces that the player gradually discovers as she explores her surroundings. In a sense, the player takes on the role of a detective looking for clues to piece together the story behind the game's setting. For example, the exploration game *Gone Home* (The Fullbright Company, 2013) places the player in an empty Victorian home, where her main goal is to uncover the whereabouts of the protagonist's family. While the player is free to move around the house as she sees fit, the layout is designed to guide her towards the narratively relevant elements. As the player finds more clues, the chronology of events becomes clearer, and she slowly forms the story in her head.

Jenkins (2004, p. 9) clarifies the concept of embedded narrative by mentioning the distinction made Russian formalist critics make between plot and story. While the former refers to events that occur

on the screen, the latter is the viewer's mental arrangement of those events in chronological order. In novels and films, the narrative is occasionally complemented by backstories that expand characters and settings. As the plot progresses, the viewer revisits and redefines the mental image to understand the unfolding story. In the same way, the player creates an internal map of the game's rules and narrative and then tests it against the interactive environment.

Gone Home's design corresponds to the narrative sequence technique used in art exhibitions. While visitors can roam between spaces somewhat freely, the story the curator wants to tell follows a predetermined structure. (Coates, 2012, p. 144) Despite the game's open-ended structure, the player is assumed to visit certain rooms to progress further, leading to a narrative with a definite beginning and end. Eventually, an experienced player can complete the game in a relatively short time after discovering the optimal linear path that leads to the end.

Finally, Coates (2012) introduces the third form of architectural narrative that he describes as biotopic. A biotope is "a small, uniform environment occupied by a community of organisms" (p. 159). In the context of architecture, the term refers to an urban territory with functions and possible storylines. The elements are complementary but independent, and their occasional mixture results to biotopic narratives. Typically, such narratives emerge in cohesive communities, such as university campuses and villages, where a group of people form a network of situations.

In virtual games, the equivalent to biotopic narrative is the emergent narrative. Instead of following a series of scripted events, the game can have an open-ended structure that allows players to set objectives and come up with their own stories. It is then up to the creator to infuse the environment with narrative possibilities and steer the player towards them. (Jenkins, 2004, p. 9) For example, *The Sims* (Electronic Arts, 2001) is a game that simulates family life without specific objectives or goals. Instead, the player's role is to interact with the game's microworld and observe the

characters as they live through different situations. The characters can engage with the game's few household objects, each of which is tied to a specific narrative action, such as sleeping, reading, or kissing. The streamlined representation of a family house creates a readable narrative space that inspires the player to explore possible outcomes. (Jenkins, 2004, p. 12)

In summary, virtual game environments and real-world architecture are based on similar methods when interpreted as vehicles for narrative. On one hand, playing virtual games differs greatly from how we experience physical spaces. The player cannot feel the temperature of the virtual world or touch its surfaces. On the other hand, the ways in which architecture and game worlds communicate make them, in the same way, exceptional storytelling tools. In both media, the narrative is based on a person's ability to navigate and map the environment, and it is up to the designer to invest the space with elements that trigger associations and make the experience meaningful. In this respect, it does not matter whether that space is real or imaginary.

Conclusion

CONCLUSION

In this thesis, my goal was to identify the similarities between game worlds and architecture. First, I addressed the question of whether game worlds can be considered virtual architecture. In the context of this thesis, the term virtual is analogous to a computer-generated imitation of the real, while architecture refers to a designed environment that hosts human activities.

There is always human behavior involved in gaming, as the process requires the player's input. In addition, playing a virtual game is a spatial experience that involves several modes of space, such as the audiovisual representations, the physical environment, and the player's kinaesthetic connection to the game. According to classical phenomenology, one experiences the world through her body. It can be argued that the pressing of buttons and other bodily movements form a connection between the virtual world and the person's self. During the interaction, the player maps her experiences in a mental space, which gives rise to emotional associations with the fictional environment.

According to Alexander Galloway, all factors related to playing can be identified as actions initiated either by the player or the machine. As far as architecture is concerned, it can be considered as part of both categories.

On one hand, the computer generates a predetermined environment whose parameters the player cannot influence. Architecture manifests itself as referential and decorative elements that have no direct effect on the mechanics of the game. In this sense, virtual worlds are comparable to the works of Giovanni Piranesi and other visionary architects whose intention was not to design actual buildings but to stimulate the imagination of the public

On the other hand, architecture provides spatial boundaries that dictate the player's motions within game space. Throughout history, from the Acropolis of Athens to Le Corbusier's Villa Savoye, architects have successfully utilized to suggestion of movement and sight lines to connect spaces and direct the visitor's attention. Most importantly, the key principles behind the High Baroque city planning

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– suspension and surprise – are also found in virtual game worlds.

The factors that determine the architecture of three-dimensional game worlds are thus visual references and directed movement. These features are emphasized in real-world architecture when approached as a narrative device. By comparing the narratives emerging from game worlds and architecture, it is possible to identify common methods, such as evocative meanings, spatial sequences, and unstructured interactions.

Game worlds do contain architecture, assuming that architecture is understood not merely as structures but as the organization of activities. Similar to a physical space, the form of the game environment is dictated by human activity, while the environment in turn accommodates and influences that activity. In game space, architecture functions both as a setting and a component of play.

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Figure 2. Galloway, A. (2006). *Gaming: Essays on Algorithmic Culture*. *Electronic Mediations* Vol. 18. (p. 37) Minneapolis: University of Minnesota Press. Redrawn from untitled diagram.

Figure 3. Panini, G. P. (1756-58). *Scalinata della Trinità dei Monti*. The Metropolitan Museum of Art. <https://www.metmuseum.org/art/collection/search/337498>

Figure 4. Piranesi, G. B. (early 1770s). *The Lion Bas-Reliefs*. Royal Academy of Art. <https://www.royalacademy.org.uk/art-artists/work-of-art/the-lion-bas-reliefs>

