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Sémiotique de l'espace à l'ère de la logique computationnelle et des pratiques numériques

Les pratiques numériques entre négociation de la contingence et design de l'expérience

The Semiotics of Video Game Spaces

La sémiotique des espaces dans les jeux vidéo

GABRIELE ARONI

Abstracts

English Français

This article proposes a semiotic framework for the analysis of video game spaces based on the structuralist theory of denotation and connotation in architecture devised by Umberto Eco. Virtual architecture is a central signifier in digital games, and its design heavily influences the gameplay as well as the narrative. In 3D games, players interact with virtual environments that closely resemble our real architecture, and as such, many of the tools we use to analyse real architecture can be successfully applied to virtual architecture. Through a series of examples from games of various genres and art styles, this article illustrates how architectural signs communicate to players and how they can be used to enhance gameplay, narration, and immersion.

Cet article propose un cadre sémiotique pour l'analyse des espaces des jeux vidéo, basé sur la théorie structuraliste de la dénotation et de la connotation en architecture conçue par Umberto Eco. L'architecture virtuelle est un signifiant central dans les jeux numériques, et sa conception influence fortement la jouabilité ainsi que la narration. Dans les jeux en 3D, les joueurs interagissent avec des environnements virtuels qui ressemblent beaucoup à notre architecture réelle. Ainsi, de nombreux outils utilisés pour analyser l'architecture réelle peuvent être appliqués avec succès à l'architecture virtuelle. À travers une série d'exemples tirés de jeux de genres et de styles artistiques différents, cet article illustre comment les signes architecturaux communiquent avec les joueurs et comment ils peuvent être utilisés pour améliorer la jouabilité, la narration et l'immersion.

Index terms



Mots-clés : architecture, art numérique, espace, numérique, sémiotique, sémiotique visuelle

Keywords: architecture, digital, digital art, semiotics, visual semiotics, space

Full text**Introduction**

1 Digital games have always been systems of signs (Nitsche 2008, p. 3), or, in the words of David Myers “semiotic machines” (2010, p. 5), where signs showed on the screen prompt players to act in a certain way to produce further signs and actions. As technology progressed, games moved away from symbols—usually simplified representations of real or fantastic objects—to iconic signs, that is, accurate representations of their real counterpart (Konzack 2006; Pearce 1997). If in *Space Invaders* (Taito, 1978) a spaceship was represented by a series of squares resembling the outline of a craft, the same object in *Star Wars Squadrons* (Motive Studio, 2020) is virtually indistinguishable from the spaceships we are used to seeing in popular movies. Especially in the past two and a half decades, many digital games have allowed players to move in three-dimensional spaces which look and function much as our physical space, with directions, distances, and constructs that, if not directly analogous, are at least linked to our common understanding of space. Indeed, many game scholars consider “space”—either two or three-dimensional—as a fundamental characteristic of digital games. Already in the late nineties, scholars such as Murray and Pearce remarked that navigable space was the main innovation of games compared to traditional, “linear” media (Murray 1997/2016, p. 72; Pearce 1997, p. 28). Wolf observed that digital games’ “added elements of navigation and interaction lend an importance to diegetic space which is unlike that of other media” (2001, p. 51), again underlining how space and movement is what sets games apart from other media, an opinion followed by D’Armenio, who proposes to replace the term “interactivity” with “environmental” or “spatial manipulation” (2014, p. 12), and reconceptualizes digital games as “kinetic images” or “image-movements”: “expressive systems based on the complex interrelation of two sets of qualities, the visual qualities and the qualities of movement” (D’Armenio 2024, p. 2). Aarseth goes as far as to consider spatiality “[t]he defining element in computer games” (2001, p. 154), and Jenkins, building on Pearce’s concept of games as spatial media, dubbed them “narrative architecture”, highlighting the link between space and narration (2004, p. 121).

2 Despite the importance of all components, digital games remain a predominately visual medium. As such, it is relevant to investigate how the visual input that players receive and that game designers, level designers, and artists create work at a semiotic level. Not just in terms of interaction or simulation, but in terms of visual correspondences with our understanding and experience of space and architecture. Most contemporary digital games display detailed, realistic-looking three-dimensional environments that can be explored in first or third-person perspective—i.e. with the virtual camera looking through the player-character’s eyes, or usually placed hovering about the shoulder—that players can move through and explore at leisure, with a flexibility of movement not unlike, and in many instances superior, to what we usually experience in our physical world. In digital games, despite the restricted physical actions the player performs—usually limited to pressing buttons on a gamepad or keys on a keyboard—the results in-game are extremely varied. In what Burns calls “semiotic amplification” (2014) to any physical input method corresponds a response in terms of visual, aural, and sometimes haptic, signs that is almost unlimited, as characters, or any type of avatar, can perform any kind of action regardless of players’ input. Also, similar to our physical world, virtual environments are predominantly structured by architectural elements. Even the natural landscapes within games, such as lush forests or expansive valleys, are artistically crafted. Yet many game environments inevitably feature buildings, whether for gameplay



mechanics or narrative depth. How do these digital environments communicate with players? How do they facilitate and enrich gameplay, storytelling, and immersion?

3 Semiotic studies on enunciation have already addressed the question of spatiality—particularly in relation to images (Bellentani *et al.* 2024; Dondero 2020). This article seeks to develop a complementary line of inquiry, by building upon the semiotic framework developed in *The Semiotics of Architecture in Video Games* (Aroni 2022a) to present the analysis of virtual architecture in a series of case studies aiming to elucidate how players interpret and respond to these architectural signs. The framework draws upon structuralist semiotic theories articulated by Umberto Eco regarding the denotative and connotative functions of architecture. Eco posits that the semiotics of architecture is independent from linguistics, as not all communicative phenomena can be explained with linguistic categories (1968/2016). Drawing from Morris (1938), Eco considers that there can be semiosis only when there is a transmission of significance, based on the codes utilized by the sender and the receiver. Architecture denotes a function, based on its own forms and our understanding of the environment, our “code”. Other than denoting a function, architecture also connotes additional meanings, which go semiotically beyond the mechanical, denotative function. Furthermore, Eco (1997 p. 187) considers architecture a form of mass communication, which brings the parallel with digital games even closer:

1. “Architectural discourse generally aims at mass appeal” (*Ibid.*). While this statement can be debatable, especially in light of the public’s lack of appreciation of modern architecture, the principle is indeed correct, and valid for digital games as well, which are designed to appeal to as large an audience as possible.
2. “Architectural discourse is psychologically persuasive” as “one is prompted to follow the ‘instructions’ implicit in the architectural message” (*Ibid.*). This is one of the main functions of digital games architecture, as it is often designed to guide players in their movements and actions within the game.
3. “Architectural discourse is experienced inattentively” (*Ibid.*). While game spaces are designed to guide players, they often do it in a way that is not overly evident. Indeed, game environments are usually the backdrop of the action. This varies between single games and genres, but more often than not, other on-screen elements are the players’ focus.
4. “[A]rchitecture fluctuates between being rather coercive, implying that you will live in such and such a way with it, and rather indifferent, letting you use it as you see fit.” (*Ibid.*) In digital games as well, the relationship between space and player can vary between genres, games, and even within the same game. Game space can function as an open backdrop to be explored at leisure, to dungeons and corridors where the space configuration dictates the direction and movement of players.

4 As such, semiotic theories of architecture are particularly appropriate to analyse digital games, as virtual architecture closely mirrors real-world architecture, offering a comparable experiential quality (Robson & Tavinor 2018). Beyond static images, players can manoeuvre through virtual buildings and alter their perspectives, mimicking real-life experiences. Even without leveraging technologies like virtual reality for enhanced depth perception, the perspective representation on screen approximates real architectural experiences. Moreover, interaction in digital games extends beyond navigation and observation; spatial forms, dimensions, and layouts significantly influence gameplay dynamics, illustrating the close affinity between virtual and real architectural design. Evidently, this approach works best for three-dimensional games with points of view similar to our own. As such, this paper will concentrate on 3D first and third-person games. However, it is worth mentioning



how architectural spaces in 2D games could be effectively analysed within a semiotic framework as well. Despite being limited to two axes—or even just one, in case of particularly old games—movement within an environment is still the primary characteristic of games. Architectural object in video games can fulfil several functions, from simple decorative objects, to a space in which to move and act, or an environment to explore both spatially and narratively. Even if direct interaction with the architecture present in the environment is limited—which, however, can happen in 3D games as well, for instance in fighting games where the environment is often only a backdrop with no bearing on the gameplay—the design of spaces and structure still fulfil its role of creating an environment which the player can navigate and understand. For instance, in classical point-and-click adventure games such as *Monkey Island* (LucasArts, Telltale Games, Terrible Toybox, 1990–2022) or *King’s Quest* (Sierra On-Line, 1980–1998) players do not navigate the environment as we would in real life, but rather direct characters through an interface in two-dimensional environments. These environments are however populated by buildings, structures, and landscapes which are, for the most part, iconic representations of plausible real-world locations, regardless of the art style the game uses. As such, the interaction with signs such as “door” or “stairs” is governed by a logic not dissimilar from the one we would use in the real world: if we want to access a room, we will direct the character to open a door, or to climb the stairs to reach a different floor. In this case, the “semiotic amplification” (Burn 2014) mentioned *infra* is arguably even more prominent, as we do not directly control the character’s movements, but rather only instruct the character where to go and what to do, and the aspects related to the dexterity necessary to control the game are practically non-existent, in favour of a direct relationship between the environmental signs on screen and the actions the players are supposed to perform in-game.

- 5 We can even draw parallels with Vitruvius’ concept of “*utilitas*”, where in his *De architectura*—the only surviving architectural treatise from the ancient Western world, composed in the 1st century BCE—he advocates designing buildings that suit their intended use, location, and occupants (1931). It is to be noted that the concept of “*utilitas*” goes beyond the mere technological function of architecture, but encloses a concept similar to “appropriateness”, a structure that works for its intended purpose on multiple aspects, from technical to aesthetic. Similarly, virtual architecture in digital games must be purposefully crafted to suit gameplay styles, player interactions, and level designs.
- 6 For instance, let us examine *Quake* (id Software, 1996) and *Hogwarts Legacy* (Avalanche Software, 2023). *Quake* is one of the first fully 3D games to be available on home computers and a commercial success. So much so that even today, almost three decades after its initial release, players still create new environments for the game, and it is regularly played. Indeed, an “enhanced” version compatible with modern PCs was released in 2021 (Wilhelm 2021). *Quake* does not focus on story or characters, but rather puts the player in a series of levels infested with enemies to be eliminated. The environments vary in their inspiration, from medieval castles to science fiction installations, but they all share the same bleak and dystopian look, as the player is pitted against their evil inhabitants. While not much is present in terms of traditional storytelling, the oppressive nature of the various environments is clear, as is the design of the spaces, carefully planned to allow for rapid movements and gunplay within their relatively limited dimensions. *Hogwarts Legacy*, on the other hand, provides an expansive open world based on the literary works of *Harry Potter*, where players can explore the castle of Hogwarts and its surrounding countryside from a third person perspective and interact with its inhabitants. The game features a standard cinematic narrative, with acted cutscenes, and many interactions involve dialogues and solving puzzles, not just combat.



Aside from the obvious technical considerations that two games separated by thirty years entail, we can observe that the architectural elements and layout of a first-

person shooter in *Quake* will look and feel different from the expansive third-person open-world game *Hogwarts Legacy*. These differences encompass all the facets of the video game. For example, in *Quake*, players will rapidly traverse hellish landscapes shooting monsters from a first-person perspective, while in *Hogwarts Legacy*, they will interact with the many characters, and explore the locations with the occasional combat at a much slower pace (see fig. 1).

Figure 1



Quake © Id Software 1996 (top) and *Hogwarts Legacy* © Avalanche Software 2023 (bottom).

- 8 Furthermore, virtual architecture not only serves gameplay functionalities but also contributes to environmental characterization and game tone. The aggressive forms and colour palette of *Quake* are well adapted to the dystopic setting of the game, whereas the architecture *Hogwarts Legacy* reflects the quaint 19th century rural England it is meant to portray. Notably it is not only the setting that changes how the environment influences gameplay and narration, but how it is visually portrayed and designed. The halls of the castle of Hogwarts in *Hogwarts Legacy* could very well work as the setting of a frantic first-person shooter such as *Quake*, if the environment is structured to allow for such a gameplay. Conversely, *Quake*'s environments could accommodate for a different, slow-paced gameplay if populated with characters to converse with, rather than monsters to shoot at. In fact, in game development, the figure of the level designer, the professional who structures the environment based on gameplay necessities, is separate from the environment artist, who visually determines how such environment will look like, not unlike a structural engineer and an architect in the real world. Obviously, the two aspects of level design and environment art are not completely disjointed, and a synergy between the two is a



positive aspect in a game. For instance, if the level design calls for a linear path to be strictly followed by the player, setting this type of movement in an open space such as a prairie would be at odds with the intended purpose, and require artificial escamotages in order to be effective, such as invisible walls preventing players from stranding from the imposed path. If the narrative were to require such a situation, however, the work of the environment artists would be to use architectural—or natural—signs to impose players a predetermined path while making it seem naturally part of the environment, such as impervious rock walls, rubbles, or other obstacles. These elements are decoded by players based on the understating of the avatar capabilities in-game. If the player-character can climb or fly, for instance, a short wall will not be perceived as an insurmountable obstacle, and actually lacking the possibility of getting over it is perceived as an unfair limitation, the aforementioned “invisible wall”. Indeed, invisible walls are none other than semiotic in nature, as it is the interpretation of the visual sign, for instance a wall, which denotes the possibility of being climbed within the setting of the game. If this possibility is negated, there is not a correspondence between the meaning of the sign and its actual function and it is thus perceived negatively.

9 As mentioned, regardless of art style, game genre, and type of visual representation, game spaces are nonetheless designed for human players to interact with, and as such, there is an underlying structural understanding of space, movement, and architecture that must be commonly understood in order to be able to play the game. Moreover, unlike natural environments or fortuitus events that might shape our surroundings, game spaces are always designed with an intent, and as such they always carry the meaning imbued in them by the designers and artists, as well as the one received and decoded by players, especially in light of the fact that game environments, unlike for instance the ones of movies or theatre, must be acted upon by players, and as such they must be semiotically understandable. It follows that, much like real architectural spaces, game spaces are designed with both technical and communicative characteristics, which allow them to function as game environments as well as narrative tools.

10 Similar to the semiotic analysis of real architecture, it is crucial to determine the starting point of our inquiry in advance. An architectural structure, at its core, is primarily a physical entity before it becomes a medium for meaning. When we observe a wall or a window, we initially perceive it as a configuration of materials arranged in a specific manner. This process of perception can be endlessly recursive: what we see is not merely a wall, but rather a collection of bricks bound by mortar; those bricks are perceived as light reflecting off our retinas, and ultimately, light itself is just electrical signals transmitted from our optic nerves to our brain. For the purposes of this analysis, we will focus on environmental elements as they exist within the semiosphere (Lotman 2005), meaning as objects that we can interpret as having a meaning. This distinction parallels Eco’s differentiation between a signal and a sign, based on Peirce’s typology of signs. A signal is described as “a stimulus that does not mean anything but causes or elicits something” (1976, p. 48), such as a bright light that causes one to squint. While there is a signal and a reaction, there is no true exchange of meaning. In contrast, a sign emerges when the stimulus conveys information that intersects with a content plane, thereby allowing a recipient to decode information beyond the mere physical stimulus. In the context of digital game spaces, since they are inherently a “constructed object,” they can almost invariably be considered as composed of signs.



1. Denotation and Connotation in Architecture

11 Considering that digital architecture shares numerous aspects with physical architecture, it is valuable to explore how architectural theory and semiotics can bolster investigations into physical architecture, and subsequently, their application in digital architecture. Initially, architecture may appear to be a non-representational form of art, distinct from reproducing existing entities but focused on creating novel structures. Umberto Eco suggests that architectural objects function rather than convey messages, primarily serving structural or mechanical roles (1997, p. 174). A roof exists to shelter, a column to support it from collapsing—their mechanical purpose is unequivocal. This notion of architecture lacking communicative intent was reinforced by modernist buildings such as apartments, factories, and hospitals, often seen as devoid of semantic or symbolic functions (Ibelings 1998). Consequently, viewers of architectural works are conditioned to appreciate their formal qualities rather than search for deeper, notably semiotic, meanings (Munro 1987; Wallis 1973). Even Vitruvius emphasized how architecture encompasses both “signifiers” and “signifieds” (Vitruvius 1931). While not explicitly discussing semiotics, Vitruvius viewed architecture as imbued with meaning, functioning through systematic precepts that architects must master (Aroni 2023b). This relationship underscores the dual nature of architecture: the form that signifies and the meaning that is signified. Semiotics thus provides a fitting framework for exploring the symbolic and ludological aspects of digital architecture, particularly in the context of the structuralist theory advanced by Eco. Eco’s insights draw upon Charles S. Peirce’s semiotic theories, particularly the notion of the iconic sign (1994), which has been applied in several fields, from architecture (Aroni 2023b) to law and international relations (Chapdelaine-Feliciati 2022, 2023, 2024). In digital contexts, architecture often functions as an iconic sign, resembling real-world structures to convey specific meanings and facilitate gameplay mechanics (Aroni 2022b; Bonner 2021). Arguably, game spaces can also be considered as composed of indexical signs (Jappy 2013; Peirce 1994), especially Spatial Indexes, where environment objects function as figures which point to other objects, locations, and actions.¹

12 For instance, in *Assassin’s Creed II* (Ubisoft, 2009), a third-person action-adventure game set in a semi-accurate reconstruction of Renaissance Florence, players are free to roam the city and climb its buildings, a feature fundamental to the gameplay since the protagonist—the titular Assassin—must use stealth to complete his objectives. In order to understand which surfaces can be climbed, the game artists employed existing architectural elements that are present in the cities, such as quoins, that is, masonry or stone blocks which protrude from the façade of buildings, usually at the base or corners thereby fulfilling their real-life role of reinforcing the structure (see fig. 2). The quoins on the façade of a building in *Assassin’s Creed II* are thus iconic signs of actual quoins, both mechanically, since they can be climbed, and visually, since they are iconic representations of their real-life counterparts. In-game, these quoins are also a path for the player, who can climb them and reach an elevated position. As such they also function as indexes, by communicating to players a function—climbing—and a direction—up or down—adding to their iconicity (Aslam & Brown 2020).

Figure 2





Assassin's Creed II © Ubisoft 2009.

13 As such, Eco's focus on the denotative and connotative aspects of architectural signs provides a suitable framework for analysing virtual architecture, as it focuses on the architectural design itself and its relation to the game mechanics analysing how they are visibly presented and structured in the game, and how they are directly accessible to players. Eco posits that architectural objects denote a primary function and connote a secondary "ideology of the function" (1997, p. 178). The terms "primary" and "secondary" are not to be read as determining an order of importance, but rather based on the fact that the secondary function "rests on the denotation of the primary function" (1997, p. 179). The denotation of function stems from an object's inherent physical properties, but its main function can still be connotative in nature. While this distinction has been criticized (Scruton 2013, p. 153; Munro 1987, p. 120), it is effective when applied to architecture due to its inherent denotative/functional aspect. For instance, a staircase signifies its utility for ascending and descending based on its form and our understanding of gravity and spatial relationships. Additionally, architectural signs can connote symbolic meanings. The symbolic aspect of architecture functions autonomously, with the denotative "primary" and connotative "secondary" functions interdependent rather than hierarchically ordered. A door has the denotative function of allowing passage through a wall, but for a monumental door, or a triumphal arch, the connotative function is their *raison d'être*, rather than simply their mechanical function. Let us mention, for example, the Holy Doors present in several basilicas in Rome, which are opened exclusively during Jubilee years, and kept sealed the rest of the time. When opened, these doors still fulfil their function as opening a passage, as they allow us to go through them, but the denotative function is not as much to allow access to the interior space of the basilicas, a function that is already fulfilled by other doors, but rather to gain plenary indulgence attached to the Jubilee celebrations. Thus, the denotative function can arise from the connotative function, reflecting both utilitarian necessity and the desired symbolic representation.

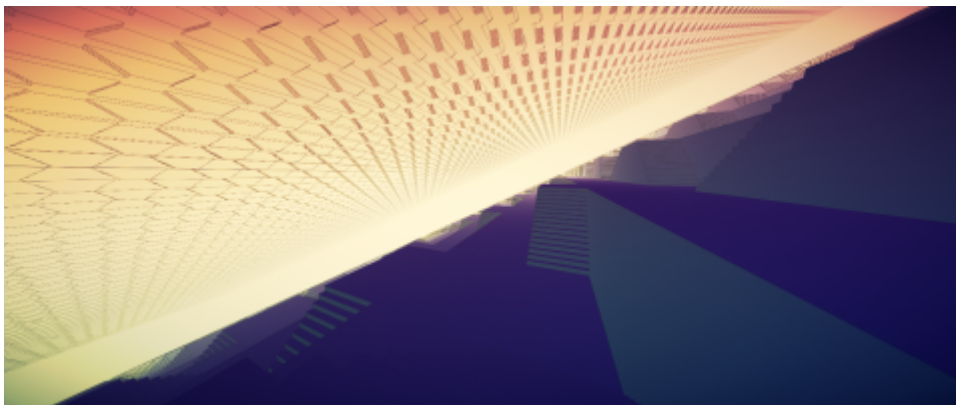
14 This is all the truer in digital games, where there is no technical and physical necessity for a space to look the way it functions. In the virtual world, the fact that a door allows our avatar to traverse a wall is merely a semiotic convention to inform players that they can move a certain way. Collisions and gravity are parameters which can be completely disjointed from the visual representation of a space. Therefore, all virtual environments are semiotic in nature rather than strictly functional, as they exist to communicate to players both the narrative and gameplay. Spatial cues in games serve multiple functions: they provide gameplay instructions, indicate navigational paths, and distinguish safe from hazardous zones. Indeed, even games that distance themselves from reality, and which can sometimes lack traditional



narrative devices such as dialogues or texts, communicate to players through their virtual spaces (Aroni 2022b).

- 15 For instance, let us examine the puzzle game *Manifold Garden* (William Chyr Studio, 2019). *Manifold Garden* was created by artist William Chyr, and places players in a world that reimagines the laws of physics and instead of our usual “cartesian space”, we are placed in a toroidal environment which makes it so that geometry repeats in every direction, and objects that fall down nevertheless reappear from the top. Chyr was inspired by the visionary art of M.C. Escher for the design of his non-Euclidean game space, and mangaka Tsutomu Nihei as concerns the inhuman vastity of the environments, but he was also inspired by the works of real architects such as Frank Lloyd Wright and Tadao Ando for the design of the architectural structures players can find (Chyr 2020). As players advance through the game solving puzzles, progress is marked by the vegetation that conquers the previously barren world. In order to make sense of this alien concept, Chyr employed architectural constructs that are familiar to us, such as stairs and columns, but placed in ways that make players understand how they can be used in such a strange world: the stairs appear upside down, or the sky is just a repetition of the very architectural structure that we are currently walking on (see fig. 3). In one of the initial environments, the only way to proceed is to jump down a seemingly bottomless pit. An action that would lead to certain death in the real world, and in most games as well, since designers usually rely on relatable signs of danger to inform gameplay. In *Manifold Garden* instead, the only way to progress is to jump down, since players will reappear from the top due to the nature of the toroidal space. After this segment, players understand that jumping down is a game mechanic, and how they can navigate the virtual space around them. Using real architectural signs, players are able to make sense even of extremely unfamiliar settings, and moreover, without the need for any additional instructions. Since we are familiar with the denotative function of simple architectural objects, their placing can be a sign for gameplay mechanics, and their strangeness, combined with the pastel colours and the noticeably “textureless” environments, contributes to the connotation that the author of the game means to imbue in this creation.

Figure 3



Manifold Garden © William Chyr Studio 2019.

2. Semiotics of Virtual Spaces

- 16 We have established that architecture serves a primary denotative function, emphasizing the utilitarian role of architectural objects based on their forms and material properties. Similarly, architecture in digital games fulfils a denotative function, which can be distinct from its real-world counterparts. Despite potential differences, architectural elements in digital games serve functional roles in



gameplay. Thus, we can draw a parallel between the primary denotative function of real architecture and the ludic function of virtual architecture.

17 The secondary connotative function of architecture, which may be incidental or absent in real architecture, assumes heightened significance in virtual environments, where every architectural element is intentionally designed and placed by artists and level designers. It is through connotation that architectural signs communicate information to players concerning gameplay mechanics, narrative elements, or gameplay instructions (Aroni 2023a). For example, seemingly minor architectural elements can be essential in understanding the virtual space surrounding the player. Spatial elements in virtual environments can connote to players many elements which are linked to their real-world counterparts, yet assume specific meanings in game environments. As mentioned supra, in *Assassin's Creed II* (Ubisoft, 2009), quoins on the facades of buildings can be climbed (see fig. 2), a fact that mirrors real life, and their presence is also a useful sign as to where the game is set since quoins are present on many buildings in historical Italian cities such as Florence. These elements therefore have a dual semiotic function. The denotative function, related to gameplay, is a sign that tells players where they can climb structures, whereas the connotative function is present to signal where players are located geographically and historically, thereby setting the game in 15th century Florence. It is worth noting how the actual shape of the elements has no bearing in them working as “climbable” surfaces in the game due to their virtual nature. Any surface could theoretically be created to be climbed, and any sign could be used to mark it as such to players: a different colour, texture, or an external mark, such as an arrow. However, what makes for good game design is when ludic, interactive elements are merged seamlessly within the environment, where they can be easily understood and used by players in fulfilling the ludic functions of the game. In short, where denotative and connotative functions are merged into one element, as in the previous example of the quoins on the façade of buildings in *Assassin's Creed II*, where interactive elements are seamlessly integrated in the environment, while being clearly understandable signs to players. Moreover, the connotative function of architecture profoundly influences game narratives, beyond its ludic implications. Similarly to *Assassin's Creed II*, the red pipes that guide the player in the modern urban environment of *Mirror's Edge* (EA Dice, 2008) do not feel out of place, while visually standing out, as there is a logical reason for their presence and colour, as pipes in real life are actually coloured based on the fluids passing within. Conversely, the recent use of yellow splotches of paint on elements of the environment that the player can interact with in *Resident Evil 4 Remake* were received with scepticism, especially since they were not present in the original game, and are considered immersion-breaking and removing the sense of exploration (Rodriguez 2023; Serin 2024).

18 Specific architectural designs can provide players with context and insights into the game world. In the science-fiction action game *ECHO* (ULTRA ULTRA, 2017), players are thrown into a gigantic, planet-sized Palace built by immortal humans with unlimited resources (see fig. 4). Players impersonate En, a girl who has just awakened after a century of stasis and must traverse the Palace in order to bring a dead person back to life. In the voyage, En must fight clones of herself, created as a defence mechanism by the Palace, who copy any moves and interaction with the environment the player performs, which hinders the exploration of the Palace. The design of the Palace itself connotes the extreme of what unlimited time and resources would be able to achieve while maintaining a human scale, for its denotative purposes, since the inhabitants are nevertheless humans. Indeed, the environment is purportedly built for humans, yet on a grandiose extension due to its elaborate characteristics of timelessness. This idea of repetition is also connoted in the architecture of the Palace, with elements such as columns, mouldings, and staircases repeating themselves to create vast compositions. The classical design of the spaces, with its Empire style furniture and ornate décor, signifies the opulence that unlimited



resources would allow, and at the same time the robotic, mechanical repetition of the spaces shows the inhuman dimension that a planet-sized palace represents. Nonetheless the stairs, parapets, and openings all mirror the denotative function of their real-life counterparts, and En has relatively human capabilities in terms of movement, and as such players expect to be able to interpret architectural signs the way they would in the real world, despite the otherworldliness of the environment. Indeed, the gameplay is based on hiding behind elements such as tables and vases, and jumping over walls and obstacles of human size. So, the denotative functions of the architectural elements is maintained within the logic of the game, and the connotative function is likewise expressed through the same elements by repetition and scale.

Figure 4



ECHO © Ultra Ultra 2017.

Conclusion

19 Architecture serves as a pivotal signifier in digital games. Players continually engage with and traverse digital game environments, necessitating a nuanced understanding of how virtual spaces communicate with them. The architectural space is essential for crafting effective game environments and deepening our comprehension of spatial perceptions, whether in virtual or physical realms.

20 As illustrated through diverse examples, a semiotic analysis of digital game architecture proves instrumental across various game genres, elucidating development processes and illuminating the profound influence of architectural design on narrative constructions and gameplay dynamics. Moreover, since digital game spaces are inherently artificial in all their aspects, a semiotic analysis is particularly appropriate, as “natural” or “accidental” events are absent even from the reproduced landscapes. Players will innately understand architectural signs that are familiar to us, even in simplified or adapted scales and forms: a door or a stair will at first glance denote the same meaning that these constructs have in our world, and players will act accordingly. This logic persists even in particularly strange and alien environments, where even the laws of physics are different from our normal understanding. In order for players to understand the logics of the virtual world, game artists resort to architectural signs that are nonetheless familiar to the general public in their denotative element. By adding connotative elements, such as materials, colours, textures, decoration, or unusual dimensions and locations, level designers and artists can communicate stories to players even without the use of traditional narrative devices. Furthermore, by acting on the semiotic potential of architectural elements, developers can combine the denotative and connotative functions. This way, the practical gameplay is communicated to players by the very same objects that already connote the story and game environment, in a seamless



play of semiosis enhancing the infinite communicative potential of virtual environments.

- 21 Further research within this line of inquiry can be applied to video games where players can actively affect and build architectural elements, such as city builders like *Cities: Skyline* (Colossal Order, 2015), or where players can freely build and modify the whole environment such as *Minecraft* (Mojang, 2011). These are particularly fecund scenarios, as players both read and generate architectural signs, rather than be passive observers. Moreover, future research can address interactive applications where the ludic aspect is not paramount, such as education applications, art installation, and digital heritage, investigating how the signs of virtual architecture can be used for educational and artistic purposes. As the tools and technologies of game development, cultural heritage—and even other disciplines such as fashion—are getting intertwined, the study of their sign-making is all the more relevant.

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Notes

¹ Peirce considers the index having the role of an identifying sign which works in relation to other objects. Game space can be considered as Index which puts the architectural objects in relation with each other and gives them meaning.

List of illustrations

	Title	Figure 1
	Caption	<i>Quake</i> © Id Software 1996 (top) and <i>Hogwarts Legacy</i> © Avalanche Software 2023 (bottom).
	URL	http://journals.openedition.org/signata/docannexe/image/5894/img-1.jpg
	File	image/jpeg, 472k
	Title	Figure 2
	Caption	<i>Assassin's Creed II</i> © Ubisoft 2009.
	URL	http://journals.openedition.org/signata/docannexe/image/5894/img-2.jpg
	File	image/jpeg, 551k
	Title	Figure 3
	Caption	<i>Manifold Garden</i> © William Chyr Studio 2019.
	URL	http://journals.openedition.org/signata/docannexe/image/5894/img-3.png
	File	image/png, 990k
	Title	Figure 4
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