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"The Simulation of Reality" as a Media Topos: Tracing the Historical Trajectory of VR

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Abstract

Purpose: This study argues that contemporary VR technology reflects a longstanding media topos: the simulation of reality. To support this claim, the historical trajectory of VR technology is traced across eight stages, from the 19th-century panoramas to contemporary VR.

Design/methodology/approach: This study is based on a review of canonical scholarly works on VR, from which eight stages are identified as the trajectory of the simulation of reality topos. Drawing on Erkki Huhtamo's media archaeological approach, a topos is understood as a recurring cultural pattern that shapes how media technologies are perceived. For each stage, the study examines the key technological developments using available sources, including patents, technical research by innovators, and publicity materials.

Findings: Recreating and simulating physical reality have often been presented as a novelty of VR and promoted as its primary affordance. However, this analysis reveals that VR is only a 21st-century manifestation of a centuries-long endeavor. This study shows that VR technology is not a novel development; rather, it is a continuation of earlier technological and discursive efforts, shaped by a specific sociotechnical imaginary and topos.

Research limitations/implications: One limitation of this study is its focus on canonical texts and mainstream technologies, which leaves peripheral forms outside its scope. Future research could examine these forms.

Practical implications: Practitioners may benefit from understanding how cultural and social expectations shape perceptions of VR as a device for simulating reality.

Originality/value: This study is the first to examine VR through the lens of the simulation of reality topos, situating it within a historical trajectory rarely considered in previous research.

Keywords: *VR, Virtual Reality, Topos, Media Archeology, Simulation*

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Introduction

In the early 2010s, major tech companies such as Meta, Google, HTC, and Microsoft made considerable efforts to promote VR as a mainstream consumer technology. Since around 2020, VR has secured its place as a mass-market product. Reality technologies entered everyday use with the advent of consumer VR and content production continued to expand. The process of legitimizing VR began in the 2010s with an emphasis on the novelty of the technology. What was considered novel was its affordance to create experiences that feel as real as those in the physical world. However, neither this assumed affordance of the technology nor the hype surrounding it was truly novel. As Evans states, the VR technology of the 2010s was only a revival, since the first wave emerged in the 1980s and the second in the 1990s. VR technology has been promoted through sociotechnical imaginaries, both today and during the first two waves (Evans, 2019, pp. 1–32).

According to Jasanoff and Kim, sociotechnical imaginaries are collective perceptions surrounding scientific and technological developments. They are the shared visions that shape the limits of a technology’s accessibility and applicability, as well as its intended purposes of use and affordances. These visions can be shaped by certain groups, corporations, and professionals (Jasanoff, 2015). From this standpoint, the idea that the primary function of VR is to simulate reality stands out as one of its dominant sociotechnical imaginaries. However, this imaginary is not limited to VR alone.

VR is a technology that continues certain historical efforts and fantasies aimed at simulating or recreating physical reality, evident throughout the evolution of various media forms (Grau, 2002). The development of media technologies like VR has been shaped by longstanding attempts to capture physical reality with high fidelity. Along this historical path, the legitimization of a medium has often been judged by how convincingly it replicates reality, which itself has generated an ongoing discourse. In this regard, 2010s VR technology can be seen as part of an ongoing discourse and can be subjected to a media archaeological analysis.

The approach in this study is based on Erkki Huhtamo’s media archeological approach, which is built on the concept of topos. Topoi (plural version) are cultural themes, motifs, and images that recur throughout media culture and appear in different historical and contextual settings. A topos, as a discursive construct shapes the sociotechnical imaginaries surrounding media tools and technologies. Following the trajectory of a specific topos allows researchers to reveal repetition of certain themes and discourses in history (Ganahl, 2016; Huhtamo, 2011). Recognizing these recurrences reveals that technologies frequently portrayed as new are grounded in particular sociotechnical imaginaries.

In the context of contemporary VR technology, the simulation-oriented topos, illustrated by statements such as “transfers physical reality into the virtual environment” and “produces experiences indistinguishable from reality,” are actually a continuation of a discourse. Concepts such as “presence” and “immersion,” often framed as affordances unique to VR for delivering realistic experiences, can in fact be traced back to media practices predating the digital era. The endeavor to render the physical

world in a virtual environment with existing technologies has a long history. It also constitutes a complex, multi-layered network connecting social and technological imaginaries, personal narratives, and marketing strategies. Understanding VR technology and the discourses surrounding it requires a re-examination of this historical trajectory.

Drawing on these historical moments, this study aims to demonstrate that the excitement surrounding VR in the 2010s was merely a recurrence. To establish this claim, the historical trajectory of VR technology will be examined. Although the trajectory of VR technology have been linked to earlier media, they have rarely been examined through the lens of a topos such as the simulation of reality. The key contribution of this study is to demonstrate that VR imaginaries are not unique to the technology itself, but rather continuations of discourses observable in earlier media. Research questions leading the study are: How has the simulation of reality topos evolved over time, and through which media has it been articulated? And, how can VR be situated among these media? Can it be regarded as their continuation, or does it constitute a genuinely novel medium?

To answer those questions, this study is based on a qualitative analysis of certain historical phases through an interpretative perspective. Huhtamo's topos analysis focuses on patterns and themes and on revealing their discursiveness (2011). To focus on the themes of simulating reality throughout history, concepts such as realism, presence, and immersion commonly associated with VR were taken into account, and a literature review of canonical scholarly works was conducted as the first step. This review is discussed in the "Simulating Senses" section of the study. The literature review resulted in a historical trajectory divided into eight stages, structured around key technological developments associated with simulation of reality with high fidelity. After identifying the stages, further reading focused on the technologies that are central to them. In the second phase of the literature review, sources such as patents, technical research by innovators, and publicity materials were selected according to their availability. These materials revealed discursive themes surrounding the historical trajectory and the associated technologies. However, one limitation of this research approach needs to be noted. This interpretive reading, focused on canonical literature and dominant, popular technologies, resulted in the exclusion of forms positioned at the peripheries of cultural field.

The literature shows that efforts to simulate reality through certain technologies are grounded in a desire to simulate the senses. While efforts focusing on visual and auditory senses are more conspicuous, the historical trajectory of the topos of simulating reality reveals that olfactory and tactile/haptic senses have long also been part of the objective of simulating reality. Thus, in this study, the trajectory of the topos of simulating reality is outlined in eight stages addresses beyond the visual senses: 19th-century panoramas and stereoscopic imaging experiments; 20th-century attempts to incorporate olfactory senses into cinematic experiences along with flight simulators emphasizing haptic feedback; Morton Heilig's Sensorama (Heilig, 1962), which aimed to simulate all five senses; advancements in computer technology and the rise of interactivity; the first wave of VR technology in the 1980s; VR as an arcade attraction; digital games in the 1990s; and, finally, contemporary VR technology of the 2010s.

The trajectory traced through the topos of simulation of reality serves two purposes: first, to situate contemporary VR technology within its historical context; and second, to demonstrate that the purported affordance of creating photorealistic experiences in certain technologies is a discourse rather than an inherent necessity. Due to the limited scope of this study, the techniques and technologies addressed in the trajectory exclude practices situated at the periphery. The scope of the analysis is confined to the popular forms of media culture. The following discussion provides an overview of sensory simulation in the context of simulating reality, before proceeding to the analysis of each historical trajectory.

1. Simulating Senses

VR, short for “virtual reality,” is used to refer to a technology that allows users to access digital environments through a headset. Along with the headset, a handheld device enables interaction with the virtual environment. This description corresponds to a standard VR setup, which integrates tracking systems with sensor fusion technology and is equipped with an advanced display. VR users experience a 360° view with binocular vision enabled by stereoscopic visuals. In a VR system, the goal is to replicate the human field of view as closely as possible. However, this hardware-focused definition is insufficient to fully reflect the context in which VR imaginaries are situated.

VR first captured public interest in the late 1980s, with attention focused primarily on the hardware system and the novel experiences it offered; what was at the focus of this fascination was the technology. However, scholars such as Jonathan Steuer argued that a definition of VR based on hardware components such as sensors, gloves, and trackers does not allow for a full understanding of VR in the context of communication. To establish a theoretically sound framework for VR, Steuer emphasized its contextualization as a communication technology. From this perspective, Steuer proposed presence as a concept linking VR to other communication devices. Defining presence as being in the immediate environment, he referred to the concept of telepresence as the perception of an environment mediated through a medium. As Steuer suggests, the perception of telepresence is not created only through VR; even talking to someone over the phone can generate a sense of telepresence (1992)

Steuer’s contextualization continues to hold relevance today. A media archeological approach necessitates this kind of contextualization in order to trace the historical trajectory of VR and the related topos. VR-related imaginaries should be analyzed in related contexts by examining which affordances of the technology are emphasized. Owing to its technical capabilities, VR is regarded as a technology that can most effectively simulate the feeling of being in a particular place. This is because VR is believed to elicit a sense of telepresence by integrating human sensory perception into digital environments as fully as possible.

Bown et al. argue that the sense of presence generated by VR differs from that of other media in the richness of sensory information it presents. This is related to the concept of the “ultimate display,” whereby the richer the sensory input, the closer the experience approaches the ideal of an ultimate

display (2017, pp. 239-243). Sutherland's metaphor of the "ultimate display" is one of the most widely recognized examples of design imaginaries aimed at simulating virtual environments so convincingly that they appear indistinguishable from reality (1965). Although achieving the ideal of the ultimate display remains a distant prospect, the path toward it is evident: to simulate the five senses as realistically as possible.

Following this ideal, the topos of simulating physical reality can be defined by the principle that the most convincing reproduction of the physical world is achieved through the high-fidelity simulation of human sensory experience. The richest sensory experience is assumed to provide the most compelling simulation. Aligned with this objective, VR clearly emerges as a leading technology. However, when VR is considered as an effort to recreate physical reality in a virtual environment, the trajectory of this endeavor can be traced back to the pre-digital era. Without going too far back and losing the focus of this study, 19th-century panoramas and stereoscopic images can be the starting point for this trajectory.

2. The 19th Century: Panoramas and Stereoscopic Images

Within the scope of this study, panoramas and stereoscopic viewing devices can be considered the conceptual precursors of VR and the simulation of reality topos. Both devices were popularized as entertainment forms in the 19th century. According to LaValle, these two media can be considered as techniques that extend visual experience beyond the boundaries of a frame. As panoramas extended the field of view, offering circular images, stereoscopic viewing created a 3D-like effect by presenting subtly different images to each eye (2023, pp. 1–30). Both techniques were perceived as immersive. While panoramas laid the conceptual groundwork for 360° viewing modalities, stereoscopic viewing represented a significant step in stereoscopic technology. The principles of stereoscopic viewing still underlie the design of contemporary VR lenses. These forms, which can be seen as mediated realities, found a market and enjoyed great popularity in the late 18th and 19th centuries.

Many writers compare the immersion of panoramas with that of VR, since both aimed to create a sense of presence in a virtual environment (Bown et al., 2017; Grau, 1999; Taboada, 2020; Nedelcu, 2013; Sherman & Craig, 2019). Essentially, panoramas are a type of wall painting, but they were distinguished from murals at the time of their invention due to their placement on cylindrical walls. Panoramas offered audiences access to spaces and experiences otherwise beyond their reach. Audiences felt as if they were in an "exotic" location, a fashionable city of the time, a captivating landscape, or even a war zone, which was a popular panorama genre (Huhtamo, 2013, pp. 4–5) Panoramas transported visitors away from their immediate reality into a virtual one. The use of light and sound effects enhanced the immersive quality of these experiences, engaging multiple senses within the scenery. Sounds and décor, appealing to the haptic senses, were important elements of panorama designs.

While panoramas were experienced collectively, stereoscopic viewing provided a form of home entertainment for the public. The first stereoscopic viewer was introduced by Charles Wheatstone in

1830. It was designed to demonstrate the functioning of binocular vision. The principle of the stereoscope is to present each eye with slightly different images, which, when viewed through a lens, appear to the eye as a single image with three-dimensionality. This technology became popular in the 1800s, coinciding with the invention of photography, which facilitated the mass production of stereoscopic cards (Zone, 2007, pp. 5–18). Oliver Wendell Holmes, whose version of the stereoscope became renowned in the USA, described it as “a dream-like exaltation of the faculties, a kind of clairvoyance, in which we seem to leave the body behind us and sail away into one strange scene after another, like disembodied spirits.” He praised being able to experience the Alps or the pyramids from the comfort of one’s home, referring to them as “stereographic trips” (1864, pp. 177–178). O. W. Holmes’ words could easily be applied to describe contemporary VR today.

When they were popularized, panoramas and stereoscopic images generated public interest similar to the enthusiasm surrounding contemporary VR, and it was 200 years ago. However, with technological advancements, the simulation of reality topos extended beyond visual-focused techniques such as panoramas and stereoscopes. In the 20th century, the focus shifted toward haptic, kinesthetic, and olfactory experiences. During the 20th century, attempts to replicate sensory experiences became evident through technologies such as flight simulators and cinema.

3. 1900s: Enhancing the Visual Experiences

The earliest instances of sensory simulation beyond vision were designs intended for entertainment, such as flight simulators and cinema. The 1931 Link Trainer, designed by Ed Link to simulate flight maneuvers and sensations, was initially an entertainment device but was later adopted for pilot training (Jeon, 2015; Link, 1931). The motions of the Link Trainer were based on firsthand studies of actual aircraft performance. Subsequent advances in simulation techniques allowed for an even closer approximation of real-flight conditions (Page, 2000, pp. 5–9). Flight-simulation tools can therefore be considered devices that exemplify the concept of simulating reality.

However, even before the Link Trainer, there were initiatives aimed at enriching entertainment; with cinematic experiences standing out in particular. Efforts to simulate different senses and enhance visual experiences for marketing films have contributed to advancements in cinema. Considering that Tom Gunning referred to the early era of cinema as the “cinema of attractions” (1986), these endeavors were not unexpected. In the early 20th century, film audiences were drawn to attractions designed to create the impression of being transported to places they had never been or could not otherwise experience. Among many examples of cinematic experiences, a notable one aimed at simulating reality was Cineorama.

Cineorama was a simulation of a hot air balloon ride, incorporating a spherical design with a screen composed of ten projectors. By expanding the visual field of a typical cinema experience, the immersive structure design of Cineorama provided audiences with 360° moving visuals as early as the year 1900 (Card, 1953). Efforts to enhance the visual experience focused on widening peripheral vision. A notable example was the 1950s Cinerama, which spanned nearly 150° of the human visual field

across three giant screens (Reeves, 1999). Cinerama, employing wide formats and 3D imagery and it was marketed as an immersive visual experience that immerses the viewer: “recreates as accurately as is possible what the eye actually sees, and the ear actually hears, by reproducing on film virtually the entire range of human vision and hearing” (Hefele, 1953). Similar efforts; Circarama, Totalrama, and, later IMAX in the 1970s, continued to offer wide formats for cinema (Mascia, 2020) and sought to simulate reality with high fidelity.

Some cinematic experiences, on the other hand, extended beyond visuals, incorporating olfactory elements to attract audiences to the theatres. For instance, AromaRama (1959) infused odor into the theatre. Another design, Smell-O-Vision, delivered scents to individual seats, while scratch-and-sniff cards such as Odorama (1981) provided synchronized odors with the images on the screen (Spence, 2020). While olfactory simulation gradually lost attention, they remained notable attempts at sensory simulation. A promotional phrase used for AromaRama illustrates both sensory realism and the topos of simulation of reality: “See it! Hear it! Smell it! Now you can actually smell the exotic and the rare aromas of the far east …” (Columbus Dispatch, 1960).

Whether appealing to the sense of smell or widening the field of vision, these alternative cinematic experiences were focused on showcasing the affordances of the technology they utilize. This is Cinerama (1952), the debut production of Cinerama, was a documentary featuring immersive scenes such as a water-skiing show, a roller coaster ride, and a boat trip in Venice. The scenes were filmed from a first-person perspective, creating a resemblance to VR images. Subsequent productions continued to tell stories that immersed audiences in experiences of landscapes and cityscapes. Through helicopter and wide-angle shots, these films exploited the potential of the widescreen format, with cinematography designed to immerse the audience in the photorealistic visuals.

Flight simulators were no different from Cineorama’s balloon ride in their use of mediated environments to provide audiences with a specific real-life experience. Given that the visual aspect is central to cinema, efforts naturally focused on enhancing it, while the exploration of olfactory senses represented another step in sensory simulation. The common thread across these efforts was the pursuit of sensory experiences designed to create a sense of “presence,” in line with the discursive framework of the topos of simulation of reality. However, of all the projects that emerged from the possibilities of film technology, Sensorama was by far the most ambitious.

4. 1960s: Sensory Stories

During the 1950s, Morton Heilig was striving for an art form designed to simulate all five senses. Heilig argued that consciousness is grounded in sensory information, which he regarded as fundamental to the experience of reality. According to him, in the earliest stages of human communication, people relied on words to share their experiences. Over time, however, the advent of machines enabled more advanced ways of imitating and conveying sensory information, thereby simulating an experience. In 1955, amid techniques such as 3D and widescreen and other attractions, Heilig conceptualized a machine designed to engage all the senses, which he described as “the cinema of the future.” In Heilig’s

vision, sight was not the only sense simulated in the cinema of the future. To achieve a more complete cinematic experience, he envisioned a multi-sensory experience as resembling “a magnetic tape with a separate track for each sense material” (Heilig, 1992/1955, p. 283). Heilig brought this vision to life with Sensorama, a project even more ambitious than the VR technologies of the 2010s.

Sensorama was a machine in which the audience sat, placing their head in a designated place. It featured 3D and peripheral vision, surrounding sound, and a system that produced breeze effects accompanied by scent emitting materials. The seat also delivered a haptic experience through vibrations (Heilig, 1962). The experiences offered by Sensorama were essentially simulations of particular situations. While Heilig aspired to create richer, more contextual, narrative-based experiences, the actual implementations remained limited to simple simulations such as riding a motorcycle or bicycle, taking a helicopter trip, or watching a belly dancer perform (Rheingold, 1991, p. 53).

With these experiences, Sensorama not only revisited the topos of simulation of reality but also offered a technical design that nearly made this vision achievable. Sensorama was not even the first device Heilig invented for creating immersive experiences. The Telesphere Mask, a personal use “stereoscopic television apparatus” (Heilig, 1960), can be considered an early precursor to today’s HMDs. Commenting on these innovations, Rheingold noted that although virtual reality had not yet been fully realized, Heilig’s visionary ideas pointed toward the field’s future direction. In their work on fully computer-generated environments, computer engineers were exploring this direction (1991, p. 46). Computer-based virtual environments were designed to simulate physical reality through digital means. Achieving the desired sense of photorealism in simulations was not possible with analog technologies. As the simulation of reality shifted to digital media, the trajectory began to advance alongside computer technologies.

5. 1960s and 1970s: Digital Spaces and Interaction

In pre-digital attempts to simulate reality, interactivity was not a central concern. With the advent of digital media, however, the simulation of reality topos became inseparable from interactivity. To continue along the trajectory of this study, it is necessary to address the concept of interaction, which has been used to define human–machine communication. The possibilities of simulating the physical world broaden when considered in relation to a medium that allows communication and feedback. In devices like VR, which aim to map physical actions into digital environments, this requires reproducing physical movements in the virtual world as closely as possible. In this context, Human–Computer Interaction (HCI) can be seen as a central strand in the trajectory of the topos of simulation of reality.

The concept of interaction gained attention with the arrival of computer technology, through endeavors directed at improving communication between humans and machines. The discipline of human–computer interaction (HCI) was established in the 1960s through work conducted in universities and corporate research labs. With the introduction of personal computers, the field turned its attention toward refining interfaces and input devices to enhance usability. Devices such as cursors and pointing devices, still common in today’s computers, were developed to support effective interaction between

humans and computers (Myers, 1998). To replicate real-world physical actions in virtual environments, researchers focused on designing new interaction modalities and interfaces, leading to the development of devices and interface designs such as VR headsets, controllers, and virtual hands. VR headsets are a key technology design that expanded the scope of interaction by tracking the head and body movements of the user through sensors.

One of the first efforts to recreate physical actions more realistically in digital environments occurred in 1965. Ivan Sutherland, a pioneer of head-tracking systems, made one of the earliest contributions to reality simulation in digital environments. Sutherland began with his concept of the "Ultimate Display," envisioned as a system that could deliver a sensory experience that achieves a fidelity that made it indistinguishable from real life. Sutherland stated that in the virtual world accessed through the Ultimate Display, a bullet could be as deadly and a chair as solid as in the real world. Despite the Ultimate Display being an unattainable imaginary, Sutherland held that computers, leveraging their memory potential, could one day turn this vision into reality (Sutherland, 1965). The head-mounted display invented by Sutherland (also known as the Sword of Damocles) was an important development in bringing sensory simulation into computer technology. Theoretically grounded, Sutherland's HMD embodied the topos of computers as instruments for simulating reality with high fidelity.

The main purpose of Sutherland's HMD, as he described, was to provide the user with a "perspective image." A "mechanical arm suspended from the ceiling" supported the ocular component of the system to track the user's head position and movements. As a result, the user was constrained to a specific area, able to move only three feet (Sutherland, 1968, pp. 758–762). Although the range of motion it provided to the user was limited, Sutherland's VR design laid the foundation for contemporary headsets. While the term "virtual reality" was not yet in use, the idea of producing reality within a digital environment was already evident. Experimental efforts like Sutherland's, realized through computer technology, are early instances of the simulation of the reality topos in digital environments.

6. 1980s: Virtual Reality

As digital technologies advanced, efforts to realize the vision provided by the topos of simulation of reality were continued by wide-field display designs. These developments took place in the field of virtual reality, which progressed alongside computer technology. In the 1960s, with the advent of integrated circuits, the microelectronics revolution began, and prices decreased. By 1977, minicomputers had evolved into personal computers and had become accessible to users. During the 1980s, user-friendly interface designs and hardware developments fueled rapid growth in the computer industry (Campbell-Kelly et al., 2014, pp. 189–251). Computer technology reached broader commercial availability and public accessibility, coinciding with the development of the first VR head-mounted displays, bearing a resemblance to modern designs.

These developments led companies to launch the first commercial efforts to sell VR equipment. In the 1980s, the development of marketable headsets began, driven by projects from NASA and private companies. NASA's VIVED, initially designed as a head-mounted display to deliver virtual environments,

developed into VIEW, an integrated system with tactile inputs, head-tracking, and stereoscopic imaging. By 1987, the project’s focus shifted toward designing low-cost, accessible HMDs, with a simple visual output to facilitate interaction (Fisher, 2016). However, photorealistic visuals alone were insufficient; to simulate a sense of presence, users needed to interact with the virtual environment. Enabling this interaction, the DataGlove, designed by Tom Zimmerman, became an essential part of VR systems.

While Thomas Zimmerman contributed to NASA projects with the DataGlove, he was also involved in VPL (Virtual Programming Languages) Research. Zimmerman, motivated by his enthusiasm, introduced the DataGlove to Jaron Lanier and colleagues, which led to the founding of VPL Research in 1984. With VPL Research, the role that personal narratives played in shaping the topos of simulation of reality becomes evident. In the 1980s, initiatives by VPL Research generated public enthusiasm for VR and helped shape a sociotechnical imaginary. The field became closely identified with the term “virtual reality,” largely due to Jaron Lanier’s frequent use of it.

VPL Research produced several devices, including the EyePhone, which ranged in price from $10,000 to $50,000 based on the model, and the DataGlove. They also introduced a virtual reality system, RB2 (Reality Built for Two), featuring a full-body DataSuit. Enthusiasts often repurposed the EyePhone and DataGlove, writing custom code to adapt the devices to their needs. Yet, the RB2 full-body suit was very expensive, resulting in sales mainly to private organizations for project-based applications. These high costs, alongside other issues within the company, eventually resulted in bankruptcy (Lanier, 2018, pp. 190–192).

VPL Research evolved through a marketing approach that emphasized simulating sensory experiences. When introducing the devices, Lanier stated: “by wearing computerized clothing right over your sense organs, you transport your sensory system into a reality that can be of any description” (Kinolibrary, 2017). However, technological developments in the 1980s were not sufficient to achieve a perfect simulation of reality. The vision to bring VR to life persisted despite limited display quality and refresh rates. Thus, while VPL Research’s products were among the first publicly available VR technologies, they remained largely confined to a niche audience of early adopters and technology enthusiasts, and the bankruptcy was inevitable.

Despite its short existence, VPL Research focused both on haptic technologies, a cornerstone of contemporary VR, and on creating systems that supported full-body immersion. As of 2025, these ambitious and costly goals remain unattainable for consumers, while VPL Research continues to be recognized as part of the trajectory of companies built around the topos of simulation of reality.

In the 1990s, it became clear that the topos of simulation of reality did not fully align with available technological affordances and was an overly ambitious endeavor. During this period, core technologies central to modern VR, including displays, processors, and graphics, were insufficient to present the intended level of quality. The available VR technology needed further development to meet anticipated expectations and realize the imaginaries of simulating reality. However, interestingly, the bankruptcy of VPL Research did not halt efforts in the VR field, and these technically demanding

imaginaries continued into the first half of the 1990s. Efforts in the 1990s gave rise to the first commercial wave of VR. VR had a brief period of popularity, appearing as an arcade-based attraction and a home console. This effort sought to benefit from the 1980s video game trend that equated photorealism with a higher-quality experience.

7. 1990s: The Surge of VR Gaming

Jonathan Waldern, the founder of W Industries (Virtuality Group) said that “In the beginning days, we thought a lot about how to get VR out to the general public -- and we decided arcade games were the easiest way to introduce the concept” (StrasselStaff, 1997). Waldern’s words clearly indicate that video games were strategically chosen to position VR as a consumer-oriented technology. Motivated by profit, Waldern aimed to popularize VR among consumers and to establish a market for it. These marketing endeavors drew on the simulation of reality topos.

Yet, in a short time, W industries, faced with financial limitations and had to partnered with an entertainment company to produce VR units called Virtuality. The 1000 CS, introduced in 1991 at around £32,000, set the stage for subsequent consumer VR models. However, its steep price made it impractical for home use, restricting it to a “location-based” entertainment. Designed to simulate multiple senses interactively, Virtuality systems were in the form of capsules or kiosks to enhance immersion (Krueger, 1991; Stone, 1993).

Although Virtuality had deployed 400 VR arcade games globally, the company went bankrupt in 1997 due to issues similar to those that affected VPL Research: rising costs and poor sales performance. Reporting on the bankruptcy, StrasselStaff said that VR “is not as good as the promoters that wanted investment says” (1997). This was a clear indication that the claims surrounding VR as a technology that can transport physical reality into virtual ones were still unmet. Though the topos of simulation of reality was being used for promotion, the technology was not sufficient to support it.

In the 1990s, alongside Virtuality’s efforts to produce arcade machines, attempts to make VR available for home use and make it more accessible repeatedly ended in failure. At a time when game consoles were on the rise, efforts were made to integrate VR into this emerging trend. The story of Virtual Boy, one of the most memorable devices of the era, is a good example of this. One of the marketing slogans for Virtual Boy was “three-dimensional high-resolution graphics so detailed and clear you’ll swear you can reach out and grab them.” (Nintendo, 1995). Judging by the graphics of the Virtual Boy, it is easy to see how exaggerated this claim was. The device had a short lifespan, with production discontinued in 1995.

In 1995, VR console initiatives progressed, Atari teamed up with Virtuality to create a headset for the Jaguar console (Horsman, 1995), while Philips and Takara also planned VR devices (Edge, 2013). Most, however, failed during design or promotion before reaching the market (Electronic Gaming Monthly, 1993, p. 56). While some designs never came to fruition, those that were produced quickly disappeared from the market due to low sales.

Successful models included VictorMaxx’s CyberMaxx, a headset relying on an external computer, designed with the understanding that standalone VR units could not support photorealistic graphics, and advertised for use with IBM computer systems. CyberMaxx offered games and also an experience called Ghost Train, which was a haunted mansion ride. Ghost Train exemplifies the simulation of reality topos built around the VR technology at the time: “A virtual reality amusement park ride, in which the headset wearer is fully immersed in a computer-generated haunted house.... A wonderful introduction to the State-of-the-Art tracking capabilities and 3D stereoscopic point of view of the Cybermaxx headset.” (Calculus, 1995, p. 42). The VFX1 Headgear, developed by Forte, was another prominent example. Featuring games like MechWarrior 2, it was advertised as "Bringing out fear, anger, aggression, and other animal instincts” (Forte, 1996). However, these devices, grounded in the simulation of reality topos and claiming to deliver photorealistic representations in virtual environments, were short-lived; due to high prices, they never became accessible to a wider audience in the 1990s.

According to Chesher, in the 1990s, VR emerged from the cultural periphery and generated excitement among the public. Promoted as a new frontier to be explored, it aimed to transform computing. Yet, the available software and hardware capabilities were unable to live up to these expectations (1994). In short, marketing an expensive technology that had yet to be fully realized, based on the promise of simulating reality, ended in failure. In the second half of the 1990s, the trajectory of the simulation of reality topos was temporarily disconnected from VR, only to resurface in the 2010s. In the meantime, the topos continued through video games during the 2000s.

8. 1990s–2000s: Video Games

From the late 1990s into the early 2000s are often remembered as a stagnant phase in the progress of VR technologies. Up to the 2010s, when Palmer Luckey developed a headset that raised hopes for a commercially viable home device, the simulation of reality topos and immersive technologies were no longer centered on VR. However, the value of experiences continued to be assessed in terms of how closely they simulated reality. In the 1990s, the rise of digital gaming, built around the simulation of reality topos, reshaped the entertainment industry. Game developers pushed photorealism through environment design and digital assets, while also making interactivity a defining feature of digital experiences. Advances in digital technologies led to the development of game engines and authoring tools, offering new methods and greater flexibility in game design. Over the course of two decades, advances in gaming hardware and software laid the groundwork for VR’s revival in the 2010s.

The interest in virtual reality during the 1980s and 1990s coincided with the golden age of arcade games and the emergence of home consoles. Since the early days of video gaming, there has been a clear pursuit of creating fully immersive 360° environments. However, as the digital game industry expanded, the pursuit of realistic experiences was legitimized through the adoption of cinematic techniques and narrative styles. Video games first appeared in research laboratories but reached the public in the 1970s with the growth of arcades. Games of these early years were simple, as graphics

were still in their infancy. Pong, for example, consisted of nothing more than a pixelated ball and two vertical bars as paddles. These stripped-down designs reflected the limited graphic technology of the time. However, with technological advancements, game design approaches started to incline towards realistic narratives, immersive environments, and the simulation of real-world experiences.

The development of circuit boards, processors, and graphics technology enabled smoother 3D environment rendering by the mid-1990s. The increased storage capacity of CDs and VCDs paved the way for a new era in gaming, while personal computers also grew in popularity. As Wardyga states, gaming grew into a profitable industry, shaped by genres and conventions like adventure games, puzzle games, real-time strategies, first-person shooters (FPS), and role-playing games (RPGs) (2023). At the heart of all these developments was the enduring goal of simulating reality and translating it into virtual environments.

Early efforts aimed to simulate lifelike spaces, characters, and objects. This trend saw a major development in 1993 with the release of Doom, which introduced the concept of the “game engine” (Lowood, 2016, pp. 203–208). Game engines are software platforms that streamlined automated tasks enhancing game mechanics, and simplified developers' work through the pre-made digital assets from libraries (Paul et al., 2012). Technological advances in hardware and software, including the advancements of game engines, enabled games to adopt a more photorealistic aesthetic. This vision of realism was realized through complex textures, nuanced lighting techniques, and visual elements designed to create a more “lifelike” appearance in virtual environments.

Cinema has long been seen as a more serious or respected form of popular culture compared with video games. This perception encouraged game developers to aim for a cinematic feel as a way of enhancing realism, a goal that continues to guide their work today. The cinematic approach in games has included attention to fine details such as lens flares and distortions, depth of field effects, camera placement, advanced color grading, and more. Developers have recreated effects such as raindrops on the screen, fisheye lenses, and nuances like flickers and scratches on celluloid, all aimed at enhancing the sense of realism conveyed (Brooker, 2009, pp. 125–127). These applications, borrowing the aesthetic language of tools designed to capture physical reality, are attempts to support the claim of realism in digital representations and reflect the simulation of reality topos.

These aesthetic choices, along with the software and hardware developed to implement them and the broader efforts to simulate reality in digital games, laid the groundwork for VR. In the 2010s, this foundation allowed VR to gain the momentum that it had not reached in the 1990s. Since the photorealistic aesthetic gained prominence in game development pipelines, game engines were designed accordingly. With these affordances, game engines have become one of the primary platforms for creating VR experiences. Thus, gaming and VR can be discussed as converging fields in the trajectory of the simulation of reality topos.

9. 2010s: VR Technology as an Empathy Machine

Any discussion of contemporary VR would be incomplete without reference to Oculus and its creator, Palmer Luckey. As Harley stated, before Luckey’s 2012 Oculus prototype, VR was not regarded as a technology that could reach a wide audience (2019, p. 1). While the VR field experienced a period of stagnation after the 1990s, there were still various experimental efforts. However, Palmer Luckey’s prototype was the closest to delivering on claims of photorealistic visuals and a wide field of view.

What continued the topos of simulating reality in the 2010s was a video game endeavor. The Oculus prototype was designed by a gaming enthusiast to enhance the gaming experience by making it more realistic. The prototype was demonstrated at a major industry event (E3) featuring a VR version of Doom 3, a popular video game developed by John Carmack (Gamereactor, 2012; Meta Quest, 2012). With the introduction of Oculus in 2012, VR captured attention, driven by the promise of enhanced realism in gaming. Technical advancements such as the use of controllers to enable user interaction and incorporate the sense of touch, the expansion of the visual field, and the use of spatial audio, were all integrated to heighten the sensory simulation.

Following the excitement generated by the Oculus prototype at an industry event, two months later, Palmer Luckey launched the “Oculus VR” Kickstarter campaign. Although the target was $250,000, the campaign raised nearly ten times that sum (Oculus, 2012). In 2014, Facebook (currently Meta) officially announced that it had acquired Oculus VR for $2 billion. Their stated intent was: “Facebook plans to extend Oculus’ existing advantage in gaming to new verticals, including communications, media and entertainment, education and other areas” (Meta, 2014). VR’s role as a medium for simulating reality quickly extended beyond video games into other fields. Meta’s entry into the VR market stimulated the industry, leading many tech companies, including Google, Samsung, HP, HTC, Sony, and Microsoft, to revive shelved projects or develop new prototypes.

In the 2010s, the simulation of reality topos was reflected in industry discourse, with VR being framed as an “empathy machine.” In 2012, before presenting the Oculus prototype at E3, Palmer Luckey used it as the platform to showcase the VR experience Hunger in L.A (2012). Hunger in L.A. is a six-minute VR experience that reenacts a news event. In the experience, the user finds themselves in a food bank line alongside people in need. At one point, a man collapses due to diabetic shock, causing panic in the crowd, and an ambulance is called. The experience is digitally reconstructed from authentic audio recordings to provide the most realistic experience possible. The reason Hunger in L.A. was showcased in VR via Oculus was its supposed affordance to enhance realism through 360° viewing and six degrees of freedom (6DoF), thereby strengthening the audience’s empathy with the event.

The link between virtual reality and empathy was strengthened with the advent of non-fiction 360° content, encompassing i-Docs, immersive journalism, and immersive documentaries. Beginning in the mid-2010s, virtual reality’s potential to foster empathy has been a central narrative in its marketing. VR came to be regarded as an "empathy machine," based on its affordance to immerse users in lifelike experiences that allowed them to "step into someone else’s shoes."

Building on this premise, during contemporary the early years of contemporary VR, 360° video has been actively utilized by many humanitarian aid initiatives and media organizations, including the BBC News, The Guardian, United Nations, New York Times, and Al Jazeera. Clouds Over Sidra (2015), a 360° video addressing refugee issues, was the most frequently discussed example. The project was co-produced by Chris Milk, who described VR as the "ultimate empathy machine" (TED, 2015). His statement sparked debates about the relation between VR and empathy.

Rose observes that VR's interactive capabilities have resulted in producers perceiving it as an "experiential" tool and reinforced the belief that it allows users to step into the experiences of others. Thus, immersion in the struggles and challenges faced by others via VR is considered capable of producing a unique empathetic response unmatched by any other medium. Many have argued that this form of compassion, rooted in empathetic understanding, is beneficial for addressing social and humanitarian challenges and is considered instrumental to society (2018).

At the core of the "empathy machine" narrative was the desire to place users directly within a simulated version of another person's sensory experience. With this, it is believed that another person's experience can be simulated as faithfully as possible. It is thought that the experiences of the person whose sensory perceptions are being simulated can be experienced by the VR user in the same manner. Through the "empathy machine" discourse, the simulation of reality topos aims not only to recreate physical reality but also to simulate and reconstruct unique experiences and personal lived moments.

The "empathy machine" approach, which remained superficial, later faced criticism, as this role was assigned to VR only to promote its adoption by a broader audience base, and it was only a revised version of the simulation of reality topos. Critics such as Nakamura have noted that the "empathy machine" discourse was largely an industry-driven rebranding effort, framing a game-oriented technology as a moral device (2020), and that any empathy it produced often amounted to a superficial sense of humanity and compassion (Kool, 2016). Although the "empathy machine" discourse declined after 2020, it was a version of the simulation of reality topos, making it a fitting final example to conclude the trajectory of this study.

Conclusion

Sociotechnical imaginaries shaped around a media topos frame a technology and influence how it is perceived by society. Within the framework of the simulation of reality topos, specific media forms and technologies have been assigned the role of presenting photorealistic visuals and translating the physical reality into virtual environments with high fidelity. This study examined VR technology as the latest stage in the trajectory of the specified topos. The primary aim, however, was to demonstrate that the simulation of reality topos is not an inherent affordance of the technology itself, but rather a discourse shaped by sociotechnical imaginaries. For this purpose, we traced the trajectory of the specified topos, showing that the preference for photorealistic visuals and experiences is not unique to VR.

Considering that the topos of simulating physical reality aims to convey the world in ways aligned with human perception, the trajectory it shapes can likewise be mapped around the simulation of the

senses. As shown in this study, when traced through eight distinct stages, the first stage in this trajectory can be identified as 19th-century panoramas and stereoscopic viewing devices. In the following decades, as cinema becomes a popular medium, attempts also emerge to incorporate the olfactory and haptic senses into the simulation of human perception. In the 1960s, Sensorama tries to simulate all five senses. During the same period, as digital technologies advances, efforts to simulate reality shifts into digital environments and the concept of interactivity gets integrated to the topos. Influenced by the advancing computer technologies of the 1980s, the topos of simulation of reality reaches the point where it first intersects with the concept of VR. Although these ambitions persist throughout the 1990s, the simulation of reality topos shifts its focus toward the growing video game industry since VR is not yet advanced enough to realize the ambitions it promised. VR remains mostly absent from the trajectory of the topos until the 2010s until when it experiences a resurgence aimed at elevating digital gaming. As the industry works to reach a broader audience, a new version of the simulation of reality topos gets introduced, with VR marketed as an “empathy machine.” The discourse today associates the topos of simulating reality with an ethical discourse and claims that the affordances of VR not only recreate physical reality but also allow users to experience the perspectives of others.

The eight-step trajectory outlined in this study shows that simulating physical reality is not an affordance exclusive to VR. It is a sociotechnical imaginary grounded in a discourse of reproduction and imitation within the context of media technologies. The assertion that a device can take people to places they cannot see, know, or be, reflecting the simulation of reality topos, positions certain technologies as tools for recreating physical reality. The simulation of reality topos is not new; historically, it has repeatedly shaped media imaginaries, demonstrating that the affordances attributed to technologies are socially constructed. Recognizing the patterns of a topos is important because it shows that the affordances ascribed to a technology should not be limited to a single function. Technologies serve a variety of purposes as the affordances are diverse. Viewing a technology like VR primarily through its affordance to simulate sensory experiences realistically is a limited perspective. VR is a technology with the potential to simulate reality and at the same time provide opportunities for expressive and creative experimentation. Highlighting the diversity of VR applications requires a research effort broad enough to be the focus of a separate study. This study has shown that the simulation of reality is a topos, observable over decades across different media, and that it is not imperative for technologies such as VR.

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