SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 11, No. 2, (2025), pp. 197-211
Open Access. Online & Print

DOI: 10.5281/zenodo.17316941

FROM PAINTED ILLUSIONS TO DIGITAL REALMS: QUADRATURA AND THE DIALECTICS OF VIRTUAL REALITY

Yunus Kaya[1*], Mustafa Kocalan[2], Tansel Türkdoğan[3]

[1]Kahraman Maras Sutcu Imam University (KSU), Faculty of Fine Arts, Painting Department, Türkiye. ORCID iD: https://orcid.org/0000-0002-3668-3320, Email: yunus.kaya@hbv.edu.tr
[2]Karabuk University, Safranbolu Fethi Toker Faculty of Fine Arts and Design, Graphic Design Department, Türkiye. ORCID iD: https://orcid.org/0000-0002-3091-2751, Email: mustafakocalan@gmail.com
[3]Hacı Bayram Veli University, Faculty of Fine Arts, Painting Department, Türkiye. ORCID iD: https://orcid.org/0000-0001-8805-8335, Email: tanselturkdogan@gmail.com

Received: 02/06/2025
Accepted: 11/09/2025

Corresponding Author: Yunus Kaya (yunus.kaya@hbv.edu.tr)

ABSTRACT

This study analyses the perceptual and phenomenological connection between traditional quadratura/trompe l'oeil techniques and modern Virtual Reality (VR) technologies using a comparative analytical method. The research examines how both strategies influence spatial perception and impact the viewer's or participant's experience through visual analysis, literature evaluation, and contextual interpretation. Research demonstrates that although quadratura and trompe l'oeil provide constrained illusions via static perspective mastery, virtual reality enhances these illusions by incorporating dynamic, interactive, and multisensory elements. While both disciplines seek to immerse audiences in alternative universes, they diverge markedly in their methods, breadth, and sensory engagement. The research examines three principal intersections: (1) the perceptual paradox between representation and reality, (2) technological mediation differentiating analogue and digital instruments, and (3) participant autonomy differentiating passive observation from interactive engagement. This project employs an interdisciplinary approach that integrates art history and new media philosophy, emphasising the potential of virtual reality to preserve ancient frescoes and enhance interactive teaching methods in art education. The study ultimately creates a discourse between historical and modern deception techniques, offering a theoretical foundation for comprehending the changing dynamics among reality, representation, and technology.

KEYWORDS: Trompe l'oeil, Quadratura, Quadraturistic-Trompe l'oeil, Virtual Reality, Art and Technology, Spatial Perception, Visual Perception, Baroque Illusion, Illusion, Reality.

1. INTRODUCTION

Art has consistently progressed from the past to the present, experiencing periodic alterations and transformations influenced by several sources. Artists, reacting to the evolving dynamics of their times, have devised novel techniques and discourses to amplify the influence of their creations. Contemporary technologies, especially sophisticated software and mobile applications, have afforded artists the opportunity to produce unique art forms. These technological innovations empower artists to expand the limits of visual representation, involve spectators in unprecedented roles, and investigate new perspectives.

This study seeks to examine the correlation between modern VR technology and classical methods such as trompe l'oeil and quadratura. Trompe l'oeil and quadratura, recognised as early techniques for producing visual illusions, correspond with Ma and Choi's claim that "Trompe l'oeil investigates the boundaries of reality, and VR does the same" (2007, p. 34). This paper analyses the integration of tradition and technology as a rejuvenation of conventional practices within the postmodern framework. Although trompe l'oeil and VR operate in different realms and utilise varied materials—especially when VR is examined independently of its artistic elements—both seek to investigate the limits of reality.

Oliver Grau's 2003 publication, Virtual Art: From Illusion to Immersion, provides a comprehensive historical survey of digital art and media, charting the evolution of virtual reality from Renaissance perspective to panoramas, stereoscopy, cinema, and digital technology. Although it underscores the historical evolution of immersive visual experiences, it addresses techniques such as trompe l'oeil and quadratura mostly as general instances within art history and media technology, lacking in-depth technical or phenomenological examination.

This study thoroughly examines the perceptual and phenomenological dimensions of quadratura and trompe l'oeil, offering a comparative comparison of these old illusion techniques and modern virtual reality experiences. This research differentiates itself from Grau's work by providing a more nuanced and creative analysis of the interaction and transformation between traditional and digital visual illusions through an examination of perception, participant participation, and technology mediation.

The study posits that the historical methods of trompe l'oeil and quadratura, intended to fabricate illusions and obscure spatial limits, exhibit parallels with modern VR technology. It asserts that both techniques, despite their distinct historical contexts and materials, share a unified objective of transcending the bounds of visual representation and examining the confines of reality.

This study examines the historical intersections, commonalities, and divergences of these strategies. This method emphasises the enduring discourse between historical and contemporary artistic practices by analysing and contrasting the similarities and contrasts between virtual reality and quadraturistic trompe l'oeil views. Furthermore, it examines the historical backdrop of simulation paintings, including anamorphosis, quadratura, and trompe l'oeil, which gained popularity in the 17th century. These strategies augmented perceived physical environments into conceptual domains, blurred spatial demarcations, and obscured the differentiation between tangible and altered components (Varoudis, 2014, p. 62).

This research integrates technology-driven artistic media, such as virtual reality, with conventional painting techniques, including trompe l'oeil and quadratura. It analyses the influence of modern VR in diverse sectors—entertainment, defence, healthcare, sports, education, and art—while also investigating the visual styles of quadraturistic-trompe l'oeil linked to the Baroque era. The study examines the similarities and differences between VR and traditional approaches through a literature review, artwork analysis, and comparative debate, emphasising their symbolic and representational dimensions. The methodology initially presents a historical review of quadraturistic-trompe l'oeil techniques, subsequently delineate the historical context and technical characteristics of VR technology, and finally examine and illustrate the artistic manipulations of these traditional and contemporary activities. This paradigm seeks to elucidate the convergence of innovation and tradition.

2. HISTORICAL BACKGROUND OF TROMPE L'OEIL AND QUADRATURA

Although the term trompe l'oeil appeared in the early 19th century, the technique itself dates back much earlier. In the 19th century, panoramic paintings, photography, and particularly stereophotography contributed to realistic illusions (Shanken, 2012, p. 166). Richard Leppert describes trompe l'oeil as a mimetic form extending to the beginnings of Western visual history, with its deceptive realism prompting the viewer to initially mistake the painting for reality (Leppert, 2009, p. 37-38).

Art historians trace its origins to Ancient Greece and Rome, with examples from the 4th century BC

such as the mosaic floors in Pompeii and Roman frescoes. One famous anecdote, attributed to Pliny the Elder, illustrates its early power. However, following the Roman Empire's fall, there is little evidence of trompe l'oeil in the Middle Ages (Schneider et al., 2007, p. 279; Krols, 2010, p. 5; Spiliotis, 2008, p. 21).

In early modern Europe, particularly during the Renaissance and Baroque periods, trompe l'oeil was adapted to serve religious and ideological aims. Grand ceiling and wall paintings in churches and elite residences were often intended to evoke spiritual transcendence. These works, particularly those integrating quadratura—a technique where architectural elements are extended or invented pictorially—blurred the boundaries between the earthly and the divine, reinforcing religious experience and doctrine. Quadratura painters played a key role in this transformation, expanding spatial illusions beyond mere decoration. Andrea Pozzo's fresco The Allegory of the Jesuit Mission in Rome's Sant'Ignazio Church exemplifies this (Image 1). Through precise mastery of perspective and spatial logic, Pozzo simulated a domed ceiling on a flat surface (Image 2), crafting a believable virtual space that integrates architecture, narrative, and religious iconography.

Figure 1: Andrea Pozzo, Allegory of the Missionary Work of the Jesuit Order, 1691-94, Ceiling fresco, Sant'Ignazio Church, Rome.

Figure 2: The illusionistic perspective of Andrea Pozzo's quadraturistic-trompe l'oeil dome in Sant'Ignazio, revealed when viewed from the opposite end, 1685

These visual illusions depend on essential creative principles perspective, depth, composition, and psychological influence to create persuasive results. Figures seem to hover, as architecture and imagery appear to coalesce. Such works frequently elicit the Sacred Gaze a culturally contextualised act of spiritual perception (Morgan, 2005, p. 2-3) in which the observer is both visually and emotionally enveloped in the illusion.

The Church probably adopted these visual tactics to reinforce its authority and convey theological messages. Trompe l'oeil, quadratura, and anamorphosis were influential techniques in moulding perception and belief. Pavel Florensky's concept of "perspective training as a taming process" (Florensky, 2007, p. 7) highlights this dynamic, however a more profound examination of this idea exceeds the parameters of this study.

Currently, modern artists including Gerhard Richter, Kyle Surges, Molly Springfield, Sharon Moody, JR, John Pugh, Richard Haas, Youri Mantra, and Ai Weiwei perpetuate the legacy by employing trompe l'oeil techniques in diverse media. Similar to their historical predecessors, these artists create immersive surfaces that captivate spectators with imaginary stories interwoven into actual environments evocative of virtual reality, yet realised through conventional mediums.

Immersion in trompe l'oeil necessitates scrupulous attention to perspective, drawing accuracy, illumination, hue, texture, and harmony with the surrounding environment. The approach facilitates a psychological change, which Janet Murray characterises as "immersion," comparable to submerging in water and entering an alternate realm (Murray, 2017, p. 99).

Trompe l'oeil creates depth and spatial reality on two-dimensional surfaces, inducing sensory deception that encourages emotional and cognitive involvement (Barrett, 2006, p. 48). It influences visual perception, directs the viewer's gaze (Harris, 2010, p. 75), and elicits immediate responses of astonishment or bewilderment (Williams, 2012, p. 58). The interaction between illusion and reality constitutes the core of trompe l'oeil's lasting influence.

3. VIRTUAL REALITY

The interplay between art and technology has experienced significant modifications over time. Panoramic paintings, originating in the 18th century, exemplify some of the earliest immersive experiences, designed to envelop the viewer's whole visual field and elicit a feeling of presence within the portrayed scene (Grau, 2003, p. 5).

Currently, Virtual Reality (VR) technology is widely utilised in various domains including aviation, military training, gaming, engineering, surgical simulation, psychiatric therapy, education, and social skills enhancement (Wong & Lee, 2024). Virtual Reality (VR) and Augmented Reality (AR) enable the dissemination of cultural knowledge via interactive, multidimensional experiences, hence improving the effectiveness and efficiency of learning processes (Siliutina et al., 2024).

As accessibility increases, modern visual artists investigate the formal and conceptual aspects of VR, broadening the experience limits of art (Lobwein & McKewen, 2024). The quest for immersive environments has a profound history: Myron Krueger's 1975 notion of "artificial reality" characterised virtual reality as a creative realm encompassing images, acoustic stimulation, and interactivity (Ma & Choi, 2007, p. 32). Notable milestones encompass Edwin Porter and William Waddell's 1915 red-green anaglyph experiments, with the emergence of 3D cinema in the 1950s, exemplified by Arch Oboler's Bwana Devil and productions from MGM, 20th Century Fox, and Warner Bros.

The concept of telepresence emerged with devices such as the Sensorama, which offered consumers immersive virtual experiences (Lau et al., 2013, p. 43). The 1970s experienced notable growth in virtual reality via interactive games and computer graphics, whereas the mid-1990s online revolution allowed for shared simulated environments that promoted collective involvement (Shanken, 2012, p. 43).

NASA was instrumental in the advancement of virtual reality technology beginning in the mid-1970s. At the Jet Propulsion Laboratory, David Em developed navigable virtual landscapes, while the Ames Research Centre created the Virtual Interactive Environment Workstation (VIEW), which includes head-mounted displays, tracking systems, interactive gloves, and a full-body 'DataSuit' for motion tracking—innovations essential for teleoperation and virtual interaction (Heater, 2023).

Virtual reality technologies provide immersive, multimodal artistic experiences that involve all human senses through digital platforms (Rodrigues et al., 2019). Interactive art corresponds with inherent cognitive and physical behaviours, converting viewers from passive spectators to engaged aesthetic players. Virtual reality and artificial intelligence-enhanced interactive art create a seamless and organic connection among the subject, object, and environment, facilitating deep aesthetic and emotional engagement (Shen & Yu, 2021).

Initial interactive art predominantly concentrated on technological experiments to tailor interaction protocols, prioritising form over participant experience and cognition. The advent of computer psychology in the 1980s, along with swift advancements in artificial neural networks, speech recognition, and machine vision, considerably propelled the development of artificial intelligence (Abbas et al., 2019).

Roger Fry contended that formal components like colour and shape produce visual allure, resulting in aesthetic enjoyment (Liu & Liu, 2022). Virtual reality technologies facilitate immersive, multisensory educational experiences by digitally recreating historical events and locations, encouraging active engagement and enhancing cognitive and emotional assimilation (Mulders et al., 2025).

Conventional perspective methods, particularly quadraturistic-trompe l'oeil, significantly improve spatial perception and cultivate historical empathy. Studies demonstrate that VR-based learning environments markedly enhance long-term information retention relative to traditional techniques. Trompe l'oeil apps provide interactive opportunities, enabling a seamless integration of subject, object, substance (paint), mathematical perspective, and spatial limits. Although people recognise the artificiality, this organised immersion facilitates emotional conveyance and aesthetic influence.

In virtual reality literature, "immersion" and "presence" are sometimes muddled although signify different concepts: immersion pertains to the degree to which users see themselves surrounded by the virtual environment, whilst presence relates to the experience of genuinely existing within it (Sherman & Craig, 2003). Elements including interactivity, embodiment, navigability, sense-ability, and create-ability are crucial for attaining elevated degrees of immersion (Dincelli & Yayla, 2022, p. 1).

Virtual reality comprises a wide range of technology systems (Rauschnabel et al., 2022). Head-Mounted Displays (HMDs) offer immersive three-dimensional environments featuring expansive stereoscopic imagery and aural feedback. Head movement tracking augments sensory realism, intensifying users' perception of physical presence in virtual surroundings (Zeng & Richardson, 2016; Or et al., 2022).

High fidelity Virtual reality design necessitates the conceptualisation of all components to completely immerse users, hence generating cohesive simulations that elicit a sense of presence. NASA's VIEW project, conducted over thirty years

ago, provides significant insights for intuitive virtual interaction (Menck et al., 2023, p. 13). Virtual reality environments are classified into partial, full, and shared immersion models. Partial immersion employs virtual visuals while preserving a connection to the real world; full immersion entirely envelops users in virtual environments. Non-immersive VR, utilising conventional input devices such keyboards and mouse, parallels trompe l'oeil and anamorphic artworks that distort the perception of actual and virtual environments (Süar, 2016, p. 125; Menck et al., 2023, p. 3).

Figure 3: NASA VIEWlab Documentation Project, 1988.

VR aims to simulate real environments as authentically as possible by engaging multiple senses. Initially designed for information engagement, VR now supports modeling, problem-solving, entertainment, and experiential learning. Sherman and Craig identify four foundational elements of VR: virtual world, immersion, sensory feedback, and interactivity. These interactive simulations detect participant actions and provide sensory feedback to foster mental immersion or presence (Sherman & Craig, 2003, p. 13). The technology is characterized by interactivity, immersion, immediacy, involvement, and presence (Ryan, 2015). Simulations immerse users in environments that simulate physical presence via computational processes (Lampropoulos et al., 2020).

Realism in VR is achieved through multisensory information—including visual effects such as color, form, and depth illusions—and sound. The environment integrates these senses to position users at the experiential center. Scene changes correspond to user movements to maintain immersion (Ng, 2021, p. 115). Appropriate sound use and immersive sensory integration are crucial for convincing simulation (Murray, 2020; Ng, 2021).

As VR technology advances, it reduces or integrates external stimuli to enhance immersion, enabling cognitive engagement with simulated worlds—whether real, imaginary, symbolic, or realistic. Artists naturally develop novel artistic grammars through VR. For instance, Estella Tse, Anna Zhilyaeva, and Jonathan Yeo employ AR and VR to blend virtual and real spaces, creating sculptural works viewable and manipulable from multiple angles (Albrezzi, 2019, p. 147). Zhilyaeva introduces 'volumetricism' to characterize her virtual works.

Figure 4: Anna Zhilyaeva, VR 3D Portraits.

Jonathan Yeo extends this concept by translating virtual volumetricism into tangible forms, creating physically touchable volumes and masses. For example, Yeo's portrait, created in VR, is transformed into a tangible bronze bust through 3D printing and expert collaboration (see Image 5 a, b). This marks the world's first sculptural self-portrait designed by hand in VR and cast in bronze. Such advancements enhance the realism of VR by appealing to multiple senses.

Figure 5 (a): Jonathan Yeo, Homage to Paolozzi (Self Portrait), bronze.

Figure 5: (b): Jonathan Yeo, Homage to Paolozzi (Self Portrait), bronze.

In conclusion, virtual reality substitutes authentic locations with synthetic ones, utilising compelling illusions to enhance the interaction between the observer and the artwork. The immersive experiences of VR enhance the perception of existence in virtual environments, revolutionising the consumption of art. By merging the domains of art and technology, virtual reality facilitates the development of immersive, interactive environments that captivate users both physically and intellectually. Thus, VR transforms artistic expression and audience involvement, providing unparalleled chances for inquiry and connection. It therefore appears as both a technological advancement and a transformational creative instrument.

4. THE RELATIONSHIP BETWEEN TROMPE L'OEIL, QUADRATURA, AND VIRTUAL REALITY

Contemporary technology enables the integration of digitally produced information into physical space, altering and transforming the visual boundaries of architecture. This technological advancement manipulates how we interact with our surroundings and reshapes our perception, profoundly influencing the viewer's imagination by creating a manipulated space. However, the manipulation of spatial and architectural environments is not a phenomenon exclusive to digital technology. Historical techniques, such as those developed by Ibn al-Haytham (known as Alhazen in the West) in the late 10th century, were further refined during the European Renaissance and utilized in Baroque period perspective theories, particularly in quadratura, anamorphosis, and trompe-l'oeil painting. These techniques have a long-standing tradition.

Sybille Ebert-Schifferer (2002, p. 22) draws a parallel between VR and quadraturistic-trompe l'oeil, noting that architectural trompe l'oeil creates an illusion where the viewer seems to step into an infinite void behind the painting's plane. She suggests that this illusion is comparable to VR. The connection between trompe l'oeil/quadratura and VR lies in their shared ability to manipulate and transform the viewer's perception of space. Trompe l'oeil aims to convince viewers of a three-dimensional reality represented in two dimensions, reducing the distance between the painting and the viewer through elements that create a relief or sculpture-like effect. Imagining the viewer within the painting's space pushes this concept to the extreme, though fitting a three-dimensional object into a flat surface is inherently impossible. Nonetheless, just as VR convinces viewers of their presence in a virtual space, quadraturistic-trompe l'oeil achieves a similar effect.

Virtual games or deceptions that overlay multiple layers in architectural space, enhancing rather than neutralizing each other, are akin to the fiction, icons, and imagery in quadraturistic-trompe l'oeil paintings. Thus, quadraturistic-trompe l'oeil is similar to the illusions created by semi-transparent layers in virtual technologies. Both techniques evoke complex psychology and perceptual illusions despite the absence of a truly voluminous object. In VR, the individual understands that a machine ultimately controls the experience and creates their own imaginary world. In quadraturistic-trompe l'oeil, the viewer recognizes the painting's presence in an architectural context. These illusions can be described as 'conscious' or 'deliberate' deceptions. The impact of such simulations on individuals is significant.

A contemporary example is Fornix (see https://www.fornixvr.com/), a Norwegian startup focusing on using VR technology to treat phobias. Their programs address various fears, including acrophobia (heights), arachnophobia (spiders), astraphobia (thunder and lightning), odontophobia (dentistry), and trypanophobia (blood or needles) (Digitaltalks, 2022). This application of VR highlights its power in creating controlled, immersive experiences that can influence and potentially transform the viewer's perception and psychological responses. The technology developed to help patients overcome their fears also systematically manipulates their perceptions of reality and transforms their worldview. This bears a dramatic resemblance to the perception psychology that churches in Western Europe aimed to create through quadraturistic-trompe l'oeil paintings on their walls and ceilings, intending to minimize (or eliminate) tension related to death or fears of the afterlife.

In "The Future of Virtual Environments: The Development of Virtual Technology," Hiu-fai Lau, Kung-wong Lau, and Chi-wai Kan analyze the historical context of virtual technology development

and discuss its future. They note that the desire to maintain a sense of presence in a simulated environment has existed long before, explaining this as an embodied experience of presence in trompe-l'oeil (2013, p. 43). This evaluation presents an important perspective that aligns with the subject and dialectics of this research.

Furthermore, the "Characteristics of Virtual Reality" table extensively discussed in the book The Virtual by Rob Shields, a Professor of Sociology and Anthropology at Carleton University in Canada, provides a clear understanding of the relationship (see Figure 1). Beyond the technological screen or artistic window separating the virtual from the real, VR and quadraturistic-trompe l'oeil share similar qualities. However, this comparison should be contextualized within the variability of their 'newness' and 'oldness,' as well as the materials they utilize. Like VR, quadraturistic-trompe l'oeil aims to depict three-dimensional objects and replace reality with a convincing illusion, prioritizing the deception of the eye. It is rooted in the relational qualities between the representational realism of VR and the materiality of physical reality. These two concepts should not be seen as mutually exclusive alternatives; rather, they manifest through different materials and forms.

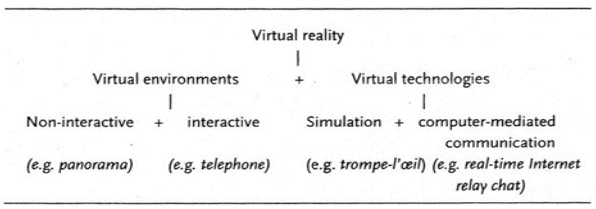

Figure 6: Classification of Virtual Reality Based on Environment and Technology.

The deception of quadraturistic trompe l'oeil mimics the illusion of gazing through a window, accomplished by merging physical reality with the domain of illusion. Comprehending the link between the actual and the virtual enhances the concept of the 'window.' In VR, virtuality manifests through a 'window' into reality, including screens, wearable technologies, goggles, and lenses. The greater the success of a window in concealing or integrating deceptive architecture inside physical architecture, the more effective the trompe l'oeil is. A painting that convincingly represents architectural forms or substitutes for a genuine structure elicits greater admiration and curiosity. Consequently, virtual space is not in opposition to reality; instead, it reveals the presence of an alternative set of rules and a distinct system, validated by an interface and a boundary between the real and the virtual. In the painted space, it is depicted through the false realism of quadratura, whereas in our simulation, it is manifested by a frame, such as a monitor or any screen, that delineates reality from digital perception. We are confronted with a basic inquiry: If the image is framed, does the actual world likewise become framed to accommodate the virtual realm?... Generally, the frame can be perceived in two manners: as an iconic interface and boundary between the real and the virtual, or as a technological apparatus for display and interaction" (Pascariello, n.d.).

In this paradigm, reality is produced with significant focus on the parallelism between the observer's process of transcending the frame in the presence of quadraturistic trompe l'oeil and the analogous process occurring in the virtual environment. The context in which these two distinct processes converge is same. Both instances encompass a virtual environment, despite their disparate temporal origins and distinct techniques of creation. One is the outcome of a meticulously executed quadratura representation technique, and the other is generated using real-time visuals and technologies. In both instances, the observer cognitively acknowledges the virtual realm but responds perceptually and reflectively (Pascariello, n.d.).

Video maker Chris Milk regarded VR technology as a means for individuals to cultivate empathy, describing it as the 'ultimate empathy machine'. Milk contended that in these experiences, the frame functions solely as a window; all media, including television and cinema, serve as instruments that provide access to alternate realms, essentially acting as windows. He expressed: "I do not desire your presence within the frame, nor in the window; I wish for you to be beyond the window, on the opposite side of the world" (Ng, 2021, p. 146). Milk's viewpoint corresponds with the fundamental nature of VR, akin to gazing through windows that lead to alternate realms, reminiscent of the trompe-l'oeil artworks on 19th-century ceilings (see to Images 1, 2, & 9).

The skyward windows designed by quadraturists like Pozzo, Giovanni Battista Gaulli (Baciccio), Allegri, Cristoforo Casolani, and Pietro da Cortona have been nearly replicated through the projection of images depicting space, the sky, and astronomy onto planetarium domes using projection technologies in the 20th century. Despite differing intended aims, in terms of methodology, technique, and the roles assigned to spectators, they might be seen as digital counterparts to the paintings on church ceilings, facilitated by contemporary technologies. The historical context of the fulldome encompasses architectural techniques that integrate mythical,

religious, theological, astronomical, and astrological components in the creation of dome-shaped edifices representing enlightenment (Phillips, 2024, p. 113). These structures have integrated the notion of windows that open to the skies, depicted through simulated representations crafted by quadraturists, into the domain of art. The fulldome is an immersive setting in which diverse truths can coalesce effortlessly (Phillips, 2024, p. 115).

Julieta Aguilera, Assistant Director of the Space Visualisation Laboratory at Adler Planetarium and faculty at the Creative Media Academy at the University of Hawaii, elucidates this relationship; early planetarium presentations were shaped by cinematic media, whereas contemporary shows are influenced by mobile and gaming technologies. This immersive media is distinct from film media, seeking to evoke the natural world through our individual perspectives. Historically, murals facilitated absorption within a static image; however, contemporary technology such as huge screens, planetariums, and Oculus headsets now give similar experience. Dioramas and stereo viewers historically provide visual depth, whereas contemporary computer graphics employ several visual cues to augment this depth, regardless of the use of stereoscopy. Historically, planetarium presenters manipulated the celestial sphere to highlight constellations; presently, we navigate effortlessly using avatars. Optical illusions and static perspective drawings were historically employed to replicate paintings as portals to three-dimensional spaces, but contemporary advancements include diverse motion tracking technology (Aguilera, 2016, p. 30).

The Ars Electronica Centre provides an immersive Deep Space 8K experience, characterised by 8K quality and stereo 3D, comprising projections on a 16 by 9 metre wall and floor. This configuration enables visitors to engage with gigapixel photos, videos, films, and 3D animations in exceptional clarity. The Ars Electronica Festival seeks to further artistic expression and scientific discourse by merging art, science, and technology using fulldome projections. The festival offers spectators immersive artistic experiences that transcend conventional media (ed. Stocker & Jandl, 2022).

Examining Correggio's fresco "Assumption of the Virgin" on the ceiling within the classical quadraturistic-trompe l'oeil painting tradition, the intentional organisation of spatial components to create a lifelike effect invites parallels with modern settings produced through VR and fulldome technologies. The core area, appearing to extend into adjacent rooms and the sky via balconies inhabited by individuals and celestial formations, generates visual alterations akin to dynamic scene transitions in virtual reality. The apostles surrounding the Virgin Mary's ascension into heaven, amidst layers of angelic clouds, saints, and patriarchs, underscore a sensation of weightlessness augmented by depth and lighting effects reminiscent of those found in virtual reality situations. The manner in which figures seem to encroach into the viewer's space exemplifies the interactive and immersive attributes inherent to VR experiences. This foreshortening technique, prominent in its time, exemplified the methods of Italian Baroque artists focused on illusionistic ceilings, marking an early use of perspective and depth that parallels modern VR techniques (see Image 9). Currently, technical innovations enable fulldome VR applications to provide dynamic and interactive experiences, exceeding the static illusions of trompe l'oeil. Real-time interactions are facilitated by projections that respond to users' motions or alterations in surrounding variables (see to Images 6, 7, and 8). These technologies seek to develop a space simulation that optimally utilises authentic visual data to attain a realistic experience.

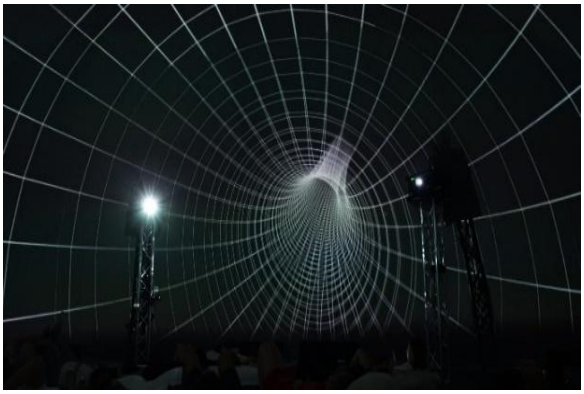

Figure 7*: *Future Room and Liminal Spaces (re-edited) 360˚ film screening – In Kepler's Gardens

Figure 8: Music: Geir Jenssen/Biosphere.no; Visuals: Dan Gregor, Dalibor Cée/Initi.org; Production: Josef Sedloň/Radio 1; Prague's Planetarium, 2022

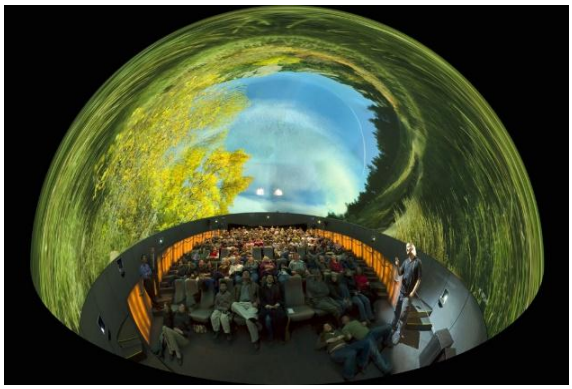

Figure 9: xRez Studio, Crossing Worlds, 2010.

Figure 10: Antonio Allegri da Correggio, Assumption of the Virgin, 1526-30, Fresco painting on ceiling, Parma Cathedral, Parma

Despite observers recognising the artwork as a painting, the artist's perceptual manipulation renders the two-dimensional surface to seem three-dimensional. Skilfully utilising this approach creates a perception of depth and realism in the viewer's mind, allowing them to feel as though they are inside the painting or in front of an authentic object. This intentional deceit can result in a transient, illusory, perceptual, and cognitive disconnection, obscuring the distinction between fantasy or fiction and reality.

Planetariums utilise sophisticated technical instruments instead of conventional means for their presentations; nonetheless, in both applications, the confines of physical space dissipate when observed through the viewer's perspective, obscuring reality. The oeuvre of Spanish artist Pablo Valbuena exemplifies this dichotomy by integrating the real and the virtual. Valbuena emphasises the notions of space, time, depth, and perception by manipulating light, so transporting the viewer's awareness to a virtual spatial depth. In his creations, the viewer's intellect serves as a conduit between these two realms. He employs position tracking, stereoscopic digital video, illumination, and projection to convert the physical environment of current rooms into a semi-virtual and simulated new one. In his piece entitled Quadratura, he generates an illusion of virtual space by the manipulation of light (see Image 10). Valbuena characterises his "Quadratura" as a convergence of art, design, architecture, and philosophy, navigating the delicate boundary between the virtual and the tangible (Hughes, 2011, p. 50).

Valbuena's creations have a remarkable similarity to Baroque trompe l'oeil techniques. Light serves as a conduit, guiding the viewers' gaze and emphasising what is significant. Through this window, light and shadow metamorphose into an enchanting and ephemeral utopia, oscillating between substance and emptiness, virtuality and actuality. The significance of Valbuena's "Quadratura" necessitates the viewer's presence; engagement is imperative. Consequently, the spectator is perpetually integrated into the artwork, necessitating the artist's consideration of the audience at each phase. The viewer is not only a spectator but the catalyst for the interchange, an actor who is both affected and affecting. The artist refrains from imposing their viewpoint and authentically occupies the position of the observer. The thing persists as a representation, a simulacrum. The virtual item is a translucent entity that serves as a simulacrum of the original piece, facilitating interaction akin to holograms.

Figure 11: Pablo Valbuena, Quadratura, Video Installation on Architecture, Site-specific Installation, Matadero/Madrid, 2010

Hans Belting's description of quadraturistic-trompe l'oeil combines the coordination of the artist, viewer, space, and event in the same perspective. According to Belting (2017, p. 142), by using all elements of visual perception, the artist can symbolically introduce visual rays into the floors, columns, or beams of a structure and transform them into fundamental components of the created representation. Thus, the artist aims to simulate the viewer who seeks or discovers the paths that light travels between objects and the eye, once again emphasizing a central gaze.

Similarly, artists such as Robert Irwin, James Turrell, and Nils Nova aim to blur the line between reality and unreality while utilizing contemporary technologies. For instance, Nova's work "Después y Antes" creates a sense of continuity and illusion through a site-specific mirror simulation using photographs of spaces from different angles, thereby transporting the viewer's perception of space to a different dimension (see Image 11).

Figure 12: Nils Nova, Después y Antes, Digital print on wall-mounted wallpaper, 600 x 630 cm & 500 cm x 670 cm, Installation, Venice Biennale, 2009.

"Después y Antes" signifies the relationship between the actual and the perceived, the observer's journey through the frame, and the perspective from a window, figuratively illustrating the dialectic between quadraturistic trompe l'oeil and virtual reality. The distinction lies in the fact that when an individual is physically immersed in a VR environment, as opposed to observing a trompe l'oeil artwork, they are not confronted with a static image derived from a singular, limited perspective. Dynamic simulation and software enable real-time calculations of architectural perspectives, geometric forms, and light direction based on the viewer's selected movement. This viewpoint presents an exceptional opportunity to transcend the singular, limited perspective offered by a painted or digital medium.

This application exemplifies a modified instance of photographic trompe l'oeil in the digital domain, establishing a genuine dialectic between distance and intimacy, as well as absence and presence. This may also evolve into a fundamental contradictory issue that influences the observer's relationship with their environment, aesthetics, and socio-political dimensions. Architectural components are adorned with a digital print, integrating them into the contemporary perspective while referencing the traditional trompe l'oeil technique. The viewer can navigate between the two spaces without requiring any wearable VR equipment, as though immersed in a virtual environment. Ultimately, both entail an exchange between diverse simulations generated on planes and surfaces in physical space, as well as cosmic realms and simulations derived exclusively from virtual images.

Figure 13: Specially designed multi-screen/projector VR example (CAVE -Automatic Virtual Environment- VR technology).

The viewer's role is essential in defining the connection between actual space and imaginary space. In this context, inherent distinctions exist among the methodologies, techniques, mediums, and technologies employed in quadraturistic trompe l'oeil paintings and virtual reality technologies; these distinctions result in variations in the realities produced by simulations. Ma and Choi (2007, p. 34) contend that trompe l'oeil and virtual reality similarly investigate the limits of reality, necessitating the active engagement and interaction of the observer. In this context, the viewer is not a passive observer but an essential and analytical component of the experience, actively participating in and uncovering the process. Both types of projection encompass numerous rhetorical characteristics, as well as similarities and distinctions. The shared and distinguishing qualities can be summarised in the table below. Certainly, these similarities might be elaborated upon; nonetheless, the table is significant for enhancing comprehension of the topic and offering a fundamental framework.

Figure 2. Comparative Analysis of VR and Quadratura/Trompe l'oeil (quadraturistic-trompe l'oeil)

Table 1: Comparative Analysis of Virtual Reality and Quadraturistic Trompe l'oeil as Illusion Techniques.

Criterion	Virtual Reality (VR)	Quadraturistic Trompe l'oeil
Technique	- Digital simulation, real-time rendering- 3D modeling, artificial intelligence, motion tracking- Dynamic perspective (changes based on user movement)	- Manual craftsmanship based on perspective rules- Fixed viewpoint- Anamorphic distortion techniques
Materials Used	- HMDs (Oculus, HTC), motion sensors- Software like Unity, Unreal Engine- Stereoscopic imagery and haptic devices	- Canvas, fresco, oil paint, gold leaf- Wall and ceiling surfaces- Integration with architectural elements
Type of Illusion Created	- Full sense of presence in a virtual environment- Multisensory deception (sight, sound, touch)- Interactive and variable scenarios	- Illusion of 3D depth on 2D surfaces- Static yet theatrical storytelling- Optical tricks that alter architectural perception
Immersion	- Full immersion (100% visual coverage)- Isolation from real-world environment- Navigation and orientation through user movement	- Mental/emotional immersion- Physically limited but psychologically expansive- Perceived from a fixed viewpoint
Effect on Viewer	- Active participation, ability to manipulate surroundings- Triggers physiological and emotional responses- Cognitive dissonance between virtual and real	- Passive observation from a static position- Momentary astonishment and trance-like state- Sensory illusion leading to aesthetic awe
Perception and Reality	- Digitally alters or reconstructs reality- Perceptual play based on technology	- Creates fiction within physical reality- Perceptual tricks achieved through traditional techniques
Artist–Viewer Relationship	- Viewer is interactive and shapes the experience- Artist constructs the system for engagement	- Viewer is an observer and interpreter- Artist directs perception through space and symbolism
Historical Context	- Product of the 20th–21st century- Originated in military, medical, and entertainment fields	- Developed during the Renaissance & Baroque periods- Used as a tool for church/aristocratic propaganda
Limitations	- High hardware costs- Requires technical expertise and software knowledge	- Can only be viewed optimally from a single angle- Dependent on physical architectural space
Examples	- NASA's VIEW Lab, Oculus Rift, VR CAVE systems- Pablo Valbuena's light installations	- Andrea Pozzo's frescoes in Sant'Ignazio Church- Correggio's Assumption of the Virgin
Shared Purposes	- Transports the viewer beyond reality- Constructs an alternative perception of reality	- Pushes the viewer beyond physical spatial limits- Proposes a new perceptual order
Tools and Methods	- Digital technologies and software-based production	- Manual artistry and optical techniques
Mode of Interaction	- Interaction through physical movement and system input- Real-time adaptability and variation	- Mental and symbolic interaction- Static but powerful illusion
Sensory Layer	- Engages sight, hearing, and touch	- Focused on visual perception and psychological impact

Key Contrasts:

1. **Temporality:** VR provides dynamic, mutable environments whereas quadratura offers static pictorial illusions
2. **Accessibility:** VR requires specialized equipment while quadratura presents universally visible artworks
3. **Artistic Control:** VR enables user-determined viewpoints while quadratura maintains artist-controlled perspectives

In conclusion, while there are many similarities between these two approaches, each also possesses its own unique characteristics. These distinct features naturally arise from the historical contexts, materials used, and environments associated with each approach.

4. CONCLUSION

Throughout art history, several artistic methods have contested perceptual limits by immersing audiences in imaginary or utopian realms. This study does a comparative investigation of traditional trompe l'oeil, particularly quadraturistic trompe l'oeil, and modern virtual reality technologies. It analyses their technical implementations, perceptual manipulations, philosophical foundations, and the dynamics of participant involvement. This research clarifies the phenomenological relationships between these two paradigms using a systematic approach that integrates artwork analysis, visual investigation, and an extensive literature review. Ultimately, it presents a theoretical and methodological framework for comprehending the transformation of reality perception across diverse artistic genres.

Within this paradigm, quadraturistic trompe l'oeil and virtual reality both focus on examining the boundaries of reality. The trompe l'oeil illusion frequently induces perceptual problems in viewers concerning whether they are witnessing a mere depiction or an extension of physical reality. Likewise, VR methods aim to envelop people in virtual environments that surpass the tangible physical realm. Both methodologies participate in the paradoxical endeavour of obscuring the distinctions between representation and tangible reality, with the objective of transcending individuals' quotidian perceptual experiences.

Historically, the invention and acceptance of perspective techniques captivated individuals, who willingly permitted themselves to be misled by these visual illusions. Computer-generated virtuality markedly varies by engaging not just visual perception but also many sense modalities, thus producing a multidimensional sensory experience. Therefore, it would be simplistic to regard quadraturistic-trompe l'oeil merely as a resurrected or digitally augmented variant. Although modern VR technology facilitate the development of very realistic and interactive virtual environments, the primary aim remains unchanged across all mediums: to mislead the observer and foster a credible sensation of immersion within a fabricated space or narrative. Since virtuality is founded on reality, the distinction between virtual and real diminishes; virtual environments are constructed in relation to and in harmony with real-world factors. However, VR uniquely enables users to enter, engage with, and experience these realms in ways that beyond natural physical constraints, eliciting remarkable sensations.

Illusion is inherent to both trompe l'oeil and virtual reality. The influence of the artwork relies not only on its technical and material attributes but also substantially on the viewer's active participation. Consequently, the viewer plays an essential role in the evolution and maintenance of the virtual environment. In quadraturistic-trompe l'oeil, the artist employs physical technologies and spatial manipulation to completely immerse the viewer, generating the illusion of narrative and iconography within physical space. The observer's mind is misled in a virtual environment, where the liberty of movement and physical confinement to sensory signals coexist. In virtual reality, this illusion is enhanced by immersive surroundings that engage physical movement and sensory perception. Significantly, in both instances, the audience engages consciously and voluntarily; their aspiration to immerse themselves in the fictional narrative converts the illusion into an actualised utopian experience, whether generated through conventional methods or sophisticated technology.

The essential difference between the two modalities resides in the perception of simulated experiences or virtuality and the level of immersion they provide. Quadraturistic-trompe l'oeil functions within the realm of analogue visuals, whereas virtual reality relies on digital imaging and the technological capabilities of its gear and software. Furthermore, the objectives underlying the generation of realistic visuals in VR are varied, including not only aesthetic illusion but also interactive and multisensory involvement. The immersive potential of VR technologies exceeds that of traditional trompe l'oeil by simultaneously engaging several senses. Consequently, while many similarities are present between these two systems, each possesses distinct traits influenced by the technological, cultural, and contextual factors of its era and application domain.

This study does not claim that trompe l'oeil and VR have comparable powers in creating illusions or virtual experiences for their audiences. Similarly, a person with acrophobia might encounter varying degrees of anxiety and apprehension while positioned at the brink of a 10-meter cliff compared to a 100-meter cliff. However, this does not diminish the idea that VR is inspired by traditional trompe l'oeil techniques and creates similar perceptual illusions. In all situations, the perceived illusion is influenced by environmental elements, including spatial distance, air conditions, aural stimuli, and time of exposure, as well as the proficiency of the artist or technology. Moreover, individual viewer elements, such as the readiness and ability to suspend disbelief, psychological condition, focus, life experiences, beliefs, and socio-cultural background, significantly affect perception. These elements collectively provide a dynamic and dialogical atmosphere between the experiencer and the artistic system, whether traditional or digital.

Traditional quadraturistic trompe l'oeil paintings primarily stimulate visual perception and do not directly engage other sensory modalities. Nonetheless, by employing spatial and optical illusions combined with theatrical storylines rooted in ritual, myth, and religious motifs, they can generate atmospheres that are authentic, evocative, and vibrant. Conversely, VR surpasses visual and perceptual immersion by creating multidimensional sensory environments that necessitate active user engagement. Virtual reality environments immerse users in technology realms that defy the conventional limits of reality, virtuality, time, and space. In this regard, VR transcends the superficial persuasive aesthetics of trompe l'oeil and transforms into a complex, interpretive framework that broadens the potential for immersive experience.

This work enhances current theoretical discourse around the sense of reality and spatial manipulation in the realm of digital aesthetics. By emphasising methodological and conceptual similarities between conventional illusion techniques and VR technology, it unveils new interpretative opportunities in the realm of digital art. This synthesis enables the archiving, reconstruction, technological adaption, and intergenerational transfer of decaying historical

frescoes and architectural illusions. In art education, the interactive and immersive features of VR provide unique teaching methods for perspective techniques that represent the integration of art and technology during the Renaissance and Baroque eras.

This study establishes a theoretical and comparative connection between traditional aesthetic strategies in art history and two illusionistic practices—one analogue and the other digital—addressing a significant gap in scholarship and proposing a new interdisciplinary research framework. This dual analysis of premodern visual approaches and contemporary digital immersion connects historical artistic practices with developing technology, emphasising their shared significance for present artistic discourse and conservation methods.

REFERENCES

Abbas, A., Choi, M., Seo, J., Cha, S. H., & Li, H. (2019). Effectiveness of immersive virtual reality-based communication for construction projects. KSCE Journal of Civil Engineering, 23(12), 4972–4983. https://doi.org/10.1007/s12205-019-0898-0.

Aguilera J (2016) Planetariums in the era of VR, Planetarian, 45(1), 30-33, (Presented at the Great Lakes Planetarium Association Conference, October 14-17, 2015, in Grand Rapids, Michigan, USA).

Albrezzi F (2019) Virtual Actualities: Technology, Museums, and Immersion, A Dissertation Submitted in Partial Satisfaction of the Requirements for the Degree Doctor of Philosophy in Culture and Performance, University of California, Los Angeles.

Barrett T (2006) Criticizing Art: Understanding the Contemporary (3rd ed.). McGraw-Hill Education: New York.

Belting H (2017) Floransa ve Bağdat: Doğu'da ve Batı'da Bakışın Tarihi, translator: Z. A. Yılmazer, Koç University Press, İstanbul.

Brookes WA (2003) Visual Virtuosity: Contemporary Quadratura Painting: An Allegory of A Portrait. Doctoral dissertation, University of Tasmania, Australia.

Digitaltalks (2022) Fobi Tedavisi İçin Sanal Gerçeklik Girişimi, https://www.digitaltalks.org/2022/03/01 /fobi- tedavisi-icin-sanal-gerceklik-girisimi/

Dincelli E, & Yayla A (2022) Immersive Virtual Reality in The Age of The Metaverse: A hybrid-narrative review based on the technology affordance perspective. Journal of Strategic Information Systems, 31(2), 1-22. https://doi.org/10.1016/j.jsis.2022.101717.

Ebert-Schifferer S (2002) Deceptions and Illusions: Five Centuries of Trompe L'oeil Painting, National Gallery of Art Press, Washington, DC.

Fisher S (2003) "Sanal Gerçeklik ve Sanatçıya Etkisi, Sanal Ortamda Sanat ve Tasarım", translator: Ö. Otçu, Marmara University Faculty of Fine Arts 3rd International Student Triennial "Sanal Ortamda Sanat ve Tasarım" Proceedings of the Symposium. ISBN: 978-975-400-272-0.

Florensky PA (2007) Tersten Perspektif, presentation: Z. Sayın, translator: Y. Tükel, Metis Press, İstanbul.

Gombrich EH (2015) Sanat ve Yanılsama, 2nd Edition, translator: A. Cemal, Remzi Bookstore Press, İstanbul.

Grau O (2003) Virtual Art: from illusion to immersion. MIT Press, Cambridge, Mass.

Harris J (2010) Art and Illusion: A Study in the Psychology of Pictorial Representation. Routledge: London.

Heater B (2023) A Brief History of VR and AR, https://techcrunch.com/2023/05/31/a-brief-history-of-vr-and-ar/

Hughes DT (2011) Pablo Valbuena: Video Projection on Architecture. Inside, 48-50, https://assets.yellowt race.com.au/wp-content/uploads/2012/11/Inside-Article_Issue67_P48-51.pdf

Krausse AK (2005) Rönesans'tan Günümüze Resim Sanatının Öyküsü. 1st Edition, translator: D. Zaptçıoğlu, Literature Press, Germany.

Krols B (2010) 3D Street Art. Tectum Press, Belgium.

Lampropoulos G, Keramopoulos E, & Diamantaras K (2020) Enhancing the Functionality of Augmented Reality Using Deep Learning, Semantic Web and Knowledge Graphs: A review. Visual Informatics, 4(1), 32–42. https://doi.org/10.1016/j.visinf.2020.01.001.

Lau HF, Kan CW, & Lau KW (2013) The Future of Virtual Environments: The Development of Virtual Technology, Computer Science and Information Technology, 1(1), 41-50). https://doi.org/10.13189/ csit.2013.010105.

Leppert R (2009) Sanatta Anlamın Görüntüsü, İmgelerin Toplumsal İşlevi, 2nd Edition, translator: İ. Türkmen, Ayrıntı Press, İstanbul.

Little S (2006) …İzmler, Sanatı Anlama, 1nd Edition, translator: D. N. Özer, YEM Press, İstanbul.

Liu, J., & Liu, L. (2022). Modeling visual aesthetic perception: Bridges between computed texture features and perceived beauty qualities in semantic experiments. Cognitive Neurodynamics, 16, 1379–1391.

Lobwein G, & McKewen D (2024) Expanded Experience: An 'Artist-Bricoleur' Approach to Writing VR in Contemporary Art, In Screenwriting for Virtual Reality: Story, Space and Experience, (pp. 205-229), Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-54100-1_9.

Ma JY, & Choi JS (2007) The Virtuality and Reality of Augmented Reality, Journal of Multimedia, 2(1), 32-37. http://dx.doi.org/10.4304/jmm.2.1.32-37.

Menck JHD, Lechte H, Riedel M, Jaja JHC, & Tümler J (2023) Realism and Experiments: Investigating Virtual Reality Experiments, Rising Like a Phoenix: Emerging from the Pandemic and Reshaping Human Endeavors with Digital Technologies ICIS, 1-17. https://aisel.aisnet.org/icis2023/adv_theory/adv_theory/1.

Morgan D (2005) The Sacred Gaze: Religious Visual Culture in Theory and Practice. University of California Press, Berkeley. ISBN: 9780520243064

Mulders, M., Träg, K. H., Kaninski, L., Kirner, L., & Kerres, M. (2025). Virtual reality and affective learning in commemorative history teaching: Effects of immersive technology and generative learning activities. Journal of Research on Technology in Education. Advance online publication. https://doi.org/10.1080/15391523.2025.2461524.

Murray JH (2017) Hamlet on the Holodeck: The Future of Narrative in Cyberspace, Cambridge, Massachusetts: The MIT Press.

Murray JH (2020) Virtual/reality: how to tell the difference, 19(1), journal of Visual Culture, 11-27. https://doi.org/10.1177/1470412920906.

Ng J (2021) 3. Virtual Reality: Confinement and Engulfment; Replacement and Re-Placement, The Post-Screen Through Virtual Reality, Holograms and Light Projections, (pp. 107-154), Amsterdam University Press, Amsterdam. http://dx.doi.org/10.5117/9789463723541.

Or MS, Hoque A, & McGregor C (2022) A Method to Visualize Patient Flow Using Virtual Reality and Serious Gaming Techniques, CONF-IRM 2022 Proceedings, 1–11. https://aisel.aisnet.org/conf-irm

Pascariello MI (n.d.) Painted Dome: Suspended Between Reality and Illusion, https://www.academia.edu/6576570/Painted_dome_suspended_between_realty_and_illusion?auto=download

Phillips M (2024) Digital Ectoplasm and The Infinite Architecture of The Fulldome. Architectural Design, 94(4), 110-117. https://doi.org/10.1002/ad.3082.

Rauschnabel, P. A., Felix, R., Hinsch, C., Shahab, H., & Alt, F. (2022). What is XR? Towards a framework for augmented and virtual reality. Computers in Human Behavior, 133, 107289. https://doi.org/10.1016/j.chb.2022.107289.

Robinson J (Ed.) (2014) Art in Theory 1900-2000: An Anthology of Changing Ideas (3rd ed.). Wiley-Blackwell: Oxford.

Rodrigues, J. M., Ramos, C. M., Pereira, J. A., Sardo, J. D., & Cardoso, P. J. (2019). Mobile five senses augmented reality system: Technology acceptance study. IEEE Access, 7, 163022–163033. https://doi.org/10.1109/ACCESS.2019.2956902.

Ryan ML (2015) Narrative as Virtual Reality 2: Revisiting Immersion and Interactivity in Literature and Electronic Media. Johns Hopkins University Press. https://doi.org/10.1353/book.72246.

Schneider S, Tonn C, Petzold F, & Donath D (2007) Designing with Images: Augmented Reality Supported on-Site Trompe L'oeil, 3rd Em'body'ing Virtual Architecture: The Third International Conference of the Arab Society for Computer Aided Architectural Design (ASCAAD), Alexandria, Egypt, 275-290, http://papers.cumincad.org/cgi-bin/works/2015%20+dave=2:/Show?ascaad2007_024

Shanken EA (2012) Art and Electronic Media, translator: O. Akınhay, Akbank, Culture and Art Series, İstanbul.

Shen, Y., & Yu, F. (2021). The influence of artificial intelligence on art design in the digital age. Scientific Programming, 2021, Article 4838957, 10 pages. https://doi.org/10.1155/2021/4838957.

Sherman WR, & Craig AB (2003) Understanding Virtual Reality: Interface, Application, and Design. Morgan Kaufmann, Amsterdam.

Siliutina, I., Tytar, O., Barbash, M., Petrenko, N., & Yepyk, L. (2024). Cultural preservation and digital heritage: Challenges and opportunities. Amazonia Investiga, 13(75), 262–273. https://doi.org/10.34069/AI/2024.75.03.22.

Spiliotis A (2008). Illusionism in Architecture: Anamorphosis, Trompe L'oeil and Other Illusionary Techniques from The Italian Renaissance to Today, Doctoral Thesis, Manchester Metropolitan University,

Dissertation for the Degree of Bachelor of Architecture, Manchester, United Kingdom.
Stocker G & Jandl M (Ed.) (September 7-11, 2022) Ars Electronica, Linz: 2022 Festival for Art, Technology, and Society: Welcome to A different life is possible. But how? Planet B, Gutenberg-Werbering Gesellschaft m.b.H.: Linz, Austria. ISBN 978-3-7757-5363-0.
Süar S (2017) İllüzyonun Ötesi: Öznel Bakış Açısı Kullanımı Ekseninde Sinemanın Yanılsamasından Dijitalin Sanal Gerçekliğine, e-Journal of New Media- eJNM, 7(1), 119-126.
Varoudis T (2014) Augmented Visibility in Architectural Space: Influencing Movement Patterns, Open University, United Kingdom.
Williams S (2012) The Art of Deception: Trompe l'oeil and Other Tricks of the Eye. Yale University Press: New Haven.
Wong, E. Y. C., & Lee, P. T. Y. (2024). Virtual reality in transportation and logistics: A clustering analysis of studies from 2010 to 2023 and future directions. Computers in Human Behavior, 153, 108082. https://doi.org/10.1016/j.chb.2023.10808.
Zeng W, & Richardson A (2016) Adding Dimension to Content: Immersive Virtual Reality for e-Commerce, In Proceedings of the 27th Australasian Conference on Information Systems (pp. 1-8). Australasian Conference on Information Systems.

Images & Figures Credits

Image 1: https://tr.wikipedia.org/wiki/Dosya:Andrea_pozzo,_gloria_di_sant%27ignazio,_1685-94,_02.jpg
Image 2: https://ilsassonellostagno.files.wordpress.com/2016/01/46-142dfe4760c5282cfd5.jpg
Image 3: http://www.telepresence.org/nasa/images/18.jpg
Image 4: https://firstagency.com/first-feed/elevating-your-brand-experiences-with-virtual-remote-technology
Image 5 (a), (b): https://www.jonathanyeo.com/from-virtual-to-reality
Image 6: https://ars.electronica.art/keplersgardens/en/future-room/
Image 7: https://www.biosphereiniti.com/
Image 8: https://www.xrez.com/wp-content/uploads/2010/01/dome_01.jpg
Image 9: http://www.visual-arts-cork.com/famous-paintings/assumption-correggio.htm#description
Image 10: http://masterefimeras.com/quadratura-pablo-valbuena
Image 11: https://nilsnova.tv/works/biennale/
Image 12: http://www.visbox.com/products/cave/viscube-m4/
Figure 1: Shields, R. (2003). The Virtual (1st ed.). 1st Edition, Routledge: London, https://doi.org/10.4324/9780203987186, (s.58)