The Impact of Digital Visual Content on the Human Brain & on the Perception of the Viewer

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Abstract

Lo studio dell'influenza delle immagini sul cervello umano e sulla percezione visiva si fonda su un approccio interdisciplinare che coinvolge neuroscienze, psicologia e arte. Esso analizza in che modo i contenuti visivi incidano sulle emozioni, sulle risposte corporee e sui processi cognitivi. Nell'era elettronica, il teatro ha cercato di costruire uno spazio mentale attraverso la tecnologia, rendendo il proprio linguaggio spesso inseparabile dal messaggio e disancorato dal contesto abituale. Il presente articolo esamina gli effetti delle immagini digitali e dell'impiego tecnologico nella pratica teatrale sulla percezione dello spettatore. Viene indagata la capacità delle immagini di suscitare emozioni specifiche, nonché l'influenza esercitata da contenuti immersivi, virtuali e interattivi sulla coscienza e sulle risposte fisiche. Le immagini operano come stimoli che attivano la mente, connettendo la realtà psicologica all'esperienza sensoriale e intellettuale. La visione di tali immagini consente l'accesso a una gamma di emozioni, poiché il cervello le associa a esperienze passate e a schemi emotivi consolidati. Le evidenze scientifiche mostrano che le immagini emotivamente connotate attivano il sistema limbico e la corteccia prefrontale. Il potenziale delle arti performative di suscitare intense risposte emotive attraverso l'impiego di elementi digitali conduce a esperienze profonde, capaci di trascendere i confini convenzionali di tempo e spazio. Le immagini, in ultima analisi, si configurano come strumenti particolarmente efficaci nella modellazione dell'esperienza sensoriale e mentale all'interno del teatro e dell'arte.

The study of how images affect the human brain and visual perception draws from neuroscience, psychology, and art. It investigates how visual content influences emotions, body responses, and thought processes. In the Electronic Era, theater has sought to create a mental space using technology, often making its language inseparable from the message and disconnected from its usual context. This article analyzes the effects of digital visuals and technology in theater on viewer perception. It looks at how images can trigger specific emotions and the influence of immersive, virtual, and interactive content on consciousness and physical responses. Images serve as stimuli that engage the mind, linking psychological reality with sensory and intellectual experiences. Viewing these images helps people access various emotions, as the brain combines them with past experiences and emotional patterns. Research shows that emotionally charged images activate the limbic system and prefrontal cortex in the brain. The potential for performing arts to evoke strong emotional responses through digital elements leads to profound experiences that go beyond time and space. Ultimately, images are potent tools that shape sensory and mental experiences in theater and art.

1. Introduction

Sociality and technology are two foundational elements in the evolution of human beings. Communication and social connection have changed significantly in the digital era. The language of written communication is shifting toward visual language because «[...] the human brain was not naturally made to read; writing is a human invention and does not belong to our genetic makeup,» says Marianne Wolf, a neuroscientist and professor at Tufts University in Massachusetts, following her studies which suggest that different alphabets may even shape brains differently. This leads us to consider the particularly significant impact that written communication has had on the organization of thought and, consequently, on society as a whole over the centuries (Sanavio, 2011).

Visual communication has become a dominant mode of exchanging information in the digital era, with images often conveying complex concepts more effectively than text alone (Lester, 2014). Artistic expression is not only about emotions but also about meaning and structure. The artist uses forms, colors, and compositions to communicate ideas and feelings, creating a work that goes beyond the simple representation of reality (Arnheim, 1974). Arnheim argues that visual perception is not a passive process but a dynamic activity in which perceptual forces play a fundamental role. These forces, which have magnitude and direction, are intrinsic to any perception and influence how we see equilibrium, form, space, light, color, movement, and dynamics.

However, the current evolution of audience perception is determined by changes in the creation of digital visual content. These technologies serve to shape a new visual perception of digital images and the visual language of virtual environments created through technology. Therefore, the problem to be studied is how visual content in digital theater, as well as its key visual and interactive elements, affect the viewer's perception process and their interaction with the performance. As a consequence, accurate virtual environments are fundamental in the era of visual information overload in which we live. The visual language in digital theater shapes the environment where interaction between the performance and the audience takes place. As a result, in the context of rapidly developing digital technologies, virtual and augmented reality, the study of digital visual language is both relevant and essential, as it will reveal the role of modern technologies and tools in enhancing the actor's experience and interaction with the audience.

The impact of images on the human brain and the visual perception of the viewer is a field of study that combines neuroscience, psychology, and art, exploring how visual content influ-

ences both the body and the emotions and cognitive processes of the viewer. The attempt to create a mental/imaginary/psychological space in theater during the Electronic Era has led to the development of languages deeply rooted in technology, sometimes rendering them inseparable from the message, and often decontextualizing them from their "natural" habitats.

One of the most active fields in experimental psychology is the impact of virtual environments on human emotions through digital visual content. Research has shown that images/videos and digital techniques used to create virtual environment content can evoke emotions (Riva et al., 2007). Riva emphasizes that virtual environments can provoke strong emotional reactions, making them powerful tools for both clinical and artistic applications.

Virtual environments are powerful instruments for discovering hidden emotions and provoking sensations. Studies by psychology researchers have shown that «the immersive qualities of VR promote a sense of presence in virtual environments, making it useful for clinical applications, particularly in the treatment of anxiety disorders.» Digital technologies such as virtual reality (VR) and augmented reality (AR) are transforming the performing arts by creating new forms of interaction and audience engagement (Dixon, 2007).

The primary goal of this study will focus on the impact on the viewer's perception of visual content in different digital virtual environments (immersive, VR, AR) within the context of digital theater. It will also examine the influence of modern digital technologies on creating an effective media-based stage space and identify the most effective technologies that stimulate audience engagement.

2. Mental Images

«Human kind cannot bear too much reality».

This famous quote by T.S. Eliot reflects on the idea that reality, with its harshness and complexity, can be difficult to face for the individual. The search for escape, whether through art, fantasy, or spirituality, can be a way to alleviate the burden of reality. Nigel Spivey, in his insightful book How Art Made the World, speculates on the concept of "peak shift". It is a concept derived from research on both human and animal behavior. A neurological principle, peak shift suggests that we need exaggerations to make our lives more interesting. Spivey asks, «Is it possible that a primordial instinct explains why humans love creating unrealistic images?» (Genn, 2007).

In other words, the effect of peak shift in pattern recognition and human aesthetic preferences means that when an artist emphasizes certain features of a face or shape, said features are exaggerated, making the final result appear more marked than the original form. This concept directly connects to Allan Paivio's dual-coding theory, which explores how mental images and language interact in our cognition. Paivio's studies (1971) are based on the consideration of images as a feature that can accompany all stimuli in different ways (Caratozzolo, 2010).

In Paivio's dual-coding theory, he proposes giving equal weight to both verbal and non-verbal processes. In his book Mental Representations, Paivio asserts: «Human cognition is unique in that it has become specialized to simultaneously deal with language and with non-verbal objects and events. Furthermore, the language system is peculiar because it directly deals with linguistic input and output (in the form of speech or writing), while at the same time serving as a symbolic function concerning non-verbal objects, events, and behaviors. Every representational theory must accommodate this dual function» (Paivio, 1990, p. 53). Paivio describes two cognitive subsystems: one specialized in non-verbal objects/events (images), and one specialized in language. These systems are driven by two units called "imagens" (containing information for generating images) and "logogens" (containing information for the sequential expression of words) (Paivio, 1990, p. 59).

According to Dr. Caratozzolo, mental images take the form of either pictorial representations or verbal representations. Pictorial representations involve an image that is partially analogous to the world it represents. «[…] They show concrete attributes (e.g., shape and size) that are similar to the characteristics and spatial properties of the object in the world they represent; they convey all the attributes and characteristics of the represented object simultaneously» (Caratozzolo, 2010).

In contrast, verbal representations «are symbolic representations because they have an arbitrary relationship to the referent. Words capture abstract and categorical information. Typically, they convey information sequentially. Neither form can represent all the qualities belonging to the represented object. Images and words represent relationships in different ways» (Caratozzolo, 2010).

Mental images can represent «things that have never been experienced before through the senses, things that do not even exist, and various forms of mental images corresponding to different senses: Visual, Auditory, Tactile, and Gustatory» (Caratozzolo, 2010).

Mental images can create various categories for valuing images and words. Caratozzolo divides them into two parts: Words with high image value tend to be concrete, while words with low image value tend to be abstract (Infante, 1999).

By "concrete," Caratozzolo refers to words that relate to tangible objects/people/places (e.g., book, father, university). "Abstract" refers to words that cannot be experienced through the senses. Abstract words have a very high potential for imagery (e.g., pain, love).

The studies cited in this section offer a fascinating perspective on how art and mental images can serve as tools for dealing with the complexity of reality. Through exaggeration, pictorial and verbal representation, and the use of new technologies, we can reconstruct and reinterpret the world around us, thereby finding a way to lighten the weight of reality, as suggested by T.S. Eliot.

By applying Caratozzolo's research to the world of performing arts, one can better understand the "motivations" behind the mental reconstruction of dramaturgical texts through new media. The simulation of a concrete or abstract subject through sensory images more effectively captures the audience's attention in order to convey a deeper sensation. Psychological/mental reconstruction through new technologies can develop in various ways, from virtual scene projections to interactive costumes/body tracking/mapping. This shift in visual communication has significant implications for human perception, as demonstrated by neuroscientific studies.

3. Neurosciences and Digital Communication: The Psychological Impact of Images on the Human Mind

Neurosciences applied to digital communication are based on measuring users' brain and physical responses when interacting with content. For example, when we watch an emotional video, the amygdale, responsible for emotions, is activated, or the prefrontal cortex during decision-making processes. The amygdale plays a key role in the enhanced processing of emotional stimuli. The amygdale modulates emotional information in a way similar to how attention influences visual processing. Additionally, brain regions outside the traditional limbic system, like the orbit frontal cortex (OFC), also contribute to emotional processing (Pessoa, 2008).

Tools such as eye tracking detect which visual elements capture our attention, while biometric data can reveal crucial information about how a viewer reacts to a specific message, image, or video. Thanks to these advanced technologies, it is possible to predict how the human brain will process content with a great deal of precision, and therefore to optimize the content

we make in light of this information in order to maximize its impact. Advanced eye-tracking technologies enable precise predictions about how the brain processes visual content, allowing marketers to optimize designs for maximum impact. The methodology is valuable for reducing visual clutter and ensuring key messages are noticed (Wedel & Pieters, 2008, p. 11).

One of the most interesting aspects of applied neuroscience in digital communication is the ability to analyze various cognitive processes and user behaviors. These include emotion, attention, memory, and perception, which are fundamental for understanding how content is perceived. By analyzing how people visually perceive content, we can determine what captures their attention and which elements generate a positive or negative emotional response. The power of environments in inducing emotions in humans has been widely studied in experimental psychology by using exposure to photographs or real-life situations. Moreover, numerous studies have shown the ability of films and image techniques to evoke emotions «[...] Currently considered one of the most powerful tools for experimentally investigating the effect of environments on emotion induction in humans» (Talamo et al., 2024).

3.1. Impact of Images on Emotions and Memory

Images influence emotions more quickly and powerfully than words. Some studies suggest that there are separate neural networks for processing «visual and verbal emotional representations» (Feng, Gu, Li, Wang, Zhang, Luo, W., & Eickhoff, S. B., 2021) and that visual stimuli are processed faster by the brain than words are (Azizian, Watson, Parvaz & Squires, 2006; Walker, Ciraolo, Dewald, & Sinnett, S., 2017). When we "see" an image, it's not just the visual cortex that is involved; the brain region responsible for emotional processing is also activated. The amygdala, for example, is «considered the region of greatest interest in the brain when considering the impact of visual images on fear, anxiety, and pain» (Nanda, Zhu & Jansen, B. H., 2012).

Moreover, images can trigger physiological reactions, such as an increased heart rate and blood pressure, sweaty palms, or even stomach aches (Bernat, Patrick, Benning & Tellegen, 2006). Many studies have found that negative visual stimuli, such as those showing violence or fear, elicit a stronger emotional response compared to positive examples, such as joy or love (Feng, Gu, Li, Wang, Zhang, Luo & Eickhoff, S. B., 2021).

As mentioned, images tend to engage both visual and verbal channels in the brain's encoding process (so-called «dual-coding»), which increases the ease of recall (Paivio, 1990).

Compared to text, images have more unique and distinctive visual characteristics (distinctiveness model) (Mintzer & Snodgrass, 1999). Additionally, images seem to evoke stronger emotional responses and greater engagement (Yadav, Phillips, Lundeberg, Koehler, Hilden & Dirkin, 2011), which, in turn, seems to enhance memory (Sharot, Delgado, & Phelps, 2004).

3.2. Lisa Feldman Barrett's Theory of Constructed Emotions

The science of emotions is in the midst of a revolution comparable to that of the discovery of relativity in physics or natural selection in biology—and this paradigm shift has immense implications for all of us. Leading this revolution is the Theory of Constructed Emotions proposed by Lisa Feldman Barrett, which offers a new perspective on the nature of emotions based on a computational and neuroscientific approach. According to this theory, emotions are not innate entities with specific neural bases; rather, they are constructed by the brain through active inference and categorization processes based on past experiences and situational contexts (Barrett, 2017, p. 31).

By applying Barrett's theory to the creation of digital visual content in performing arts, we can understand how digital images might influence the emotional perception of the viewer. Through categorization processes, active inference, and multisensory integration, digital images become powerful tools for constructing complex emotions, amplifying the impact of artistic performances. The theory highlights the fundamental role of cultural fabric in constructing emotions. In digital theater, digital images can be used to convey specific cultural meanings, influencing the emotional perception of the audience based on their cultural background.

After this brief exploration of how images influence emotions, we may consider how these dynamics apply in digital contexts.

3.3. Impact of Images in Digital and Social Contexts

Undoubtedly, the impact of images on the perception of the 'connected' audience in virtual and social environments, such as social networks, is one of the main issues studied by scholars in the field of psychology. Martina Korte, in her article The Impact of the Digital Revolution on the Human Brain and Behavior: Where Do We Stand? discusses a study exploring how the use of electronic media, such as audio, images, and animations, affects the

development of reading skills in children. Using fMRI, the study examined brain activity while listening to stories in different formats.

The results show that, compared to audio, the use of images and animations reduces the effort on the linguistic network and increases connectivity between the visual, cerebellar, and default networks, suggesting that the use of images facilitates comprehension without overloading the linguistic system. This has implications for new readers and individuals with reading difficulties.

3.4. Art and the Neurosciences

The essay entitled *Art and the Mind*, written by Semir Zeki and published in the Journal of Consciousness Studies in January 1999, examines the link between artistic expression and neuroscience, focusing on how the brain interprets visual information. Zeki highlights studies conducted by Salomon Henschen, which revealed a direct connection between the retina and a specific area of the brain's cortex, known as the primary visual cortex (V1). This new discovery challenges the claim that the entire cortex is involved in processing visual input and opens up the debate on the division between localized and distributed processing of visual information in the human brain.

The parietal lobe, and specifically V1, plays a fundamental role in processing visual information from birth. Zeki also discusses concepts such as "visual blindness" and agnosia, emphasizing the important role of V1 in these processes. Despite continuous changes in sensory information, the brain is capable of categorizing objects and surfaces, maintaining an accurate perception of the visual world.

In summary, neuroscience offers powerful tools to understand and optimize digital communication. From measuring emotional responses to applying the Theory of Constructed Emotions, these insights allow us to create content that not only captures the viewer's attention but also evokes deep and lasting emotions.

4. Virtual Space, Immersive Scene

The Technology Acceptance Model (TAM), first proposed by Fred Davis in 1989, posits that two primary factors influence an individual's intention to use a new technology: perceived usefulness and perceived ease of use (Roe, 2024).

As the 20th-century media theorist McLuhan suggested: «A new communication technology – whether printing, radio, cinema, television, or social media – not only transports but translates

and transforms the sender, the receiver, and the message. Changing the medium means changing the message – the signs, symbols, and meanings it conveys, as well as the co-creative relationships between the author, actor, and audience that contribute to the creation of meaning» (treccani.it).

Technological innovations, beyond modifying communication, transform the user's experiences, influencing technology adoption. Recent studies explore how the shift from physical to digital media changes how people interact with new technologies. With physical media, the audience was a homogeneous collective, but with digital media, individuals «people» have fluid roles (producers, consumers, critics) and interact in more complex ways (Lievrouw & Livingstone, 2006, p. 11).

Virtual reality is not just a new medium, but a true experiential space in which the user is no longer an external observer of content, but is physically and psychologically immersed within it, redefining the boundaries between the real and the virtual (Slater & Sanchez-Vives, 2016, p. 1). With traditional media, the user was a passive receiver, whereas with digital media (and even more so with VR and immersive media), the user becomes an active participant.

The ability to simulate abstract environments that are difficult to represent in the physical world has allowed artists to create imaginary spaces through the immersive nature of VR, which promotes a sense of presence within a virtual world, where the audience, in a world far from lived reality, discovers unexpected emotions. «[…] To this end, significant progress has been made with the development of Virtual Reality (VR), currently considered one of the most powerful tools for experimentally investigating the effect of environments on the elicitation of emotions in humans» (Faita et al., 2016 in Talamo et al., 2024).

4.1. Experimental Installations and Emotional Interaction

Mirror Ritual is an interactive installation that explores the co-construction of emotions between humans and machines, challenging traditional paradigms of emotion recognition (ER). Based on Lisa Feldman Barrett's Theory of Constructed Emotions (TCE), the work uses a combination of ER techniques and poetry generation to engage the viewer in a critical reflection on their emotional state. Through a real-time affective interface, the mirror generates unique poems based on the perceived emotional state of the person, encouraging them to contextualize and give personal meaning to the words.

This process not only regulates emotions but contributes to building the personal narratives that form human identity. The installation, which uses a convolutional neural network (CNN) for emotion recognition and the GPT-2 model for text generation, is designed to be integrated into daily life, promoting deep and tangible emotional experience. Mirror Ritual represents an alternative to surveillance-based Affective Computing systems, shifting focus towards a more subjective and meaningful interaction between humans and machines. Following Picard's vision of affective computing as a tool to «recognize, interpret, and respond to human emotions in meaningful ways» (Picard, 1997, p. 267), Mirror Ritual shifts the focus from surveillance to collaboration, transforming emotional data into a reflective and poetic dialogue.

Stringesthesia is a paradigm of interactive and improvised musical performance that explores the dynamics of trust between the artist and the audience. Using functional near-infrared spectroscopy (fNIRS), a non-invasive neuroimaging system, the artist's level of trust is measured in real time and displayed during the performance. This data influences audience participation: when trust is high, the audience gains more control over the performance (e.g., playing instruments or selecting chords), while when trust is low, the artist retains greater control. Audience members, through comments, described the sensation of being connected and the emotion of involvement. «[…] I feel so inspired to improvise with anything […] It really was a cool, engaging, multisensory experience» (Hopkins et al., 2023, p. 6).

4.2. AI and the New Aesthetics of Art

Hees, Grootswagers, Quek, and Varlet (2024), in their work Human Perception of Art in the Age of Artificial Intelligence, point out that AI-generated art has reached a level of sophistication that challenges the traditional perception of human art. With the continuous progress of technology, it is urgent to further explore how AI will influence creativity and artistic appreciation, as well as the social and cultural implications of this transformation.

The article explores how people perceive and appreciate AI-generated art compared to that created by human artists. The study focuses on the use of DALL·E 2, an advanced AI image-generation tool, to create artworks that are then compared with human-made works in terms of preference and discrimination ability.

Interactive installations, immersive performances, and the use of AI-generated art are witnesses to a crucial shift in artistic communication. They are not simply tools but true catalysts for

transformation in how we perceive, create, and relate to art and emotions. VR, AI, and advanced technologies are redefining the viewer's experience, transforming them from passive recipients to active co-authors. The works discussed in this section of the article demonstrate that technology is no longer just a medium, but a partner in dialogue in the construction of meaning.

5. Digital Theater and Immersive Performance: Reflections on New Aesthetic and Interactive Paradigms

Digital technologies have destabilized traditional notions of «presence» by blurring the distinctions between the real and the virtual, and between live and mediated performances. The interaction between physical and virtual spaces in performance creates a new aesthetic paradigm, in which the viewer's perception of presence is continuously negotiated. Digital performance does not replace live performance but creates a third space of hybrid experience (Dixon, 2007).

As technology advances and changes at a rapid and seemingly impossible pace, integration becomes more a matter of balance and strategy than of keeping up with trends. The new technologies being developed are not necessarily meant to replace traditional methods, but to enhance them. Maintaining a balance between tradition and artistic intention at the heart of the creative process allows technology to transform ideas into reality. In fact, we are living in an era of change, where we have the opportunity to define what theater means for our time. Digital components influence how we do theater: the creative process, the delivery of the final product, and even the audience's experience. Modern theater must find a balance that embraces current possibilities while honoring the traditions of this art form.

5.1. New Catharsis

Looking back at the history of theater, one of the main goals of the performing arts has often been emphasized: the impact a work has on the audience. Alberto Bentoglio, in his essay Between Reason and Emotion: The Compromise of Theater investigates the role of emotional impact throughout the history of theater. […] The artistic-aesthetic pleasure derived from experiencing a performance is one of the ultimate goals of the theater. The article discusses the 20th-century avant-garde movements, which sought to shake the audience through intense and often unpleasant emotions, breaking with traditional conventions and seeking total audience involvement.

[...] Aaron Hill, in his Works, argues that it is the elements that the audience perceives as being closest to their own daily reality that most move and engage them. In conclusion, Bentoglio reiterates that theater is a compromise between reason and emotion, between the representation of reality and poetic abstraction, continuously evolving in its attempt to emotionally move the audience (Bentoglio, 2006).

In digital theater, the old debates about what the purpose of theater should be, and what one's preferences should be, seem to lose their importance. Instead, the focus has shifted to the activity that is made possible: the practice of searching for a space where emotional union no longer originates only through intellect but enters through the body, another interface between the inner world and the version of it augmented by technology. Immersive scenography in digital theater needs to create an environment where the human can have the opportunity to be more involved, united, and connected, perhaps through sensory and interactive enhancement that fosters emotional union.

Multimedia theater has a long history of its own. Some scholars trace its origins to early 20th-century image-based theater, which prioritized images over dramatic form, relying on the idea of visual composition as a creative principle inspired by Cage's composition theory; this can be seen in the works of Robert Wilson and Lee Breuer (Klich & Scheer, 2012, p. 40). Other scholars trace its origins to the 1980s when a group of artists rebelled against the performance art (which was the dominant genre at the time) and turned to theater in search of elaborate visual, auditory, temporal, and spatial structures (Berghaus, 2005).

5.2. Immersive Images

The use of computer graphics in the set design of a musical performance is by far the most common technique in theater. Today, technologies are fully focused on creating visual images, so their use in the staging process is justified from the perspective of the universalization of show production: from an idea to a sketch or layout to set design solutions. Lev Manovich identifies directors who use space modeling software as either creators of «media art» or as «artist-programmers» (Manovich, 2001).

Digital technology is best understood as a set of technological innovations in interactive software that significantly expand the space of the theatrical stage within its inherent genre context. As a result of the influence of digital multimedia content, graphic, audiovisual (sound),

and visual information on the viewer, the emotional and cognitive aspects of perception are activated. In this context, digital technology creates a special form of theatrical art that combines classic theatrical principles and innovative expressions, with modern multimedia elements, thereby producing a new form of artistic expression and a unique aesthetic.

Media products, as a basis for creating deep symbolic content, enrich theatrical representation. These digital elements, fragments of the characters' lives, are transformed into a polysemantic space (rich in multiple meanings) that becomes the interactive context in which actors move and act. The digital multifacetedness of this space breaks and reinterprets apparently established views of the concept of drama. It is as though the set designer is painting with a computer, using pre-made samples, and expanding the possibilities of computer technologies.

Immersive theater breaks the fourth wall, placing the audience inside the narrative and transforming them from passive observers to participants (Machon, 2013).) Immersive theater aims to fully immerse the audience in the world of the performance. Often, this involves a unique, adapted location (site-specific theater) and interactivity with the environment and performers (although I hasten to add that "interactive theater" is not synonymous with "immersive theater" (Edward Gibbons-Brown, 2011). Brown, in his essay, discusses an immersive experience in which the story effectively builds the connective tissue between the complex digital world and the real one, making the interaction something unexpected. The limits of human consciousness are contrasted with the unlimited vision of a god or a higher power.

Marvin Carlson, in his essay Post dramatic Theater and Post dramatic Performance, analyzes various theatrical works produced internationally that have made a fundamental mark in the context of immersive theater. Castorf was one of the first to use this technique, initially showing the audience off-stage actions live, and later, with improved technology, projecting these actions onto large screens above the stage and showing the creation of these images by bringing mobile handheld cameras on stage, allowing the audience to simultaneously see both the image and the process of capturing it. (Carlson, p.7) In Anglophone Theater, the term was brought to prominence by the British company Punch drunk, founded in 2000 with the specific goal of creating a new type of theater in which a manifold environment is created within which the audience is free to enter and exit at will. (Carlson, p.10) «A major European performance group, Signa, founded by performance artists from Austria and Sweden, has come much closer to realizing truly emancipated performances and even an authentic post-dramatic presentation,

in productions such as their Ruby Town Oracle». « [...] members of the audience were free to wander and interact freely with the performers, following or not following the story of the village, as they so chose». (Carlson, p.12) Indeed, immersive theater is widely considered to have reversed the traditional power relationship between the performer and the audience, putting the latter in control of the production.

5.3. Eyes, Ears, and Mind: How Technology Reshapes the Viewer's Perception

Maurice Merleau-Ponty's philosophy emphasizes the role of the body in perception, a concept that can be applied to the viewer's experience during a live performance. The reference to Merleau-Ponty is crucial for understanding how the body is not just an object among others, but the primary tool through which we perceive and know the world. According to him, perception is not an abstract process, but an embodied act, tied to our physical presence in the world. In light of this view, theatrical experience is not a passive process, but a dynamic and integrated experience in which the viewer activates their body and reacts to what happens on stage, participating actively in the creation of meaning. In this context, the viewer is seen as a «being of perception and movement», whose body plays a fundamental role in sensory and perceptual experience. (Merleau-Ponty, 2003, p. 459).

Viewer of digital theater, in all its forms practiced in recent years (immersive, interactive, VR), find themselves in a hybrid space between live and virtual, rich in visual content. Immersive images enhance empathy and engagement, but at the same time, they risk overwhelming the systems of perception.

Wilcox (2010), points out that Birringer, in Performance, Technology, & Science, emphasizes the «contemporary techno sphere», where a new aesthetic emerges from the fusion of art and science. Birringer believes that the combination of the human and the digital makes it necessary to create "a critical context to analyze hybrid systems of organization.

The viewer is exposed to the greatest potential suggestiveness of images that has ever seen, which are now dynamic, interactive, evolving, and 'alive' in immersive image spaces.

The human brain is a complex organ, capable of processing vast amounts of sensory information in real time. Virtual reality and immersive performances aim to replicate this information in such a way as to create an immersive experience that the brain accepts as real. To achieve this goal, VR uses a combination of visual, auditory, and tactile stimuli. The synchroniza-

tion of these stimuli with the movements and expectations of the viewer is crucial to deceive the brain and make it "believe" that the virtual experience is authentic. (Giardini Digitali, 2024).

Gareth White, in his book Audience Participation in Theater, not only analyzes the phenomenon of audience participation, given the growing interest in contemporary forms of interactive and immersive theater, but also contributes to defining a new theoretical approach that explores how the rules of interaction might be written and structured to make the theatrical experience more dynamic and interactive. As Tomlin (2015) highlights, White describes how artists construct rules and conditions for audience involvement. White draws on several theories, including those of Erving Goffman and Pierre Bourdieu, to analyze how class, gender, age, and other cultural distinctions influence audience participation.

The emotion of the «live» experience lies in seeing a performative event unfolds, with all the risks that entails. Live performance is intrinsically interactive. The spontaneous exchange between performers and viewers, and between a group of sensitive performers, is an integral part of the appeal of theater as an art form, both in the more stylized genres of theater and in «realistic» theater. (Saltz, 2001, p. 109).

Media produce an emotional effect on the audience. Affective media are non-diegetic; they do not exist in the world of the character. The most familiar form is background music, which so characterized melodrama and is now ubiquitous in cinema. Although affective media are more often auditory, visual media can also be used for this purpose (Saltz, 2001, p. 126).

In conclusion, digital theater confirms itself as a crucial experimental field for investigating the evolution of human perception in the technological age. As demonstrated by neuroscientific studies and the latest performance theories, the challenge is not only technical, but philosophical: redefining the boundaries between the real and the virtual, between the body and the interface, between emotion and visual simulation. The future of performance will necessarily pass through an increasingly close collaboration between artists, scientists, and technologists, in a continuous dialogue between innovation and tradition. It is hoped that artists working in this field will give great attention to the creation of virtual space, alongside the technique, the creation of digital visual content and projection, as well as the visual value of immersive space, without neglecting applied technology.

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Biografia dell'autrice / Author's biography

Mahnaz Esmaeili è scenografa multimediale, ricercatrice e traduttrice. I suoi ambiti di interesse si collocano all'incrocio tra arti performative e tecnologie digitali applicate alla scena. È dottore di ricerca in Tecnologie digitali per la ricerca sullo spettacolo, titolo conseguito presso l'Università di Roma "La Sapienza", dove attualmente è docente a contratto. Nell'a.a. 2024/2025 tiene i corsi di Tecnologie digitali per la danza e il teatro presso la Facoltà di Lettere e Filosofia e Performance Design Studio presso la Facoltà di Architettura. È co-fondatrice e direttrice artistica di Mop-studio, laboratorio di ricerca e produzione artistica orientato all'esplorazione delle intersezioni tra spazio scenico, corpo e tecnologia. Con oltre vent'anni di esperienza, la sua pratica si concentra sulla scenografia digitale e sull'uso critico delle tecnologie immersive nei linguaggi performativi contemporanei. Ha curato la traduzione in lingua farsi di

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Mahnaz Esmaeili is a multimedia scenographer, researcher, and translator. Her areas of interest lie at the intersection of performing arts and digital technologies applied to stage design. She holds a Ph.D. in Digital Technologies for Performance Research, awarded by Sapienza University of Rome, where she currently serves as a contract lecturer. In the academic year 2024/2025, she teaches Digital Technologies for Dance and Theater in the Faculty of Letters and Philosophy, and Performance Design Studio in the Faculty of Architecture. She is co-founder and artistic director of Mopstudio, a research and artistic production lab focused on exploring the intersections between stage space, the body, and technology. With over twenty years of experience, her practice is centered on digital scenography and the critical use of immersive technologies in contemporary performance languages. She has translated several specialized texts into Farsi, including *Leggere Uno spettacolo Multimediale* by Anna Maria Monteverdi, and has published scholarly contributions in both Italy and Iran. Among her main publications are *La Riscoperta del Fuoco*, a collection of essays on the work of Robert Lepage (in Farsi), and *La scena Aumentata* (Italy), based on her doctoral research. Her work is characterized by an interdisciplinary approach that integrates theoretical inquiry and stage design, with particular attention to the relationship between aesthetics, technology, and perceptual processes in live performance.

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