

AESTHETIC PARADIGMS OF INTERACTIVITY AND IMMERSION IN DIGITAL AUDIOVISUAL ART OF THE METAMODERN ERA

Ihor Pecheranskyi

Doctor of Philosophical Sciences,
professor, Kyiv National University
of Culture and Arts, Kyiv
ipecheranskiy@ukr.net

Печеранський

Ігор Петрович

доктор філософських наук,
професор, Київський національний
університет культури і мистецтв,
м.Київ
ipecheranskiy@ukr.net

Abstract. This scholarly contribution aims to scrutinize the trajectory of interactivity and immersion, conceptualized as aesthetic paradigms within digital audiovisual art during the period spanning 2000–2010. The analysis is anchored by an examination of seminal works and pivotal technological platforms characteristic of this era. The methodological framework is constructed upon a synthesis of the metamodern concept (T. Vermeulen, R. van den Akker), the media-archaeological approach (F. Kittler, S. Zielinski), and actor-network theory (B. Latour). This tripartite theoretical amalgamation facilitates the understanding of interactivity and immersion not merely as technical attributes but as fundamental aesthetic paradigms. The principal academic contribution resides in the conceptualization of interactivity and immersion as paradigms that establish normative frameworks, evaluative standards, and blueprints for creative problem-solving within the digital era. Furthermore, it identifies their intrinsic connection to metamodern sensibility, characterized by an "oscillation" between sincerity and irony, and between autonomy and constraint. These paradigms fundamentally reconfigure the role of the spectator, transitioning them from a passive recipient to an active co-creator, thereby dissolving the ontological demarcation between corporeal existence and mediated reality. Their evolutionary trajectory delineates a progression from constrained, finite systems offering a limited repertoire of choices (e.g., branching narratives) to expansive, open systems characterized by procedural generation and algorithmic adaptation. Metaverses, in this context, manifest as the quintessential environment for the comprehensive synthesis of both paradigms. Within these emergent digital ecosystems, the individual viewer ultimately assumes multifarious roles: co-author, co-proprietor, and co-habitant of the digital realm.

Keywords: interactivity, immersion, aesthetic paradigms, metamodernism, digital audiovisual art, VR/AR/XR, procedural generation, metaverses.

Introduction. Metamodernism, as conceptualised by Timotheus Vermeulen and Robin van den Akker in the early 2010s, signified a departure from postmodern tendencies towards irony and deconstruction. It introduced a paradigm of "new sincerity," characterized by an oscillation between enthusiastic engagement and melancholic detachment. In the domain of digital audiovisual

art, this conceptual shift manifested most profoundly through the establishment of two interconnected principles: interactivity and immersion. These principles are gradually displacing the conventional aesthetics of passive spectatorship that once dominated cinema, television, and traditional painting. Instead, they proffer novel frameworks for the relationship between the artwork, its creator, and its audience — frameworks predicated on active participation, volitional input, and profound absorption. A comprehensive understanding of these transformations is essential to elucidate why contemporary viewers increasingly opt for interactive serial narratives over linear films, virtual reality apparatuses over conventional theatrical seating, and active involvement over contemplative observation.

This transition from postmodern deconstruction to metamodern "new sincerity" was not abrupt. As Pecheranskyi and Hubenator (2024) astutely observe, the postmodern era, significantly propelled by advancements in digital and video technologies, instigated a radical metamorphosis within the audiovisual landscape. During this period, artists adopted "disjunctive" and non-linear narrative structures, deconstructed the traditional "sender–receiver" model, and reconfigured narration as an act of intercommunication where the viewer/recipient assumed a pivotal role. In the researchers' view, this transformative shift — which coincided with the dematerialisation of the art object, the establishment of a domain where the electronic image holds primacy, and the spectator's deep immersion within it — constituted a crucial juncture in the formation of a novel audiovisual ontology. It was precisely during this epoch that immersive and interactive practices began to coalesce, subsequently evolving in the metamodern era into technologies such as virtual reality (VR), augmented reality (AR), mixed reality (MR), and procedural generation.

The contemporary significance of this research is predicated on the profound metamorphosis of the fundamental conceptualization of the audiovisual medium, driven by digital advancements. Interactivity and immersion, once considered specialized applications, have now become pervasive phenomena: commercial streaming platforms deploy interactive narratives, social media increasingly employs algorithmic personalization, virtual reality technologies are being integrated into cinematic production, and virtual environments, often termed *metaverses*, attract substantial financial investment. Concurrently, the requisite theo-

retical framework for analyzing these developments remains disparate; interactivity is frequently reduced to a mere technical function, and immersion to a psychological state, leaving their inherent aesthetic dimensions largely underexplored.

This proposed study addresses this lacuna by conceptualizing interactivity and immersion not as discrete technical elements, but as overarching aesthetic paradigms that establish prevailing norms, evaluative metrics, and creative problem-solving methodologies across broad categories of artistic production. The interactive paradigm postulates a shift from passive viewership to active co-authorship, wherein user agency (e.g., narrative branching decisions, object manipulation, algorithmic input) directly influences experiential outcomes. The immersive paradigm, conversely, aims to construct environments that dissolve the perception of an external frame (e.g., screen, stage), thereby blurring the distinction between mediated and physical realities. Collectively, these paradigms embody a metamodern sensibility, characterized by the convergence of technological optimism with a quest for authenticity, and a dynamic interplay between ludic freedom and profound engagement.

The period spanning the 2000s to the 2010s witnessed the accelerated development of these paradigms, progressing from nascent forms of interactive cinema featuring branching narratives to sophisticated procedural content generation, and from pioneering virtual reality installations to widespread virtual social platforms. An analytical review of seminal works from this era facilitates not only the identification of aesthetic innovations but also the delineation of theoretical underpinnings for subsequent inquiry into emergent post-platform models and decentralized virtual ecosystems.

The primary objective of this article is to delineate the developmental trajectory of interactivity and immersion as aesthetic paradigms within digital audiovisual art from the 2000s to the 2010s, with an emphasis on exemplary works and pivotal technological platforms of that era. Specifically, the investigation will encompass: the evolution of interactive cinematic forms (e.g., from *Late Shift* to *Bandersnatch*); the maturation of immersive experiential modalities (including 360° video, spatial audio, and haptic interfaces); the progression from branching narrative structures to procedural content generation (exemplified by titles

such as *Minecraft* and *No Man's Sky*); the impact of extended reality (XR) technologies — comprising VR, AR, and MR — on audiovisual semiotics; and finally, the emergence of virtual social environments, or metaverses (e.g., *VRChat*, *Fortnite*, *Roblox*), as synergistic spaces for the integration of both paradigms.

Methodology.

The conceptual and methodological underpinnings of this inquiry are derived from an integration of diverse perspectives. Firstly, the metamodern conceptualization, as articulated by T. Vermeulen and R. van den Akker, furnishes a comprehensive cultural-historical matrix. This framework facilitates the apprehension of interactivity and immersion, not merely as discrete technological advancements, but as aesthetic paradigms emblematic of the metamodern fluctuation between authenticity and cynicism, as well as involvement and disengagement. Secondly, a media-archaeological perspective, aligning with the lineage of F. Kittler and S. Zielinski, allows for the chronological mapping of interactive and immersive modalities throughout the 2000s and 2010s, establishing continuities with antecedent explorations in video art, hypertextual literature, and rudimentary virtual reality systems. Thirdly, the scrutiny of individual creations is executed utilizing the apparatus of actor-network theory (B. Latour) and assemblage theory (M. DeLanda). These theoretical constructs permit the conceptualization of an interactive entity not as a circumscribed construct, but as a mutable configuration of disparate constituents—encompassing both human agents (e.g., creators, perceivers, coders) and non-human components (e.g., algorithms, interfaces, hardware). This particular methodological lens facilitates the transcendence of both technological determinism (where aesthetic qualities are reduced to mere technical specifications) and anthropocentric biases (which discount the autonomous role of technology). In lieu of these, it establishes the notion of "complicit agency" — the reciprocal interplay between human and machine in the co-production of audiovisual phenomena.

The empirical corpus supporting this investigation encompasses prominent exemplars from the designated timeframe, specifically: interactive cinematic works (*Late Shift*, *Black Mirror: Bandersnatch*), virtual reality installations (*Carne y Arena*, *The Enemy*), procedurally generated digital games (*Minecraft*, *No Man's Sky*), communal VR environments (*VRChat*),

metaverse platforms (*Fortnite*, *Roblox*), alongside pertinent technological infrastructures (VR/AR/MR/XR, spatial audio systems, haptic interfaces). The analytical process applied to these selected instances is conducted through the lens of identifying aesthetic schematics (pertaining to the structuring of interaction and the generation of immersive phenomena) and their correlative relationship with metamodern affectivity.

Main research material. The rationale for designating interactivity and immersion as "aesthetic paradigms" is predicated upon several interconnected justifications. Firstly, these concepts delineate the foundational principles governing artistic engagement within the digital era. In contrast to conventional aesthetic categories (e.g., the beautiful, the sublime, the tragic), which primarily describe inherent qualities of an artwork or the modalities of its reception, interactivity and immersion fundamentally establish the structural relationships among the artwork, its creator, and the audience. Interactivity implies that the spectator or user transcends the role of a passive observer to become a co-creator whose interventions shape the progression of the artistic experience. Immersion extends beyond mere "engulfment", signifying the construction of an environment where the participant's perception of external boundaries (such as a screen or stage) diminishes, leading to a blurring of distinctions between mediated and physical realities. Secondly, these notions function as prescriptive frameworks that define what constitutes "quality" or "efficacy" within specific artistic domains. For instance, in fields such as cinema and video games, heightened interactivity (exemplified by open-world role-playing games) or profound immersiveness (as seen in virtual reality experiences) emerge as central evaluative metrics. They consequently influence audience expectations, steer technological advancements, and provide models for addressing creative challenges (e.g., fostering a sense of presence, reconciling user agency with authorial vision, or structuring narrative without strict linearity). Thirdly, these paradigms maintain intricate relationships with preceding aesthetic systems, occasionally complementing them and at other times entering into contradiction. While traditional cinema, predicated on passive contemplation, persists, it is compelled in the digital era to engage with alternative paradigms. Interactivity and immersion do not nullify established aesthetics but rather engender novel problematic do-

mains: how to reconcile interactivity with dramatic coherence, or how to safeguard artistic integrity when the recipient can alter the narrative trajectory? Fourthly, these paradigms possess a distinct historical trajectory, which illustrates an evolution in their dominant manifestations. Nascent forms of interactivity (such as hypertext literature or LaserDisc-based interactive video) were constrained by technological limitations. Immersion, in its early iterations, was frequently attained via expansive displays or panoramic installations. The advent of virtual/augmented reality, procedural generation, and neurointerfaces imbues these paradigms with novel content, yet their underlying logic — pitting active participation against immersive engagement — retains its constancy. This continuity supports their conceptualization as enduring structures that shape artistic practice.

Finally, within contemporary media theory, there is an established tradition of applying the paradigm concept to interactivity and immersion. Lev Manovich (2001) famously analyzes the "language of new media" as comprising a system of paradigmatic operations (e.g., selection, combination, transformation). Marie-Laure Ryan (2000, 2015) investigates immersion as a pivotal paradigm of digital narration, juxtaposing it with conventional "narrative distance." Oliver Grau (2003), in *Virtual Art*, demonstrates immersion as a continuous thread throughout art history — from 19th-century panoramas to contemporary VR environments — positing it as an enduring paradigm. While these scholars may not explicitly label interactivity and immersion as "aesthetic paradigms," their work establishes the theoretical groundwork for such a conceptualization.

The historical development of interactivity within audiovisual art can be traced to the 1960s–1970s, a period when video art commenced the deconstruction of the passive spectatorship inherent in conventional cinema. In Nam June Paik's oeuvre, particularly his installation *Robot K-456* (1964), the authorial intention was intentionally subverted through the incorporation of technical malfunctions, remote manipulation, and aleatoric elements, thereby precluding its attribution to a singular originator. Concurrently, structuralist cinema emerged, wherein the authorial role transitioned "from the expression of an internal state to the exploration of the material properties of the film itself, the projector and the screen" (Barrett, 2023, 60). In cinematic works by Peter Kubelka (*Arnulf Rainer*, 1960) and Tony Con-

rad (*The Flicker*, 1966), authorship resided less in the director's specific intent and more in the opto-acoustic apparatus itself: the rhythmic alternation of light and dark frames, the temporal frequency of visual stimuli, and the resultant retinal afterimages generated meaning independent of individual volition. Video art of the 1970s exhibited an amplified level of technological agency: in pieces by Peter Campus (*Interface*, 1972) or Dan Graham (*Present Continuous Past(s)*, 1974), closed feedback loops involving "camera — monitor — viewer" instigated a form of distributed authorship shared among the corporeal presence, its mediated capture, and the display device. As Michael Rush pertinently observed, within such configurations, the artist relinquishes a portion of their creative authority to the technology, which then assumes a determinant role in shaping the final manifestation of the artwork (Rush, 2005). Consequently, video art and structuralist cinema collectively established the conceptual bedrock for interactivity as a foundational principle, transforming the viewer/user from a passive recipient into an active co-creator of the unfolding experience.

A pivotal phase in the progression of this artistic framework was the emergence of interactive cinematic forms during the 2000s–2010s, characterized by the integration of branching narratives within the moving image medium. *Late Shift* (2016, dir. T. Weber, B. Plasch) served as a prime illustration of this genre, featuring a protagonist entangled in an auction house heist, whose narrative trajectory and ultimate resolution are shaped by viewer input via a dedicated application. Building upon this, the interactive series *Black Mirror: Bandersnatch* (2018, Netflix), set in 1984, introduced a more intricate decision-making framework. In this production, a burgeoning video game developer creates a game inspired by a novel, and audiences exert influence not merely over pivotal plot developments but also over granular elements, such as musical selection or breakfast choices. A. D'Aloia lauded *Bandersnatch* as a particularly compelling experiment in narrative form, reigniting scholarly discourse surrounding the genre. Conversely, J. Sarkar, in a study of posthuman interactivity aesthetics, observed that the production transcends mere viewer choice by satirizing conventional author-viewer dynamics, thereby fostering a "cyborg subjectivity" — a blended state where human volition is constrained by technological parameters (Sarkar, 2024). This metamodern contemplation concerning the constraints of free will and the decep-

tive nature of control precisely defines the aesthetic essence of interactive cinema in the 2010s, wherein narrative manipulation functions concurrently as both a foundational tenet and a subject of artistic scrutiny.

The subsequent phase in interactive evolution involved virtual reality (VR) installations, which transitioned beyond narrative choices to situate the participant physically within the mediated environment. This trajectory culminated in Alejandro G. Iñárritu's Oscar-winning installation, *Carne y Arena (Flesh and Sand)* (2017). This installation meticulously recreates the plight of migrants attempting to traverse the Mexico-United States border. Participants remove their footwear, enter a dimly lit chamber with a sand-covered floor, don VR headsets, and are then immersed in the Chihuahuan Desert alongside a group of apprehensive migrants journeying towards the frontier. The system monitors each participant's spatial orientation and ocular focus, enabling virtual "police officers" to engage with them individually, occasionally at close proximity. As film critic Peter Bradshaw (2017) observed, the experience powerfully conveys the sensation of being confronted by a firearm, offering an unprecedented understanding. Iñárritu articulated his objective as leveraging VR technology to investigate the human condition, aiming to transcend the conventional cinematic frame — which typically confines perception to observation — and instead facilitate a direct, empathetic experience, allowing visitors to inhabit the migrants' perspectives (Alejandro G. Iñárritu: *Carne y Arena*, 2018). This endeavor represents the zenith of interactivity's development as a foundational tenet, wherein the participant no longer merely selects narrative pathways but physically inhabits the unfolding events. Their corporeal presence, movements, and visual orientation are intrinsically woven into the audiovisual composition. Consequently, interactivity achieves its most profound expression, transitioning from a technical utility to an ontological state of perception, thereby dissolving the divisions among observer, artistic creation, and technology, and epitomizing a metamodern ethos of profound immersion and engagement.

Spatial immersion denotes an aesthetic paradigm where the observer transcends the perception of a work as a discrete entity demarcated by a screen's frame, instead becoming enveloped within an all-encompassing media environment. As articulated by M.-L. Ryan (2000), immersion is characterized as "the phenomenological feeling of being in a world differ-

ent from reality," a sensation predominantly facilitated in the digital era by 360-degree video and panoramic projection technologies. Zero Point (2014), the pioneering 3D-360-degree documentary for *Oculus Rift*, exemplifies this, affording participants the liberty to orient their gaze within each scene, thereby fostering a sense of active involvement rather than mere observation (Lang, 2014). This concept of spatial immersion is further pronounced in the Google Spotlight Stories series, notably in the animated features *Pearl* (2016, dir. P. Osborne) and *Age of Sail* (2018, dir. J. Cars). These works were conceived for dual presentation: a conventional flat-screen theatrical release and a 360-degree VR mobile version. Within the VR iterations, viewers could actively rotate their heads, exploring the interior of the vehicle in *Pearl* or the ship's deck in *Age of Sail*, thereby generating an impression of corporeal presence within the animated environment. According to C. Zhang et al. (2017), it is in these contexts that spatial immersion transcends a mere technical contrivance to become a foundational principle. The conventional cinematic frame is eliminated, editing becomes subliminal (requiring seamless transitions between sequences), and audience attention is guided not by directorial intent but by their intrinsic curiosity and physical head movements. This exemplifies the metamodern "oscillation" between autonomy and constraint: while observers possess ostensible freedom to direct their gaze, this liberty is inherently circumscribed by the predetermined narrative and environmental design, which subtly orient their attention towards pivotal occurrences.

Auditory immersion is of comparable importance and frequently a crucial determinant of overall immersion, given that sound, unlike visual information, intrinsically envelops the individual from all directions, even without the aid of a virtual reality headset. The period between the 2000s and 2010s witnessed a pivotal advancement with the introduction of object-based audio and *Higher-Order Ambisonics* (HOA) technologies. These innovations facilitate the encoding and reproduction of a soundscape by independently accounting for the direction, distance, and movement of each distinct sound element. The most prominent commercial application of this paradigm is the Dolby Atmos system, which debuted in cinemas in 2012. Diverging from the conventional channel-based approaches (e.g., 5.1, 7.1), where audio is constrained by static speaker placement, Atmos empowers sound designers to pre-

cisely position and dynamically manipulate up to 118 individual sound objects within the three-dimensional space of an auditorium (Kenny, 2012). The inaugural film to utilize this format was the animated feature *Brave* (2012, Pixar Animation Studios), where the sounds of projectiles, rainfall, and footfalls were accurately spatially situated, thereby fostering a sensation of the viewer's physical presence within a Scottish forest (Dayal, 2012). Another illustrative case is the film *Gravity* (2013, directed by A. Cuarón), where the audioscape of the vacuum of space was deliberately engineered through vibrations transmitted via the astronauts' bodies rather than atmospheric propagation, yielding a distinctive audial immersive experience that earned an Academy Award for Best Sound Editing. Such sophisticated systems not only enhance audio fidelity but also fundamentally alter the aesthetic principles of audiovisual works: sound transcends mere pictorial accompaniment and becomes an autonomous conveyer of spatial information, capable of guiding the observer through the narrative, generating suspense, or, conversely, diverting focus from the visual component (Turner et al., 2022). This metamodern dynamic interplay between the synchronicity and autonomy of sound emerges as a fundamental aesthetic tenet of immersive cinema.

Tactile immersion represents the most profound dimension of immersion, as it transcends visual and auditory perception to directly engage the participant's physical being. In the 2000s–2010s, initial prototypes of haptic suits and vests emerged, enabling users to experience on-screen events through haptic feedback, electrostimulation, or thermal variations. An example is the Tactile Gaming Vest, developed at the University of Pennsylvania in 2010, which facilitated the perception of bullet impacts, the sensation of a knife's touch, and even the impression of blood flow. Subsequently, more advanced systems arose, such as the *Teslasuit* (2016) — a comprehensive haptic suit offering electro-tactile responses that could simulate not only impacts but also caresses, the sensation of wind, or warmth (Rigg, 2016). However, for an extended period, these technologies remained primarily confined to the video game sector. The first significant incorporation of tactile immersion into audiovisual art was the virtual reality park *The Void* (2015), which integrated VR head-mounted displays with haptic vests, gloves, and physical environmental elements (e.g., walls, doors, textured floors), generating an impression of

complete absorption within a virtual world. Visitors could perceive the texture of a virtual wall through touch, undergo the sensation of a grenade detonation via vest vibration, or experience the heat of volcanic lava through integrated heating elements. Tactile immersion effectively dissolves the ontological distinction between the viewer's body and the media object: the viewer shifts from mere perception to embodied experience of the creation through touch, constituting a profound reorientation within aesthetic theory, traditionally dominated by visual and auditory modalities (Stark, 2024). It is precisely at this confluence of spatial, audial, and haptic modalities that the metamodern aesthetics of immersion is born — understood not as an avoidance of actuality, but as an augmentation of sensory experience, where technology serves as an extension not solely of ocular and auditory faculties (as per M. McLuhan) but of the holistic corporeal apparatus.

Initial manifestations of interactivity in audiovisual art were predicated upon a branching narrative paradigm, wherein the viewer or player selects from predetermined narrative pathways for the development of events, and the system then presents the associated audiovisual segment or scene. A quintessential illustration from the video game industry is *Heavy Rain* (2010, Quantic Dream studio), which offered an intricate framework of ethical decisions: four central characters investigate the "Origami Killer" case, and every choice made by the player — whom to rescue, whom to trust, whether to transgress legal boundaries — yielded enduring ramifications, potentially culminating in the demise of a central character, after which the narrative subsequently progressed in their absence (Wei, & Calvert, 2011). A still more intricate structural divergence was evident in *Until Dawn* (2015, Supermassive Games studio), where players managed the actions of eight adolescent characters in a slasher-film style scenario: the fate of each character, survival or demise, was contingent upon a multitude of choices and quick-time events, with the concluding sequence offering in excess of 250 distinct permutations (Zahrakhosravi, 2025). In interactive cinema, as previously noted, this model was refined in *Late Shift* (2016) and *Black Mirror: Bandersnatch* (2018). However, research indicates that the branching structure possesses an inherent constraint: the proliferation of alternatives increases geometrically with each new decision node, rendering it impractical to construct genuinely intricate

multi-stage narratives owing to technical and financial limitations (Jones, 2022). Consequently, this "decision tree" model is progressively being supplanted by a more adaptive framework — procedural content generation.

Procedural generation (PG) is an algorithmic approach for the dynamic creation of content, circumventing the need for prior manual design of individual constituent elements. In contrast to conventional systems that offer selections from a predetermined, finite set of branches, PG frameworks synthesize novel worlds, entities, scenarios, or even comprehensive narratives, drawing upon specified rules, stochastic values, and user-derived information. A seminal illustration of PG is presented by *Minecraft* (2011, Mojang Studios), wherein each virtual environment is procedurally constructed. Topography, subterranean structures, hydrological features, ecological zones, and the distribution of raw materials are all algorithmically derived, contingent upon a foundational stochastic parameter (a "seed"), thereby ensuring the distinctiveness of each generated world (Dallan, 2024). Such extensive variability is unattainable through traditional branching narratives; *Minecraft*, for instance, offers not a finite set of conclusions, but a virtually boundless array of potential user interactions.

No Man's Sky (2016, Hello Games) represented a more ambitious application, envisioning a vast cosmic expanse comprising 18 quintillion distinct planetary bodies, each likewise procedurally generated. Botanical forms, zoological species, ecological systems, meteorological conditions, and even nomenclature are all algorithmically synthesized. This paradigm elevates the concept of interactivity, as the participant's agency extends beyond mere selection from predefined narrative paths. Instead, user actions (e.g., exploring specific planetary biomes, extracting particular resources) directly modulate the parameters of algorithmic synthesis. Consequently, the system responds dynamically to user input, altering the likelihood of manifestation for certain elements (Cook, 2020). This metamodern "oscillation" — the dynamic interplay between stochastic elements and deterministic rules — constitutes the foundational aesthetic principle of procedural generation. The user experiences a duality of perception, simultaneously embracing the role of an explorer discovering a novel realm while remaining cognizant of its algorithmic provenance, governed by designer-established parameters.

The subsequent evolutionary phase involved real-time algorithmic adaptation, a paradigm wherein interactivity transcends the confines of discrete artifacts and pervades the entirety of the content delivery pipeline, individually tailored for each recipient. A salient instance is the streaming platform *Twitch* (launched in 2011), where audiences can exert influence over the trajectory of a streamer's game via synchronous text-based communication, employing directives, collective polling, or even direct manipulation of character actions through specialized bot intermediaries. The phenomenon of *Twitch Plays Pokémon* (2014), where tens of thousands of simultaneous viewers collectively controlled a single character via chat commands, became a widespread cultural event (Hamilton et al., 2014). This emergent behavior is frequently designated as "crowd interactivity". Rather than centralized individual decision-making, a decentralized collective agency manifests among myriad users, whose frequently conflicting directives result in a disordered yet captivating manifestation of communal innovation. The efficacy of this interactive paradigm was notably evinced by the *Twitch Plays Pokémon* social experiment, where a vast aggregation of over one million individuals jointly governed a single game character through the issuance of textual directives. This dynamic is intrinsically characterized by spontaneous, emergent engagement, facilitating the transition of passive observers into active, co-creative agents (Aleta, & Moreno, 2019).

Further exemplification is found in customized content delivery on platforms such as Netflix, where proprietary algorithms dynamically modify the duration of episodes, the episodic progression, or even specific elements within scenes, all in accordance with the user's past consumption patterns. Despite the inherent opacity of this technology, scholarly discourse highlights that algorithmic adaptation effectively dissolves the demarcation between a "fixed artifact" and a "continuous data flow". The recipient transitions from a passive consumer of a static entity to an active participant in an iterative process of algorithmic refinement, wherein each interaction (e.g., viewing, approving, omitting) functions as a datum for subsequent customization.

From this vantage point, the trajectory of interactive methodologies — spanning from branching narratives to procedural generation and culminating in algorithmic adaptation — is discernible as a progression from constrained, delimited frameworks with finite

selectable outcomes towards expansive, perpetually extensible systems. Within these advanced systems, the foundational principles of engagement are subject to dynamic modification during interaction. This embodies the metamodern conception of interactivity: not merely an illusion of agency within predefined constraints, but rather the fostering of authentic collaborative authorship, wherein the user assumes the role of a co-architect in the algorithmic process.

A pivotal catalyst in the evolution of audiovisual communication during the 2000s and 2010s was the widespread adoption of virtual reality (VR), augmented reality (AR), mixed reality (MR), and extended reality (XR) technologies. Initially confined to experimental laboratory settings and digital art installations (such as the interactive piece *telefunken (wtc)*, which transformed sound into visual elements) in the early 2000s, these innovations achieved broader recognition following the release of the Oculus Rift DK1 in 2012 (Lang, 2014). A notable illustration is the documentary *Zero Point* (2014) by Danfung Dennis, designed for the Oculus Rift. Its 360-degree cinematography enabled viewers to freely select their perspective, immersing them directly within diverse scenarios like a stock exchange or a military training ground. This production underscored the dissolution of the traditional cinematic frame and the integration of "invisible" editing, as the viewer's gaze autonomously directed attention (Lang, 2014). Subsequently, Eliza McNitt's *Spheres* (2018) garnered the Venice Film Festival's award for best immersive narrative and became the first VR film to command a seven-figure sum at Sundance (Graver, 2019). Developed using the Unity engine, *Spheres* afforded complete 360-degree spatial navigation, with interactive elements responsive to voice and bodily movements within a cosmic environment. Concomitantly, the audiovisual lexicon transformed: sound acquired spatial properties, serving as an attentional guide, and haptic feedback (via Oculus Rift controllers) facilitated tactile engagement with the media experience.

In my previous research, I argued that 360° VR video transcends a mere technical format, constituting a "technological brand" within contemporary film production that shapes a novel visual paradigm rooted in principles of immersion, active viewpoint selection, and simultaneous perception. In contrast to the conventional cinematic frame, where directorial agency dictates viewer attention through editing and composition, 360° video delegates this control to the spectator,

who autonomously navigates the visual field, thereby generating a distinct observational experience each instance (Pecheranskyi, 2023). This empowerment, however, introduces a novel aesthetic challenge: how to sustain the "attractiveness" of the visual sequence when the viewer possesses the liberty to divert their gaze from crucial narrative elements? I have proposed several methodologies to address this conundrum, notably the strategic deployment of auditory cues, dynamic illumination for directing focus, and bespoke editing tailored to the temporal dynamics of 360° content consumption (Pecheranskyi, 2023). These strategies align directly with the metamodern aesthetic of "oscillation", wherein the viewer's apparent freedom of choice is subtly pre-structured by technological and narrative mechanisms that discreetly guide attention toward salient points within the spatial environment. Consequently, 360° VR video exemplifies a "strong" form of complicit agency, where the collaborative design efforts of the director, cinematographer, and sound designer converge with technological capabilities (e.g., head-tracking systems, spatial audio) to foster an emergent and inherently unique experience for every individual viewer.

Concurrently with the advancements in VR, augmented reality (AR) technologies underwent significant development. The mobile application *Pokémon GO* (2016) presented a hybrid experience, superimposing virtual entities onto physical environments via smartphone cameras. Artistic endeavors, such as the London-based collective Marshmallow Laser Feast's *In the Eyes of the Animal* (2015), allowed participants to perceive a forest from an insect's perspective, employing LiDAR scanning and 360-degree drone cinematography (McGoogan, 2015). In 2016, Microsoft unveiled HoloLens, a mixed reality (MR) device facilitating interaction with holographic objects intrinsically integrated into physical space. By 2017, the comprehensive term XR (extended reality) emerged, unifying VR, AR, and MR. The collective influence of these technologies profoundly reshaped audiovisual conventions: the cinematic frame, once a fundamental element of filmic language, diminished in its privileged status; editing became contingent upon viewer movement; sound evolved into a primary attentional guide; and the spectator's corporeal presence assumed centrality within the artistic encounter. As Armstrong posited:

"We have to change the whole language of film.

The frame no longer exists. We have to learn from games culture. The goal remains, though — to put you in someone's shoes to help you understand them better" (Armstrong, 2014).

The zenith of interactivity and immersion has manifested in the concept of metaverses — enduring, socially interactive three-dimensional digital environments where users, represented by avatars, engage in communication, creation, recreation, and economic transactions. A forebear to this phenomenon was the platform *Second Life* (2003), which offered a virtual realm enabling users to acquire digital property, construct structures, and trade goods using the internal Linden Dollar currency, convertible into real-world funds (Hatmaker, 2022). A substantial breakthrough materialized in the 2010s with the proliferation of VR-based platforms. *VRChat*, launched in 2017, empowered users to fashion their own avatars and digital domains, leveraging body movements and facial expressions tracked via VR controllers for real-time interaction. Distinct from conventional gaming, a prescribed narrative was absent; content was entirely user-generated, embodying a "strong" form of interactivity. The gaming metaverse *Fortnite* (2017) expanded the traditional definition of a game, with its virtual expanse subsequently hosting musical performances (e.g., Travis Scott's *Fortnite* concert, 2020), cinematic screenings (e.g., Nolan's *Inception*, 2020), and political assemblies (e.g., *We The People*, 2020). *Roblox* (established 2006, gaining prominence in the 2010s) furnished users with tools for proprietary game development and revenue generation through its virtual currency, Robux, also exchangeable for real money (Yaden, 2020). Within these metaverses, interactivity and immersion attain their highest degree of synthesis: the user is not merely an observer but an active co-creator, and technology functions as an unobtrusive mediator sustaining expansive digital ecosystems. Thus, metaverses emerge not only as a technological innovation but also as an aesthetic paradigm — embodying the metamodern aspiration for "new sincerity", where artificially constructed worlds become venues for authentic emotions, relationships, and even political engagement.

The metaverses emerging between the 2010s and 2020s do more than merely integrate interactivity and immersion; they fundamentally reshape the roles of author and spectator. In contrast to constrained inter-

active narratives, such as interactive cinema, where user agency is circumscribed by pre-established pathways, metaverses facilitate "continuous engagement." Within these environments, participants construct their own virtual personae, fabricate digital milieus, and engineer interactive frameworks. In certain instances, exemplified by platforms like *Decentraland* (2017) and *The Sandbox* (2011, metaverse release 2018), users even attain joint ownership of virtual real estate and economic systems, facilitated by distributed ledger technologies (blockchain) and non-fungible tokens (NFTs). For example, in *Decentraland*, land parcels are acquired by players using MANA cryptocurrency, with each plot constituting a unique token, enabling the establishment of casinos, galleries, clubs, or even entire districts operating under bespoke regulations. This evolution from a participatory co-creator ("viewer-co-author") to an owner-creator ("owner-co-author") signifies a pivotal advancement in the history of interactive media, where the user not only influences narrative progression but also acquires proprietary entitlements over a segment of the virtual realm (Koehler, 2025). A salient illustration of this phenomenon was Travis Scott's virtual concert in *Fortnite* in April 2020, which attracted an audience exceeding 27 million concurrent participants. During this event, the artist's colossal avatar traversed the digital terrain, while audience avatars navigated the environment by swimming, flying, and dissolving into volcanic formations, all synchronised with the musical performance (Travis Scott's *Fortnite*, 2020). This constituted not merely a concert but a syncretic audiovisual event that dissolved conventional distinctions between musical performance, gaming, and social gathering, with attendees transitioning into active contributors to the spectacle via their digital representations. Such events embody the tenets of metamodern aesthetics: the genuine affective engagement of a collective experience (manifested through avatar-mediated expressions of emotion such as sorrow, joy, and embrace) is juxtaposed with an ironic detachment (stemming from the recognition of the digital construction of the environment), wherein technology functions not as an impediment but as a conduit for genuine emotional expression (Kretzschmar, 2021). Consequently, metaverses are not merely an incremental progression of gaming or social networking platforms but rather constitute an emergent cultural milieu where interactivity and immersion attain comprehensive integration, and the

recipient ultimately transforms into a co-creator, co-proprietor, and co-resident of the digital domain.

Conclusion. The preceding analysis has demonstrated that interactivity and immersion in digital audiovisual art of the 2000s–2010s manifest not as discrete technological implements or psychological phenomena, but as foundational aesthetic paradigms that govern the core tenets of artistic experience structuring in the metamodern era. These paradigms establish novel standards and evaluative benchmarks for creative output, reconfiguring the dynamic between originator, artifact, and audience. They engender a novel conceptual domain wherein conventional aesthetic classifications (e.g., the beautiful, the sublime, the tragic) are superseded by concepts such as participation, agency, immersion, and presence. Interactivity, evolving from rudimentary forms of branching narrative to sophisticated procedural generation and algorithmic adaptation, elevates the spectator from a passive recipient to an active co-creator whose agency directly influences narrative progression. Immersion, through the synthesis of spatial, auditory, and tactile dimensions, obliterates the ontological demarcation between the corporeal self of the observer and mediated reality, thereby engendering a sensation of "presence" in lieu of conventional "contemplation". Together, these paradigms actualize the quintessential metamodern sensibility — an oscillation between technological optimism and the quest for authenticity, between ludic liberty and profound engagement, and between ironic detachment and emergent sincerity.

The evolutionary trajectory of interactive and immersive practices during this period reveals a consistent movement from constrained systems offering a finite array of choices (e.g., branching narratives in *Late Shift* or *Bandersnatch*) to expansive, infinitely malleable frameworks where the very operational rules of interaction can dynamically adapt (e.g., procedural generation in *Minecraft* and *No Man's Sky*, algorithmic adaptation on *Twitch*). Virtual Reality (VR), Augmented Reality (AR), Mixed Reality (MR), and Extended Reality (XR) technologies have fundamentally recalibrated audiovisual semiosis: the visual frame has been divested of its singular primacy, editorial processes are now contingent upon audience locomotion, auditory elements function as attentional cues, and embodiment has assumed a central position within the artis-

tic encounter. The zenith of this developmental arc is represented by metaverses (e.g., *VRChat*, *Fortnite*, *Decentraland*), where interactivity and immersion attain their maximal integrative potential, and the recipient ultimately transforms into a co-creator, co-proprietor, and co-resident of the digital realm. Concurrently, as evinced by the analysis of specific works, metamodern aesthetics does not obviate antecedent artistic methodologies but rather engages in a complex intertextual discourse with them, such that conventional passive reception coexists with dynamic involvement, and linear narratology is juxtaposed with generative proceduralism.

Prospects for further research can be delineated across several avenues. First, further theoretical explication is required regarding the transformative impact of interactivity and immersion on established aesthetic categories — specifically, the concept of "authorship", which, in an environment of distributed agency spanning human, algorithmic, and audience contributions, necessitates substantial re-evaluation (this bears a direct correlation with the theoretical construct of "complicit agency" developed in previous publications). Second, the examination of the influence of post-platform frameworks (e.g., Web3, decentralized virtual environments, neuro-interfacing technologies) on the progression of interactive and immersive paradigms is pertinent, particularly concerning the manner in which distributed ledger and non-fungible token technologies are redefining proprietary status and collaborative creative attribution within virtual environments. Third, the phenomenon of "algorithmic subjectivity" warrants additional inquiry, particularly concerning instances where recommendation engines and generative artificial intelligence models not only mediate but actively construct the experiential reality of the participant, thereby rendering the demarcation between human intentionality and machinic agency progressively indistinct. This opens an emerging domain for interdisciplinary scholarly endeavor at the nexus of aesthetics, media studies, and computational science. Finally, it is crucial to scrutinize the ways in which interactive and immersive paradigms shape the constitution of collective identity and societal practices in the digital age, encompassing phenomena from virtual musical performances and political convocations within metaverses to novel modalities of collaborative artistic production and economic enterprise.

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Печеранський Ігор Петрович

Естетичні парадигми інтерактивності та імерсії в цифровому аудіовізуальному мистецтві епохи метамодерну

Анотація. Метою статті є дослідити траєкторію розвитку інтерактивності та занурення, концептуалізовані як естетичні парадигми в цифровому аудіовізуальному мистецтві протягом 2000–2010-х рр. Аналіз ґрунтується на розгляді основоположних праць та ключових технологічних платформ, характерних для цієї епохи. Методологічна основа побудована на синтезі метамодерністської концепції (Т. Вермелен, Р. ван ден Аккер), медіа-археологічного підходу (Ф. Кітлер, С. Зелінський) та теорії актор-мережі (Б. Латур). Це теоретичне об'єднання сприяє розумінню інтерактивності та імерсії не лише як технічних атрибутів, а і як фундаментальних естетичних парадигм. Основний академічний внесок у концептуалізації інтерактивності та імерсії як парадигм, що встановлюють нормативні межі, оціночні стандарти та плани для творчого вирішення проблем у цифрову епоху. Крім того, він визначає їхній внутрішній зв'язок з метамодерністською чутливістю, що характеризується «коливаннями» між щирістю та іронією, а також між автономією та обмеженням. Ці парадигми фундаментально реконфігурують роль глядача, перетворюючи його з пасивного реципієнта на активного співтворця, тим самим розчиняючи онтологічну демаркацію між тілесним існуванням та опосередкованою реальністю. Їхня еволюційна траєкторія окреслює прогрес від обмежених систем, що пропонують обмежений репертуар вибору (наприклад, розгалужені наративи), до розширених, відкритих систем, що характеризуються процедурною генерацією та алгоритмічною адаптацією. Метавсесвіти, у цьому контексті, проявляються як квінтесенція середовища для всебічного синтезу обох парадигм. У цих цифрових екосистемах окремий глядач зрештою бере на себе різноманітні ролі: співавтора, співвласника та співмешканця цифрового простору.

Ключові слова: інтерактивність, занурення, естетичні парадигми, метамодернізм, цифрове аудіовізуальне мистецтво, VR/AR/XR, процедурна генерація, метавсесвіти.

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