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INTERACTIVE STORYTELLING IN VR GAMES: REVISITING JANET MURRAY'S LEGACY

Olexander Poberailo,
Postgraduate Student at the Department of Art Studies,
Kharkiv State Academy of Culture (Kharkiv, Ukraine)
ORCID ID: 0009-0003-8259-4921
poberailo@gmail.com

Abstract. This article examines the prospects for interactive storytelling in virtual reality (VR) games through the theoretical lens of Janet Murray's foundational concepts: immersion, agency, and transformation. While Murray's work provided a seminal framework for digital narrative, the rapid evolution of VR technologies and artificial intelligence (AI) necessitates a critical reassessment of these ideas. Utilizing a narrative literature review, this study synthesizes theoretical extensions by scholars such as Marie-Laure Ryan and Hartmut Koenitz, while addressing ludological critiques regarding the tension between game rules and narrative structure. The analysis identifies three primary directions for future development: the integration of AI for real-time adaptive narratives, the use of VR for educational and empathetic "storyliving," and the emergence of collaborative storytelling in social VR spaces. The study argues that while VR amplifies the potential for embodied narrative experiences, it also introduces significant ethical and practical challenges, including algorithmic bias, accessibility barriers, and the risk of illusory agency. The conclusions suggest that the future of VR storytelling lies in hybrid models that successfully balance authored intent with procedural openness and social responsibility.

Key words: Interactive Storytelling, Virtual Reality (VR) Games, Janet Murray, Artificial Intelligence, Narrative Design.

Introduction. Interactive storytelling in digital media has undergone significant evolution since Janet Murray's seminal work, ***Hamlet on the Holodeck: The Future of Narrative in Cyberspace*** (Murray, 1997). Murray envisioned computational environments as participatory spaces where narratives emerge through user interactions, characterized by immersion (enclosure in alternate realities), agency (meaningful actions with feedback), and transformation (shape-shifting stories).

This framework has profoundly influenced virtual reality (VR) games, a medium that amplifies presence and enactment. However, as VR technologies advance in tandem with artificial intelligence (AI) and procedural generation, there is a need to reassess the prospects for interactive storytelling by building on Murray's legacy and the work of her followers.

Purpose and Objectives of the Study. The primary purpose of this article is to provide a comprehensive analysis of the future prospects for interactive storytelling in VR games, extending Janet Murray's narratological approach to contemporary digital contexts. By integrating critical insights from her followers, the study aims to bridge theoretical foundations with practical innovations, justifying the topic's relevance beyond a purely historical review. This involves demonstrating how Murray's ideas enable hybrid models that address real-world complexities, such as ethical dilemmas and social issues, within immersive VR environments.

To achieve this purpose, the article first reviews and analyzes recent research on Murray's followers in interactive digital narratives (IDN) to identify thematic continuities that substantiate the focus on VR games. This foundational step is followed by a critical analysis highlighting extensions, critiques, and specific gaps in relation to VR storytelling, alongside a delineation of the methodology employed for synthesizing the literature. Subsequently, the study explores the main prospects for the field, including AI integration, educational applications, and ethical considerations. The analysis con-

cludes by drawing inferences aligned with these objectives and offering recommendations for future research, ensuring a rigorous, evidence-based exploration of VR's unique affordances.

Main part. Recent scholarship extends Murray's foundational concepts by shifting the analytical focus from linear narrative structures to complex, procedural systems – a transition critical for understanding modern VR. Koenitz (2015) formalized this shift through the System–Process–Product (SPP) model, positioning interactive narratives not as static stories but as "protostories" realized only through user interaction. This systemic view parallels the adaptive nature of VR environments, where narrative meaning is co-constructed rather than passively received. Nack (2022) further argues that this hybridity makes IDN a unique medium for representing socio-technical complexity, suggesting that VR's affordances are best utilized not for simple escapism but for ethical simulation and "moral experimentation".

However, the application of Murray's concepts to VR is not without contention. Ryan (2001) refines the notion of immersion, critiquing Murray's holistic formulation by distinguishing between spatial, temporal, and emotional engagement. She posits that true immersion in virtual environments demands "active mental reconstruction" rather than seamless agency, a distinction that highlights the cognitive load inherent in VR experiences. Conversely, ludological critiques explicitly challenge the narratological bias. Aarseth (1997) prioritizes "ergodic effort," characterizing games as configurations of rules rather than stories, while Juul (2005) identifies an inherent "clash" between game rules and fiction. In the context of VR, this tension is exacerbated: the procedural constraints necessary to maintain a coherent virtual world often limit the "transformational" agency Murray originally envisioned. More recent studies, such as those by Cardona-Rivera and Young (2019), attempt to bridge this gap by focusing on narrative affordances and player cognition, treating Murray's legacy as a catalyst for emergent storytelling models rather than a rigid canon.

Murray herself has actively engaged with these evolutions, moving beyond her early hypotheses to address the "kaleidoscopic" nature of contemporary digital narratives. In later works, she reaffirms that immersion and agency remain foundational but must embrace complexity to simulate real-world systems (Murray, 2018). She explicitly critiques transmedia approaches tied to "legacy platforms," advocating instead for design strategies that leverage distinct digital affordances – a perspective that directly supports the development of "cyberdrama" as enacted stories in virtual environments (Murray, 2004; 2017). Furthermore, her responses to ludological critiques emphasize the hybrid potential of digital media, arguing that the perceived dichotomy between story and play overlooks the capacity of interactive environments to offer cathartic, agentic experiences (Murray, 2005; Jenkins, 2012).

Despite the rich international discourse, a targeted analysis of Ukrainian academic databases reveals a significant gap. Queries utilizing terms related to Murray's legacy or IDN theory on local academic domains yielded no direct results. The available literature focuses predominantly on technical aspects of computer graphics or general pedagogical approaches, lacking specific engagement with interactive narratology. This absence indicates a potential disconnect between global IDN theoretical frameworks and local academic contexts, highlighting a clear opportunity for future research to bridge this divide.

Methodology. This study employs a thematic, narrative literature review rather than a fully systematic review. The aim is to bring into dialogue key theoretical and applied works on interactive digital narratives (IDN), Janet Murray's legacy, and VR games, in order to trace conceptual continuities and emerging prospects. Sources were identified through targeted searches in academic databases (e.g., Google Scholar, ACM Digital Library) using keywords such as "interactive storytelling," "Janet Murray," "VR games," and "interactive digital narrative," as well as through citation chaining from foundational texts.

The selection prioritizes peer-reviewed articles and books published between 1997 and 2023 that explicitly address Murray's concepts (immersion, agency, transformation) or extend them in IDN and

VR contexts. In addition, a small number of industry reports and community or developer materials (e.g., market analyses, developer blogs, player discussions) are included to illustrate how theoretical ideas manifest in commercial practice; these are treated as contextual rather than primary analytical evidence.

Data synthesis follows a thematic strategy: sources are grouped into (1) theoretical extensions of Murray's framework (e.g., Ryan's typologies of immersion, Koenitz's SPP model), (2) critical responses (e.g., ludological critiques by Aarseth and Juul), and (3) applications and prospects (e.g., VR projects and AI-driven IDN). Within each theme, the analysis compares how authors conceptualize immersion, agency, and transformation, and evaluates their implications specifically for VR games. The resulting synthesis underpins the forward-looking assessment of prospects and ethical challenges.

Results and discussion. The theoretical underpinnings of interactive storytelling in VR have expanded significantly beyond Murray's original framework by incorporating cognitive narratology and systems theory. Ryan (2001) refines the concept of immersion, arguing that VR amplifies spatial, temporal, and emotional engagement through "embodied cognition," where the user's physical presence bridges virtual and real perceptual cues. This perspective aligns with phenomenological approaches, positioning VR as a space where bodily interaction is central to meaning-making. Parallel to this, Koenitz (2015) offers the System–Process–Product (SPP) model, which conceptualizes narratives as dynamic "protostories" realized through interaction—a structure that mirrors VR's procedural nature. Nack (2022) extends this by framing IDN as a tool for representing socio-technical complexity, suggesting that AI-driven loops can support reflective agency in ethical simulations. However, ludological critiques persist; scholars like Aarseth (1997) and Juul (2005) warn that strict game rules may clash with narrative fluidity, a tension particularly visible when procedural constraints limit the "transformational" potential of VR environments. To bridge this divide, Vallance and Towndrow (2022) propose "narrative storyliving," distinguishing VR from traditional storytelling by emphasizing active internalization and co-authorship over passive consumption.

Contemporary VR titles illustrate these theoretical concepts by operationalizing agency through distinct mechanics. *Half-Life: Alyx* (Valve, 2020) and *The Walking Dead: Saints & Sinners* (Skydance Interactive, 2020) exemplify "physics-based agency," where manual interaction with the environment reveals plot layers and forces moral choices, effectively grounding Murray's concept of transformation in tactile experience. In contrast, titles like *Lone Echo* (Ready at Dawn, 2017) and *Moss* (Polyarc, 2018) prioritize "emotional immersion," utilizing specific locomotion mechanics (zero-gravity) or framing devices (diorama perspectives) to foster empathy and believable character relationships. Collaborative possibilities constitute another frontier. *The Under Presents: Tempest* (Tender Claws, 2020) demonstrates how VR can function as a "cyberdrama" arena for multiplayer storytelling, though experiments like *The Invisible Hours* (Tequila Works, 2017) reveal the difficulty of balancing spatial freedom with narrative pacing – often resulting in passive observation that undermines the player's sense of influence.

Looking toward 2030, industry trends point to a convergence of AI and metaverse-like spaces. Emerging projects (e.g., from NeuroSyncVR) frame AI not merely as a production tool but as a mechanism for thematic personalization, addressing complex issues such as isolation or ethics through procedurally generated narratives.

However, these advancements bring significant risks. The heightened sense of presence in VR raises the stakes for "illusory agency," where algorithmic biases may perpetuate discriminatory storylines or manipulative behavioral feedback loops. Furthermore, issues of accessibility, ranging from hardware costs to motion sickness, threaten to limit these transformative experiences to a privileged demographic. Thus, while the potential for "storyliving" is evident, its realization depends on resolving the tension between procedural openness, narrative coherence, and ethical responsibility.

Table 1

Key Prospects for Interactive Storytelling in VR Games

Prospect Area	Murray's Concept	Strategic Implications & Critical Challenges
AI-Driven Narratives	Transformation	Enables real-time personalization but risks algorithmic bias and "illusory agency" without transparent design1.
Educational VR	Immersion	Facilitates experiential "storyliving" for social impact; limited by hardware accessibility and validity gaps2.
Ethical Design	Agency	Essential for safety in deep immersion; requires balancing procedural constraints with user consent norms3.
Multiplayer Hybrids	Cyberdrama	Fosters collaborative co-authorship yet challenges narrative coherence under real-time social interaction4.

From this systematization, distinct patterns emerge regarding the maturity and risk of these prospects. Immediate potential is most evident in educational VR and ethical design, which directly operationalize Murray's concepts of immersion and agency. However, these applications require rigorous empirical validation to avoid becoming elitist "empathy machines" accessible only to a privileged few.

In contrast, AI-driven narratives offer the most radical reinterpretation of transformation, yet they paradoxically amplify the risks of illusory agency and algorithmic bias; without transparent implementation, such systems threaten to simulate depth rather than deliver it. Similarly, multiplayer hybrids effectively demonstrate the cyberdrama ideal of co-authorship but expose the fragility of narrative coherence when subjected to unpredictable social interaction.

Taken together, these observations suggest that the central challenge is no longer the invention of novel storytelling techniques, but the orchestration of viable hybrids: balancing authored structure with procedural openness, and individual expression with social responsibility. Closing this maturation gap will likely depend less on technical innovation and more on interdisciplinary collaboration among narratologists, designers, and ethicists.

Conclusions. This study indicates that the evolution of VR games serves as a critical testing ground for Janet Murray's narratological framework, confirming that her concepts of immersion, agency, and transformation remain vital yet require significant updating in the age of algorithmic media. The analysis demonstrates that the "Holodeck" ideal is shifting from a purely technological ambition to a complex design challenge that must reconcile authored intent with procedural openness.

While early VR adaptations focused on spatial immersion, the emerging prospects identified pecifically AI-driven narratives and social "storyliving" suggest a transition toward systemic agency. However, this shift introduces a paradox: as technologies enable deeper transformation and personalization, they simultaneously amplify ethical risks regarding privacy, algorithmic bias, and illusory choices. Consequently, the realization of Murray's vision depends not merely on graphical fidelity or processing power, but on the development of "hybrid" narrative architectures that can support meaningful player action without compromising narrative coherence or user safety.

Ultimately, the future of interactive storytelling in VR lies in interdisciplinary collaboration. Future research must pivot from theoretical taxonomy to empirical validation, specifically focusing on how players cognitively process AI-mediated characters and the long-term social impacts of immersive simulations. The legacy of the Holodeck, therefore, functions less as a blueprint for escapism and more as a mandate for ethical, human-centric design in increasingly autonomous digital environments.

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