

Immersive Heritage: Challenges and Opportunities of Virtual Reality in Cultural Heritage Reproduction

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ABSTRACT

Virtual reality (VR) has emerged as a powerful tool in the reproduction and dissemination of cultural heritage. From archaeological reconstructions to interactive museum exhibitions, immersive technologies offer new avenues for historical engagement and public education. However, these advancements also pose significant challenges, including questions of authenticity, accessibility, preservation ethics, and epistemological integrity. This paper explores the opportunities and limitations of VR in cultural heritage contexts, analyzing its role in transforming how we experience, understand, and curate the past. Drawing from case studies across Asia and Europe, and guided by both media archaeology and critical heritage theory, the study outlines a framework for balancing technological innovation with cultural responsibility in the digital reproduction of memory.

Keywords: Virtual Reality, Cultural Heritage, Digital Reproduction.

INTRODUCTION

In recent years, the use of virtual reality (VR) in cultural heritage has grown from experimental novelty to institutional standard. Across the globe, museums, heritage sites, and academic consortia are adopting immersive technologies to reconstruct ruins, simulate historical environments, and visualize intangible traditions. The promise of VR lies in its capacity to immerse users in multisensory, interactive representations of the past, which traditional forms of documentation—text, image, or static 3D modeling—cannot match. However, the enthusiasm that surrounds these technological applications often obscures deeper philosophical and ethical questions: What does it mean to "experience" a place or moment that no longer exists? Who decides which version of the past is rendered visible? And how does immersion impact our understanding of authenticity, memory, and cultural continuity?

This paper argues that while VR has significant potential to democratize access to heritage and enhance interpretive strategies, it must also be approached with critical awareness. Issues of narrative control, technological obsolescence, and socio-cultural bias permeate many VR heritage projects, often reinforcing rather than challenging hegemonic narratives. In exploring these tensions, the paper draws upon theoretical insights from critical heritage studies, postcolonial media theory, and the materialist turn in digital culture scholarship. In particular, the study engages with concepts of cultural encoding, simulation theory, and post-representational museology to illuminate the deeper implications of digitally mediated memory.

THEORETICAL FRAMEWORKS: AUTHENTICITY, SIMULATION, AND MEDIA ARCHAEOLOGY

The debate surrounding authenticity in heritage reproduction has long animated cultural theory. In the context of VR, authenticity must be understood not only as factual accuracy but as the affective and cultural

resonance of reconstructed experiences (Smith, 2006). Walter Benjamin's seminal critique of the "aura" of original artworks (1936) finds new relevance here: in digitally reconstructing a temple, a lost manuscript, or a vanished landscape, do we preserve memory, or fabricate nostalgia?

Media archaeology offers another critical lens, foregrounding the material and technological conditions under which cultural memory is mediated. Erkki Huhtamo and Parikka (2011) and Wolfgang Ernst (2013) have emphasized how each media form carries implicit ideologies—VR included. Thus, immersive simulations are not neutral reconstructions but techno-cultural artifacts shaped by institutional, aesthetic, and historical forces.

Baudrillard's (1981) concept of simulacra and hyperreality is also central. In VR, the line between representation and reality becomes blurred; users may interact with a reconstruction that is more vivid and engaging than the historical referent itself. This hyperreal environment challenges the notion of fidelity, replacing it with a digitally induced experience that can reshape collective memory.

CASE STUDIES: PRACTICING VIRTUAL HERITAGE

The Kyoto Byōdō-in Reconstruction

An iconic Pure Land Buddhist temple in Japan, Byōdō-in's digital twin enables users to explore its 11th-century interior using a VR headset. Despite meticulous data capture via LiDAR and photogrammetry, certain iconographies—like the symbolic placement of Bodhisattvas—are speculative. The question emerges: when does informed interpretation become imaginative intervention?

Roman Forum Reimagined (Italy)

This multi-agency EU project reconstructed the Roman Forum using game engines and AI extrapolation. While visually spectacular, critiques note that the interface aestheticized imperial grandeur, sidelining everyday Roman life and marginalized groups. The absence of interpretive context risks presenting simulation as historical certainty.

Indigenous VR Archive (Canada)

Unlike the top-down approach of many heritage simulations, this indigenous-led initiative co-created VR landscapes with community elders and youth. Storytelling, ritual performance, and environmental memory were encoded into virtual territories. This case exemplifies ethical collaboration and cultural sovereignty in immersive media.

These case studies demonstrate that virtual heritage is not monolithic but reflects varying methodologies, priorities, and levels of community participation. They also highlight the need for constant negotiation between fidelity to historical record and the imaginative potential of immersive environments.

CHALLENGES: ETHICS, OBSOLESCENCE, AND INSTITUTIONAL AGENDAS

Virtual heritage projects face multiple challenges:

Ethical Tensions: Whose voice is privileged in reconstructing the past? Top-down simulations may inadvertently silence plural histories or reproduce colonial perspectives.

Technological Obsolescence: VR applications depend on hardware and software ecosystems prone to rapid obsolescence. How do we preserve access to these digital artifacts in the long term?

Institutional Agendas: Many heritage simulations are driven by tourism or branding motives. This risks reducing cultural complexity to entertainment, turning historical experience into consumable spectacle (Tsivopoulos & Pujol-Tost, 2019).

Epistemic Risk: The realism of VR can mask the interpretive nature of reconstructions, leading users to assume objectivity where there is subjectivity. This has implications for historical literacy and critical thinking.

These challenges underscore the need for ethical design, transparent authorship, and participatory frameworks that include source communities in the design process.

OPPORTUNITIES: ENGAGEMENT, EMPATHY, AND EDUCATIONAL REACH

Despite their risks, VR platforms also offer remarkable opportunities:

Emotional Engagement: Immersive environments can evoke empathy and historical presence, enabling users to relate to past lives and events in visceral ways.

Pedagogical Innovation: VR can transform education, making abstract or distant histories tangible and relevant. When properly contextualized, simulations foster critical thinking.

Access and Inclusion: VR allows remote or mobility-impaired users to access heritage sites they could not otherwise visit. When designed inclusively, this expands the cultural commons.

Community Co-creation: Participatory VR projects allow cultural communities to embed their own epistemologies, symbols, and narratives into the digital fabric, ensuring cultural continuity.

The key lies in designing VR experiences that are not only visually compelling but also intellectually rigorous and socially just.

CONCLUSION

Virtual reality is not simply a tool for preservation; it is a mode of cultural production that shapes how history is visualized, remembered, and transmitted. As this paper has shown, immersive heritage can empower education, empathy, and engagement—but only if deployed reflexively. The cultural authority VR exerts must be checked by frameworks of critical heritage practice that prioritize inclusivity, narrative transparency, and epistemological humility.

By embedding VR heritage practices within broader ethical and theoretical debates, we can ensure that digital memory does not become just another spectacle, but a space of shared cultural responsibility. A reflexive virtual heritage practice must consider:

Collaborative authorship models

Long-term digital stewardship

Transparent interpretive framing

Cultural sustainability

As we navigate an increasingly digital future, the reproduction of heritage must be more than a matter of visual fidelity or technological sophistication. It must ask: Who builds the past? For whom? And to what end?

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