


Chapter 3


Multimodal Context– Awareness in AI– Driven Virtual Reality

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ABSTRACT

This chapter examines how context-aware artificial intelligence (AI) enhances virtual reality (VR) by increasing immersion, user engagement, and adaptive interactivity. Drawing on foundational theories of presence and immersion (e.g., Slater, 2009; Csikszentmihalyi, 1990), this investigation examines how AI systems interpret environmental, behavioural, and verbal cues to personalise and enrich immersive experiences. Reviewing recent innovations in generative AI, reinforcement learning, and intelligent agent design, the chapter analyses the capacity of these technologies to support dynamic content generation, adaptive gameplay, and naturalistic interaction. Complementing the literature review, a user-centred survey captures VR user perceptions and priorities regarding intelligent, adaptive systems. The chapter

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concludes with a discussion of ethical considerations, user modelling challenges, and future research directions, offering a timely contribution to ongoing debates in AI-driven entertainment design.

INTRODUCTION

With the rapid development of digital technology, many aspects of everyday life have been changed, resulting in major global interests in computer systems that can sense and respond to context (Augusto, 2022). These transformations are particularly noticeable in the field of integration between Artificial Intelligence (AI) and Virtual Reality (VR), where technology has shifted away from traditional pre-programmed static experiences towards more dynamic interactive experiences. Modern VR platforms are no longer limited to simply using visual immersion alone, but now they routinely capture rich streams of contextual information, including environmental cues, body movement, and speech. AI systems continuously interpret this multimodal information to allow VR environments to respond in real-time. By combining AI and VR together, we can produce more immersive, personalised and adaptive user experiences (Ojha et al., 2024; Shirazi et al., 2024; Yu et al., 2024).

Recent studies have highlighted a clear move from fixed simulations to environments that evolve in response to use behaviour. AI-driven dialogue systems, for instance, can allow users to naturally interact with virtual non-player characters (NPCs), which strengthens immersion and realism. Rong (2024) notes that these systems can support more realistic and believable communication. Beyond conversations, AI can also adjust environmental parameters such as lighting, difficulty or even narrative pacing in line with the emotional or physical states of the user. These adaptations form a continuous feedback loop, where a user's behaviour actively shapes the VR experience (Song et al., 2024; Ojha et al., 2024).

Motivation

The motivations behind this chapter were to investigate how multimodal context-aware AI can enhance user engagement in VR experiences by continuously analysing environmental signals, user actions, and the user's voice input in real time. The study draws on recent research, technologies, and practical applications across the domains of entertainment and education (Augusto, 2022; Cao et al., 2023; Dyulicheva & Glazieva, 2022; Song et al., 2024). Context-awareness in this case reflects the AI's ability to interpret situations and respond based on those interpretations, and by

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