Chapter 3
Representing Cultural Heritage in Immersive Virtual Spaces:
The Experience of the "Marriage of the Virgin" in the Metaverse

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ABSTRACT

*The development of the Metaverse has opened new research perspectives for digital representation in virtual environments, influencing the communication of material and intangible cultural heritage. Digital experiences in these spaces offer opportunities for interaction, knowledge sharing, and immersive participation. This chapter investigates the role of virtual environments in the analysis and representation of heritage, focusing on Raphael's *The Marriage of the Virgin*, whose central architectural structure was reconstructed in 3D and integrated into the multi-user immersive platform Spatial. The model, explorable via avatars and VR visors, transforms a pictorial element into a navigable digital space, enabling new forms of analysis. This experimentation forms part of broader research on virtual architecture in the Metaverse, addressing issues of perception, graphic rendering quality, and user interaction. The chapter contributes to the academic debate on digital heritage, outlining future directions for cultural representation in virtual worlds.*

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INTRODUCTION

In 1992, writer Neal Stephenson first introduced the concept of the Metaverse in his novel Snow Crash, describing it as a three-dimensional digital universe, populated by personalised avatars, in which users take refuge to escape from the decaying and fragmented social reality of the real world (Stephenson, 1992). More than thirty years after the publication of that work, the term Metaverse has been progressively repurposed to denote a new category of interactive and persistent digital environments designed to host immersive multi-user experiences in real time. Such virtual environments are based on the convergence of emerging technologies related to the so-called Web 3.0, including blockchain, NFT, smart contracts, cryptocurrencies and, more recently, generative artificial intelligence systems applied to the production and management of three-dimensional content. Although to date there is still no unified and interoperable Metaverse among the various digital platforms, it is already possible to live immersive experiences within persistent three-dimensional environments, accessible through virtual reality viewers or desktop devices, within which users can interact with each other and with digital objects in the virtual space. Experiences of this kind are now possible on platforms that represent constantly evolving environments in which public events, virtual exhibitions, academic meetings, artistic performances or simple exploratory experiences can be organised, all mediated through customisable digital avatars.In this context, the field of digital representation of historical-artistic heritage has progressively recognised the potential of these immersive virtual spaces, conceiving them as strategic tools for the conservation, valorisation and dissemination of tangible and intangible cultural heritage. The possibility of representing navigable three-dimensional models of historical architecture and works of art, integrating them into multi-user immersive environments, has made it possible to overcome the traditional limits of two-dimensional representation and museum fruition in presence, opening up new perspectives for cultural communication and scientific research. The combination of three-dimensional modelling, real-time rendering and VR/AR technologies has made it possible to experiment with innovative approaches to the digital restitution of historical buildings, urban landscapes and complex cultural contexts. Thanks to advanced modelling software, graphics processing and real-time rendering tools, it is now possible to reproduce historical architecture in highly realistic digital environments, enriched by high-definition textures, Physically Based Rendering materials, panoramic HDRI maps and dynamic lighting systems consistent with the virtual scene (Proietti, Zollo, 2023). A significant example of this methodology is represented by the digital reconstruction project of Raphael's Temple of the painting *Marriage of the Virgin*, a case study that demonstrates how an ideal architecture, originally conceived in pictorial form, can be transposed into a three-dimensional