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Reviving Cultural Heritage in a Virtual Reality Environment: The Role of Artificial Intelligence and 3D Modeling

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Abstract:

Artificial intelligence plays a pivotal role in preserving cultural heritage, including both tangible (physical artifacts) and intangible elements inherited from past generations through the use of 3D modeling techniques, digital preservation, and documentation of heritage objects in virtual environments. It also supports tasks such as digital restoration. Recently, we have witnessed the development of numerous AI programs capable of transforming two-dimensional images into three-dimensional models within virtual reality. Despite the significant contributions AI has made to the fields of art and heritage, the debate over the relationship between humans and machines continues. Many questions are being raised about the future of artists, designers, and restorers in light of this rapid development. However, there is general agreement that artificial intelligence is an effective tool in the modern era capable of completing many tasks efficiently, saving time, reducing material waste, achieving more accurate results, and even contributing to sustainability. This research paper explores how artificial intelligence can revolutionize the application of 3D modeling in heritage conservation, while also highlighting the current challenges facing the field.

Research Problem: The research problem centers on the emerging challenges and questions regarding the potential of artificial intelligence (AI) to preserve cultural heritage through 3D modeling. It also addresses the ongoing debate about AI's capability to perform 3D modeling and artistic documentation within virtual environments.

Research Objective: The research aims to: Examine the role of artificial intelligence in preserving cultural heritage through 3D modeling techniques within virtual environments. Demonstrate the extent to which artificial intelligence integrates with human expertise in digital heritage documentation processes. Identify the challenges and concerns associated with the use of artificial intelligence in creative and heritage fields.

Research Methodology: Analytical and experimental approach.

Conclusions and Recommendations: The growing partnership between art and digital technology has radically transformed not only contemporary art but also the preservation of ancient art and cultural heritage. Artificial intelligence (AI) has played a pivotal role in this transformation by enabling the identification, reconstruction, and imaging of historical sites, as well as facilitating 3D modeling. However, significant challenges remain in using AI as a tool for cultural heritage preservation—particularly in achieving high-accuracy results. Human intervention is often necessary to train AI systems and provide them with the appropriate data to ensure reliable outcomes. Alternatively, AI can serve as a preliminary step, generating 3D models from 2D images that are later refined by human experts to improve accuracy. In conclusion, there is no doubt that artificial intelligence can contribute to sustainability across its various dimensions, and that digital technology and AI will continue to drive significant advancements in the near future. This research recommends leveraging the potential of artificial intelligence by thoughtfully and effectively integrating it into the fields of art and cultural heritage.

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Artificial Intelligence, 3D Modeling, Cultural Heritage, Digital Sculpture, Sustainability, Virtual Reality.

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