

# Special Issue: Virtual Heritage

## Guest Editors' Introduction

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Over the last 15 years, with progress in computer graphics and virtual systems, multimedia and the internet, and technologies for imaging and sensing, the field we now know as “Virtual Heritage” emerged. Virtual heritage — the confluence of many forces — brings together disparate disciplines, from architecture to archaeology, the arts and entertainment to museology and conservation, with computer science and technology. From professionals to the general public and policy makers to educators and tourists this is a field that spans disciplines, cultures, and ages.

In 1990, advances in computer graphics and computer-aided design made possible some of the first forays into the “virtual modeling” of heritage sites around the world. In Japan, for example, architects at Taisei Corporation had begun digitally reconstructing the great monuments of ancient civilizations with early 3D modeling, rendering, and animation software (<http://www.taisei.co.jp/kodaitoshi>). At the annual CAA (Computer Applications in Archaeology) conference in 1990, the term “virtual archaeology” appeared in papers. In the museum world, heritage and virtual reality were beginning to be mentioned at the ICHIM and Museums and the Web gatherings.

Although virtual heritage was in the literature by the mid-1990s, the field really came together at the Virtual Systems and Multimedia Society conference in Gifu, Japan, in 1998 (<http://www/vsmm.org/vsmm98>). A special session on “Virtual World Heritage”, and the cooperation of UNESCO’s World Heritage Centre (the UN body responsible for coordinating international heritage designation and conservation efforts), brought the issue to the fore. In response to growing demand, we created the nonprofit Virtual Heritage Network in 2000 to provide a gathering point for research and activities in the area. Later that year, we brought some of the best work at the time together in a special “Virtual Heritage” issue of *IEEE Multimedia*.

In the ensuing years, the field has matured and

evolved. Low-cost tools and readily accessible 3D scanners and game engines have enabled a growing number to participate. Laboratories at universities and research centers across the globe now list Virtual Heritage on their agendas, and multimillion dollar/multiyear research efforts have been launched throughout the world. A number of European Commission projects, including the EPOCH (Excellence in Processing of Open Cultural Heritage) Network of Excellence, have targeted Virtual Heritage. The Japan Science and Technology agency has made several grants in the field, including the CREST Digital Archiving Project at the University of Tokyo, and the new Australasian Center for Interaction Design (ACID) has chosen Virtual Heritage as one of four theme tracks for research and development.

This special issue of *Presence* was originally planned in 2003, and a call was put out for the best work in graphics, multimedia, virtual and augmented reality, rendering, modeling, and animation. We sought papers focusing on aspects within the three main technical segments of the field:

- new **documentation and preservation** tools and techniques (image-based modeling, 3D scanning and data capture, remote sensing, and satellite imaging);
- the state of the art in **data management and modeling** (networked cultural databases, image-based rendering, large scale terrain modeling, geo-temporal 3D databases, 3D GIS for cultural and natural sites, object and image restoration and modeling, game engines); and
- the latest in **presentation and dissemination** (virtual and immersive reality for museums, kiosks, and sites; projection technologies; multimedia delivery and exemplary web, DVD, and other media presentations).

Although the quality and diversity of submissions made it hard to narrow the field, six papers were eventu-

ally chosen from over fourteen submissions. As always, the choice was difficult, as there were many excellent candidates. Although we have tried to provide a perspective on the breadth of work across the virtual heritage domain, with these six papers we can but begin to reveal the richness of applications in this burgeoning field.

The works presented here span the virtual spectrum, from underlying issues of place, to modeling, animation, rendering, augmented reality, artificial life, and virtual museums. Kim, Kesavadas, and Paley take us through a complete virtual heritage project, addressing issues of reconstruction, authenticity, modeling, animation, and interface in the context of ancient Assyria. Zara tackles issues of data optimization, level of detail, and image versus model-based rendering in the context of a 3D web-based model of historic Prague. The paper by Schnädelbach, Koleva, Paxton, Twidale, Benford, and Anastasi details the successive development and testing at medieval Nottingham castle of two augmented reality systems. Naimark's Forum discussion of representation and place in the context of the seminal "Aspen Movie-map" project provides an important reminder of the fundamental divide in this new field between technology and culture, and might serve as a call to arms for the virtual heritage community. In Liu, Wang, Lei, and Lin's work, an augmented reality system is developed and tested at the historic Yuanmingyuan gardens in Beijing. Finally, in Ch'ng and Stone's work, the potential of artificial life is explored in the virtual heritage context of a submerged Mesolithic landscape.

In conclusion, we would like to thank the authors for their submissions, the journal editors for agreeing to this special issue, and the reviewers that participated in the difficult task of selecting the best among all the submissions. We hope you enjoy the articles and are inspired to join in the application of technology to the documentation, conservation, and understanding of our shared heritage.

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