

Computer Graphics in Art History and Archaeology



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Recent developments in computer graphics are providing powerful tools for modeling multidimensional aspects of data gathered by art historians and archaeologists. Many different roles have emerged for computer graphics in these fields, including

- documenting the current state of existing artifacts or works of art,
- measuring, dissecting, or visualizing objects and sites to gain new insights, and
- educating students and the general public about cultural heritage.

Different challenging issues arise in each of these applications. For example, we can use computer graphics techniques to reconstruct and visualize features of artifacts and sites that might otherwise be difficult to appreciate. This new perspective may enhance our understanding of the environments in which our ancestors lived and worked. However, if we're to avoid misleading impressions of artifacts or sites, then the computer-generated images should not only look real but must accurately simulate the physical properties of the objects being modeled.

About the articles

The four articles presented in this special issue address different aspects of the use of computer graphics in understanding art history and cultural heritage.

In "Active Optical 3D Imaging for Heritage Applications," Godin et al. address the documentation of art and historical artifacts. They describe 3D scanning technology that they've developed over the years for capturing the shape and appearance of objects. In this new area, it's not enough just to produce digital objects. They also describe several projects in which they've demonstrated the use and value of these digital representations.

In "Discovering Petra: Archaeological Analysis in VR," Vote et al. tackle the problem of using computer

graphics to make effective research tools for archaeologists. Examining the relationships between artifacts found at an archaeological site is inherently a 3D problem. However, it's not obvious how to effectively represent the site and the objects and what interaction tools will be accepted and used by archaeologists. In this article, the authors describe the evolution of a tool that's being used to investigate finds at the site of the Petra Great Temple in Jordan.

Computer graphics has great potential to add to the experience of visiting a historical site. Advances in computer graphics and mobile devices suggest that we can give people more views and information about a site while they're actually there. In "Archeoguide: An Augmented Reality Guide for Archaeological Sites," Vlahakis et al. discuss the development of an electronic guide that enhances the experience of visiting an ancient site. Visitors can see the site today and how it might have looked in the past, with dynamic views as they tour the site.

Computer graphics is also useful in communicating modern history. Even studies of 20th century history can be dull when it's only learned from books. In the study of culture, it's also difficult to bring together many aspects of life in a single document. In "Virtual Harlem," Johnson et al. describe the use of a virtual environment as a virtual field trip to Harlem in the 1920s. This interactive experience doesn't replace traditional methods but augments what students learn by other means.

Bringing it to fruition

We received 21 high-quality submissions for this special issue, which gave the panel of international reviewers the difficult task of selecting the four articles that appear here. We thank them for all their hard work. We'd also like to thank the staff of *IEEE CG&A* for their efforts in helping to put together this issue.

We hope you enjoy the articles and are inspired to investigate new and exciting ways in which computer graphics, art history, and archaeology can work together to improve our understanding of the past. ■



Alan Chalmers is a reader in the Department of Computer Science at the University of Bristol, UK. His research is in investigating the use of very realistic graphics in the accurate visualization of archaeological site reconstructions and techniques that may be used to reduce computation times without affecting the perceptual quality of the images. He received an MSc from Rhodes University, South Africa, and a PhD from the University of Bristol. He has published more than 80 papers in journals and international conferences on very realistic graphics and he is a former vice president of ACM SIGGRAPH.

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Holly Rushmeier is a research staff member at the IBM T.J. Watson Research Center. Her research interests include data visualization, rendering algorithms, and acquisition of input data for computer graphics image synthesis. She received a BS, MS, and PhD in mechanical engineering from Cornell University. In 1990, she was selected as a US National Science Foundation Presidential Young Investigator. She has served as papers chair or co-chair for the ACM SIGGRAPH conference, the IEEE Visualization conference, and the Eurographics Rendering Workshop. From 1996 to 1999, she was editor in chief of ACM Transactions on Graphics.

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