Web Graphics

The growing popularity of Internet use has created the need to migrate traditional applications—that previously ran locally—to a Web environment and, for more powerful Web applications. This evolution will provide users with a common operating environment and application developers with a single development platform. Furthermore, users can access Web applications from anywhere an Internet connection is available, while application developers can reach out to large populations of users. Other advantages include convenient application updates and dynamic content refresh.

The increasing availability of and the concurrent dramatic reductions in the cost of 3D graphics hardware accelerators has made these accelerators a standard component in PCs. As a result, we are seeing an increasing number of research projects to develop more powerful tools that support Web graphics applications (in both 2D and 3D).

What is Web graphics

Unlike traditional graphics applications, which often run on a single machine, Web graphics applications assume a distributed environment, that is, over the Internet. Most of these applications are based on a client–server architecture, where a server provides services and often the geometry data, and a client accesses them. The two main issues in Web graphics are the content itself and the tools that support content development and playback. Research issues on Web graphics tools include geometry data streaming, progressive geometry compression, real-time rendering and interactions, data synchronization, motion prediction, and message filtering. The computer graphics community has investigated some of these issues, while the distributed systems community has addressed many of the remaining issues. Recently, researchers have combined the research results from these two communities, adapting them to the new domain.

One important consideration for Web graphics applications is that users need to browse content in a manner similar to browsing Web documents, where a user clicks on a link to almost instantly receive content. However, the large data size of most Web graphics applications—and in particular 3D applications—creates a long download time from servers to client machines. A possible alternative is to stream graphics content on demand, but more complex Web graphics tools than those currently in use are needed to support this approach.

Although most newer desktop PCs are already 3D enabled, a majority of the Web graphics applications (or contents) are still primarily 2D. Investors are still unsure if Web-based 3D graphics can create a profit for the businesses that run them. There is a general feeling that a killer application must come about to attract more attention to and, hence, funding for developing more Web-based 3D graphics applications. Internet games—which let multiple players participate and interact with each other—have recently increased in popularity. However, it’s too soon to tell whether these will eventually become such a killer application.

About the articles

In this special issue, we present five articles that describe some of the important research issues related to Web graphics. The first two articles each describe a Web Graphics application. The first, from authors at the Naval Postgraduate School, discusses the Army Game Project—a 5-year effort to develop a networked game aimed at giving the public the experience of life in the US Army. The second article, from authors at the University of Geneva, describes an online technique to size clothing. Using inputted body measurements, the system generates a 3D model of the user. The system then adjusts the size of selected garments to fit this user model for visualization.

The next two articles describe streaming architectures. Nagoya University authors describe a technique for real-time selective transmission of animation information related to virtual humans. The level of detail of the transmitted animation depends on available network bandwidth. Next, authors from IBM Haifa Research Lab and Tel Aviv University describe a method...
for streaming animation videos. Because most mobile devices don’t have hardware support for 3D rendering, the article proposes rendering the 3D scene at the server and streaming the resulting video encoded in an MPEG-4 format to the mobile device.

The last article of this special issue is a tutorial on Web graphics, prepared by various colleagues with research experiences in different fields. The authors cover such important areas as standards, distributed virtual environments, and human and topological modeling.

Future
Web graphics extends over a broad research area; therefore, this special issue only covers a few of the subject’s many aspects. However, we hope the articles we present here can serve as a starting point for more research and discussion into developing more powerful tools and applications on Web graphics.

Toshiyasu L. Kunii is a professor at Hosei University, an honorary visiting professor at the University of Bradford, and a professor emeritus at the University of Tokyo. His research interests include computer graphics and homotopy. He has B.Sc., M.Sc., and D.Sc. degrees from the University of Tokyo. In 1991, he was elected as an IEEE fellow for his contribution to visual computer and visual computation. He has authored and edited more than 50 books in computer science and other areas, and published more than 300 refereed papers.

Readers may contact Rynson W.H. Lau at City University of Hong Kong, Dept. of Computer Science, Tat Chee Avenue, Kowloon, Hong Kong, email rynson@cs.cityu.edu.hk; and Toshiyasu L. Kunii at Hosei University, Faculty of Computer and Information Sciences, 3-7-2 Kajino-cho, Koganei City, Tokyo 184-8584, Japan, email kunii@k.hosei.ac.jp.

For further information on this or any other computing topic, please visit our Digital Library at http://computer.org/publications/dlib.