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Research News

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GEORGIA TECH CREATES 3-D "MAGIC CARPET RIDE" AS PART OF ATLANTA'S BID FOR OLYMPICS

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To boost Atlanta's bid for the 1996 Summer Olympics, researchers at the Georgia Institute of Technology created a three-dimensional, interactive "magic carpet ride" through the U.S. candidate city. Combining aerial photography, computer-generated satellite images and high-resolution graphic modeling, the video serves as a marketing tool for the United States' campaign to host the Olympics.

But researchers say Georgia Tech's video package will continue to open new doors in marketing, architectural design, urban planning, animation, and education -- long after 1996.

"In the past, there wasn't much of a marriage between the computer graphics artist and the architect's computer-aided design (CAD) tools," said Michael J. Sinclair, a senior research engineer at Georgia Tech. "Architects are interested in this capability, mainly from a marketing standpoint. This allows the architect to take a potential client on a walk-through of the building."

By using the Georgia Tech graphics package, Sinclair said, urban planners concerned about the impact of development can bring an architect's drawing to life, placing a proposed facility in its appropriate setting. The key to Georgia Tech's rendering system is a set of offline software tools that convert CAD data into a format compatible with a commercially available, high-resolution animation program. Georgia Tech also produced the system's online software, which controls a pair of video laser disks.

A Magic Carpet Ride

Developed at the request of the Atlanta Organizing Committee (AOC), which is in charge of the U.S. Olympics bid, the Georgia Tech video opens with a three-minute ride from space across the city. The viewer "flies" over mountains, treetops and buildings, zooms directly through the AOC office in a towering skyscraper, and winds up in a luxurious Atlanta hotel. From that point on, the video becomes interactive, through a system patented by Advanced Interaction, Inc. of San Francisco, Calif.

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To operate the video, the viewer spins a track ball to move across a colorful "You Are Here" map on an Apple Macintosh II computer screen, visiting points of interest throughout the city, via the images displayed on an adjacent Sony monitor. In this way, the viewer can visit a proposed Olympic Village or tour basketball and swimming facilities. A built-in database periodically provides pertinent information, such as building size and seating capacity, on each facility.

At the heart of the program are two video laser disks. Similar to compact audio disk technology, the laser disks contain a thin metal substrate covered with tough plastic. Laser beams are used to record information in pits on the metal substrate. In the Georgia Tech/Advanced Interaction system, one laser disk contains images to coincide with north/south movement on the map, while the second disk stores east/west perspectives. Georgia Tech Software Engineer George Olive and others developed online software to automatically cue each disk. As the viewer's cursor approaches an intersection on the map, the laser disks begin searching for the appropriate images.

Produced with help from the Team Gyro film company of Los Angeles and Crawford Post Productions of Atlanta, photographic scenes of Atlanta were prepared using a Gyrosphere camera affixed to a helicopter. In addition, realistic aerial views were computer generated using Landsat satellite data and fractal imagery, explained Mike O'Bannon, a senior research scientist for Georgia Tech and co-producer of the video.

Linking CAD Graphics and Animation

Actual scenes of the physical landscape may be reproduced photographically and through fractal imagery. But proposed facilities such as the Georgia dome must be visualized using CAD images and an animation package. To achieve this, Georgia Tech researchers developed an interfacing system to integrate animation and CAD software.

First, the Atlanta-based architectural firm Heery International generated basic 3-D line drawings using a workstation made by Intergraph, a major CAD graphics vendor. Since Intergraph uses a computer language which is proprietary, or exclusive to the company, Heery had to translate the CAD data into an industry-standard language known as IGES. These converted images were then recorded on magnetic tape, which could be read by a Convex computer at Georgia Tech. After transferring the data to an Ethernet system, the data was then fed into an Iris workstation, where software provided by Wavefront Systems of Santa Barbara, Calif. performed a partial conversion. A team directed by Frank Vitz, an independent consultant working for Georgia Tech, produced a suite of software tools to complete the conversion -- thus translating the basic CAD images into high-resolution, animated renderings.

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Future Plans: Putting the Picture in Perspective

The Olympics video was completed by summer 1989, in time to capture the imagination of visiting IOC members. But Georgia Tech researchers are currently upgrading the system to place computer graphics in perspective, on "top" of an actual photographic video segment.

On the current video, graphic models of proposed facilities appear to "float" above the photographic landscape. Then the photographic background drops from sight as the viewer "tours" the facility. The effect is impressive, but O'Bannon and Sinclair want the animated facility to remain stationary against the photographic background -- even as the camera moves to various aerial vantage points.

Using a technique known as "witness point tracking," the Georgia Tech team has already produced several successful segments showing graphic models in perspective against actual landscape footage. Ultimately, the entire video should incorporate this technology.

Georgia Tech also hopes to use the video as a catalyst for a new Multi-Media Center devoted to research in the areas of high-definition television (HDTV) and electronic educational/research tools.

Many Hands Make a Video

The Olympics video originated with a vision by Georgia Tech President John P. Crecine, who assembled a production team. But Georgia Tech received assistance from an army of volunteers as well as businesses and organizations across the country. Macintosh, Sony, Wavefront and other companies donated significant amounts of equipment. Heery International, Advanced Interaction, Crawford Post Productions, student and AOC volunteers donated time and effort to the project.

Mechanical engineering student Raymond Haleblian volunteered to help bring the Olympics to Atlanta -- but gained valuable computer graphics skills in the process.

"I'm interested in seeing the Olympics come to Atlanta because that would be a great boon to the city and for Georgia Tech," Haleblian explained. "So that was my motivation, but on a personal level, I also wanted to learn more about computer graphics. Through this project, I'm working with state-of-the-art technology."

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