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Using Computerized Visual Simulations as a Historic Preservation Strategy

A Case Study from Columbus, Georgia

Thousands of times each year, State Historic Preservation Offices (SHPOs) carry out their consultation responsibilities with federal agencies and their applicants under Section 106 of the National Historic Preservation Act of 1966, as amended, to ensure that the effects of their undertakings to historic properties are taken into account, and, if possible, to improve the design of new construction so that it does not adversely affect historic properties. Often difficult is the task of gauging the impact of new construction within fragile historic districts, and truly comprehending the size, scale, and materials of new buildings and the effects these new design elements will have on historic properties. The historic preservation movement's design review goal is simple, but in many ways difficult to attain—how can the design of new construction be reviewed and molded to ensure that new buildings are successfully integrated, from an urban design perspective, into historic settings and communities?

Before: this aerial view shows the project site. The Muscogee Mills Complex, one of two National Historic Landmarks in the project area, is shown at the extreme left, facing the Chattahoochee River.

After: this view represents the final composite of the original "existing condition" photograph and the virtual reality image of the overall project.

While some SHPOs employ preservation architects, many are forced to rely on a rudimentary understanding of architectural documents such as renderings, plans, and elevations. To aid in the assessment process, supplemental graphic information is painstakingly produced by artists, planners, and architects which illustrates the effects of proposed construction on historic properties. Although useful, the resultant data is limited, time-consuming to produce, and expensive. Also, elements such as color, reflection, and texture are subject to interpretation and legal challenge.

New visualization options for SHPOs have been developed over the past few years. One emerging tool is visual simulation data generated through powerful computers and innovative new software, including digital photography and computer-assisted design. This case study explores the use of this tool in Columbus, Georgia, where computer-generated design materials played a vital role in ensuring that community-based historic preservation interests, as well as the SHPO,

supported quality new design within a highly significant historic district.

Second Avenue Revitalization Project

In late 1996, the Columbus Consolidated Government (CCG) negotiated a Programmatic Agreement (PA)[1] with the Georgia SHPO and the Advisory Council on Historic Preservation to assist in mitigating the effects of proposed redevelopment of a 46-acre tract along the Chattahoochee River in the historic city of Columbus, Georgia. The project area covered more than 20 historic structures. The National Park Service, the Historic Columbus Foundation (the local non-profit preservation organization), and the Columbus Board of Historic and Architectural Review (the local historic preservation commission) all participated in the consultation process and were invited to concur in the agreement. The PA contained a number of stipulations that dealt with examining the possibility of adaptively reusing historic properties as a component of new project construction, and how new construction would relate with surrounding historic buildings. The PA required the CCG to "ensure that the project design for rehabilitation, new construction, and site improvement projects in the project area is compatible with the historic and architectural qualities of the surrounding historic buildings in terms of scale, massing, color, and materials." Total System Services, Inc. (TSYS), a subsidiary of Synovus Corporation, tendered the successful bid for this 46-acre tract. The company wanted to construct a new headquarters; the massive project represents one of the largest economic development projects ever attempted in the State of Georgia.

Enhancing the Design Review Process

In 1997, TSYS unveiled its preliminary design for the corporate campus, designed by Kevin Roche/John Dinkeloo Architects. Computer-generated elevations showed the proposed design of a number of new buildings within the campus district, including two massive parking decks. Serious concerns were raised regarding the impact of the campus' overall plan on existing historic buildings, and how the proposed new construction would relate to historic buildings located at the periphery of the project area. The initial campus design plan reflected the findings of an analysis of the adaptive re-use potential of a number of buildings associated with the National Historic Landmark Muscogee Mill Complex, located to the south of the project area. This analysis concluded that the re-use of the mill was impossible, because of programmatic requirements of the new project. The initial design, therefore, included one new parking deck on the site of the Muscogee Mills Complex, and a second parking deck toward the northeast corner of the project area.

The SHPO raised many issues about the size, scale, and design of the new campus and the parking decks, and argued that additional visual simulation information would be required prior to design approval. Local preservation organizations and economic development officials concurred in the need for additional visual simulation information. Greg Clark, Chief of Economic Development for Columbus, stated that, "It is important that the campus make a statement, but also that it blends in and doesn't overwhelm the existing downtown." The SHPO assisted the CCG in locating non-profit and for-profit organizations that could create computer-generated images. In July, IMAGINE (Interactive Media Architecture Group in Education), based at the Georgia Institute of Technology in Atlanta, was chosen to produce these materials.

IMAGINE began in the early 1990s as an informal group of students and faculty researching the possibilities of integrating research and education through the development of digital tools. Early research focused on emerging technology for visualization and the impact this new technology might have on designers. According to Tolek Lesniewski, Multimedia Coordinator at Georgia Tech's College of Architecture, the Columbus virtual reality (VR) project represented the "largest composition/collage project ever attempted" by IMAGINE, and was made more difficult because of the need to merge photographic images in raster format with computer images in vector format. Under a $23,000 contract with the CCG, IMAGINE agreed to conduct six work tasks leading to the development of final VR images placed within a number of real-world photographic views.

The first step involved obtaining "existing condition" photographs from the project area, through which a number of three-dimensional reference points could be selected. This process involved taking a series of color print photographs, while carefully noting the x, y, and, z axis positions and camera focal length necessary to match the photographic perspectives and computer-generated images. The second step involved creation of a photo CD for archival purposes. Photographs were digitized at 2,400 by 3,000 pixels resolution. Using Adobe Photoshop® software, digital photographs were color corrected to erase the effects of fog and haze, and buildings scheduled for demolition were digitally edited from some views of existing areas. The third step converted the existing three-dimensional geometry of proposed construction (obtained from the project architects) and updated this geometry to reflect changes at the beginning of the project. Kinetix's Autodesk 3D Studio MAX® software was used to create this new development model. Wire frame models were then overlaid on

each photographic view to determine if there were any problems with the virtual models. This process gave the IMAGINE staff some idea where the model's silhouette would overlay existing buildings, and which elements might need to be removed. Two assumptions and decisions were made in the design process. First, it was assumed that the terrain in all views was flat, which corresponded closely to the development site, and thus would not need to be adjusted. Second, the relative depth of each picture was determined. Each photographic view was divided into a "front" and "back." For every image, IMAGINE staff could start with a background, overlay a view of new construction, and add a foreground.

Images by IMAGINE.

The fourth step undertook the process of creating renderings of the computer model for 12 selected views, at a level of detail corresponding to information obtained by the project architects. Such details as the position of the sun, color, and materials chosen for new construction, were checked for integrity. The fifth step generated 12 realistic composite images showing the new development in existing context. Because computer images appear too perfect to the human eye, this step also involved careful visual review of each image. In some cases, the edge between photographic and computer-generated images was blurred; noise was added to match the texture of photographs. Edges between images were rechecked to create seamless final pictures. The final step involved creating color hard copies for each of the 12 views selected. These views were made available to the PA signatories.

A few additional pieces of information about IMAGINE's work on this project, and its computer capabilities, may be useful to readers. This project was completed within an eight-week time period and was executed as a team effort by Mr. Tolek Lesniewski, a principal project manager (a student), and several undergraduates majoring in architecture and industrial design. The project was created within a Windows NT® operating environment using a number of computers running at 120-200 megahertz and 128 megabytes RAM. Local storage was 2-4 gigabytes per computer. Importantly, because each working image often represented up to 25 megabytes of visual information, 10 computers were networked to accelerate the time required to produce the final renderings.

Before: this is a northern view into the southernmost edge of the project site, from the perspective of a pedestrian at street level. The Muscogee Mills Complex, with its prominent smokestack, is in the center of the view.

After: this view shows a virtual reality (VR) parking structure inserted into the area along 14th Street. By examining the effects of proposed new construction on nearby historic buildings, the SHPO was able to effectively argue for changes in massing and materials.

How VR Imagery Improved Design Review

As described in the photo captions, VR imagery greatly enhanced our ability to understand the effects of proposed new construction on historic properties located on the edge of the project area. The capabilities of the technology are easily seen when comparing a "before" aerial view of the project site with the "after" view. By examining the effects of proposed new construction on surrounding historic buildings, the SHPO and local preservation organizations were able to effectively argue for changes in overall building massing, geometry,

materials, and color. For example, the SHPO and local preservation officials requested that the design of the first parking deck be changed to better match the overall volume, fenestration patterns, and materials of the Muscogee Mills Complex which it was replacing. Similar modifications resulted from an analysis of the design for a second parking deck. Taking information from the existing site, preservation officials reviewed an initial effort at design, and quickly determined that the overall size of this deck was too massive, and would create an overwhelmingly negative presence when compared to the size and scale of historic properties along Second Avenue. To address these issues, the SHPO requested that the deck's overall massing be reduced by breaking its volume into two distinct parts. The final design clearly shows these improvements. VR technology also allowed the project to be viewed from many angles, literally unveiling certain buildings hidden by later design additions.

Summary

Work in Columbus, Georgia on the TSYS project vastly improved our office's ability to comment on design development materials, allowed us to provide technical assistance at critical points to improve the overall quality of analysis, and expedited the preservation consultation process. Because the visual simulations were produced in an easy-to-understand format, collaboration among affected organizations was greatly facilitated. I believe that the use of computer visualization technology heralds the arrival of a powerful new historic preservation tool that has applicability in many other locations across the country. The use of this innovative technology will ensure that historic places and properties are better protected for this and future generations.

Because the PA called for a series of new "public benefit" products, our office believes that this technology will lead to the emergence of new interpretive and educational products. By integrating the vast number of informational sources generated through the inventory and evaluation phases of this project—including written historical data, photographic images, historical visual materials, and Historic American Engineering Record quality record data—with VR information, the many stories related to historical development of the milling industry in Columbus will be publicly presented in ways not possible a few years ago. An interdisciplinary education and interpretation team will be assembled in 1998 to begin planning for a multiplicity of products to inform the public. This effort will also examine how this information can be packaged in informational kiosks placed along the city's "River Walk" and reach a national if not international audience through a new World Wide Web site. The possibilities are exciting and limitless.

As Nicholas Negroponte, director of MIT's Media Lab pointed out in his 1996 bestseller *Being Digital*,[2] "there is just not enough digital media in the hands of executives, politicians, parents, and all those who most need to understand this radically new culture." The challenge facing many State Historic Preservation Officers, and other cultural resource managers, is how to best utilize this fast-developing technology in ways that truly improve the overall design quality of federally-assisted projects that use or affect historic resources. Given the mission of the National Park Service's National Center for Preservation Technology and Training—to promote and enhance "the preservation of prehistoric and historic resources in the United States through the advancement and dissemination of preservation technology and training"—perhaps a nationwide effort assisted by the Center to enhance the capabilities of SHPOs to fully utilize the potential of this important developing technology might be in order.

Notes

1 The Programmatic Agreement between the Georgia State Historic Preservation Office, the Columbus Consolidated Government, and the Advisory Council on Historic Preservation, was executed in December, 1996. All subsequent quotations are taken from that document.

2 Negroponte, Nicholas, *Being Digital* (New York, N.Y., Vintage Books, 1996), pg. 7.

For the past three years, Mark Edwards has served as State Historic Preservation Officer for Georgia. Previously, Mr. Edwards worked for 17 years with the Maryland Historical Trust. While in Annapolis, he functioned as Deputy SHPO and Deputy Director of the Division of Historical and Cultural Programs with the Maryland Department of Housing and Community Development. He is also a longtime member of the CRM *editorial board.*

The author wishes to thank Richard Cloues, Jeff Durbin, Sue Edwards, and Tolek Lesniewski for their assistance in reviewing and making suggestions to improve this article.