

Engaging the Virtual Landscape: Serious gaming environments as tools in historical landscape reconstruction and interpretation.

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The nature of historical data and historical research in general provide unique challenges within the context of Geographic Information Systems projects. Recent advancements in geo-visualization, immersive environments, and even virtual reality offer the opportunity to generate digital representations of the cultural and physical landscapes, and embed those virtual landscapes with information and knowledge from multiple sources (Harris et al., forthcoming). The development of these technologies and their application to historical landscape research has opened up new opportunities to synthesize historical records from disparate sources, represent these sources spatially in a digital form, and embed the qualitative data that is often crucial to historical interpretation.

Within the last few years, a number of developments within the fields of computer science, Internet and Web technologies, and geospatial technologies have begun to broaden the possibilities for generating virtual representations that can more intuitively incorporate the qualitative aspects of space and place by going well beyond current multimedia GIS. The increasing availability of relatively inexpensive advanced graphics technologies are now moving us far beyond the static two-dimensional paper map and providing researchers with the tools to not only generate nearly photo-realistic three-dimensional virtual landscape environments, but also incorporate realistic light and textures as well as replicating such physical systems as cloud and water movement, fog, and weather. Computer and video games now routinely feature extensive virtual worlds with recognizable geography and real-world behaviors, and the ability to achieve a high level of realism is a key element in the commercial success of such games.¹ Creating a sense of immersion through the generation of such life-like virtual landscape features, combined with camera perspectives and navigation that mimic human perceptions of movement through space are key elements in generating the sense of immersion and interaction that allow users to feel as if they are experiencing a virtual landscape.

The first phase of this project focused on the development of a virtual reconstruction of the historic landscape of Morgantown, West Virginia, using GIS data and 3D models generated in SketchUp.² To begin the project, we assembled the data necessary to generate building footprints, ground surface, and vegetation/ street furniture for downtown Morgantown c.1900. At that time, Morgantown was a small regional city on the Monongahela River that was experiencing rapid urban growth at the time due to the expanding coal, lumber, and glass industries in the area. The elements created in the first phase were brought together in ArcScene, a 2.5D cartographic interface that is part of ESRI's 3D Analyst extension.

Due to the limitations associated with ArcScene and similar GIS packages it was decided that the project should be moved to a new software environment that could leverage advanced graphics and

¹ Bogost 2007.

² Google 2008.

functionality. Through experimentation and based on the decision to focus on tools that are compatible with ESRI's ArcGIS to avoid the need to rewrite existing GIS capabilities, it was decided that a custom application built on Microsoft's .NET framework would best meet these needs. At the same as this project began Microsoft launched its XNA Framework which is based on .NET and DirectX technologies. Utilizing Microsoft's XNA Framework through XNA Game Studio 2.0,³ the current phase of this project is focused on the development of a serious game application,⁴ the Spatial Experience Engine, which provides the same level of graphical capability, navigability and interaction as leading entertainment video games.

More realistic ground and object textures, lighting, and movement have been incorporated in the Spatial Experience Engine without sacrificing performance. Users are able to explore and be immersed within the virtual landscape, utilizing video game-based first-person perspective navigation tools. Users can now begin to experience phenomena that create a sense of place allowing them to immerse themselves in the virtual world and to make connections that may not be visible in text, photos or other stand alone media.⁵

Moving beyond the representation of increasingly realistic landscapes in a virtual world, gaming environments such as those built using the XNA framework also allow researchers and scholars to build interactive, immersive serious games that enable users to go beyond the passive viewing of these digital worlds. Utilizing game functionality we can add sounds, smells, and other sensory input that would be part of such landscapes, and users can begin to *experience* phenomena that in combination creates a sense of place. In addition, the advanced graphics power of gaming environments allows for the modeling of water movement, weather, and other physics-based aspects of the virtual environment that are important components in creating a sense of interactivity and immersion.

Multimedia sources such as photographs and other historical documents, and audio and video can provide historical information that can be embedded and then accessed through user interaction with features in the reconstructed digital landscape. These qualitative data sources are essential components in the reconstruction and interpretation of historical landscapes, and are difficult to represent in a traditional GIS.

In order to continue to explore ways in which virtual landscapes can not only provide users with an opportunity to immerse themselves within such an environment, but also convey related knowledge about the places represented within the virtual world, the project team is now working on the representation of GIS data and analyses within the immersive environment.

References

Bergeron, B. 2006. *Developing Serious Games*. Boston, MA: Charles River Media.

Bogost, I. 2007. *Persuasive Games: the expressive power of video games*. Cambridge: MIT Press.

³ Microsoft 2008.

⁴ Bergeron 2006; Bogost 2007.

⁵ Harris et al., forthcoming.

ESRI, Inc. 2008. ArcGIS Desktop 9.2. Redlands, CA.

Google, Inc. 2008. Google SketchUp 5.0. Mountain View, CA.

Harris, T. M., L. J. Rouse, and S. Bergeron. Humanities GIS: Adding place, spatial storytelling and immersive visualization into the Humanities, forthcoming in *Geography and the Humanities*, Routledge.

Microsoft, Inc. 2008. XNA Game Studio 2.0. Redmond, WA.