AN AUTO-COMPOSING VIRTUAL HERITAGE SYSTEM

WINGLY SHIH, HUA-LUN LIANG
Graduate Institute of Architecture, National Chiao Tung University
swingly@arch.nctu.edu.tw

AND

JUNE-HAO HO, YU-TUNG LIU
Graduate Institute of Architecture, National Chiao Tung University
{jhou, aleppo}@arch.nctu.edu.tw

Abstract. This paper proposed an auto-composing virtual heritage system. By means of GIS data, media could be composed without time-consuming authoring process and easily integrated into an interactive virtual environment.

1. Introduction

Virtual heritage has become increasingly important in the conservation, preservation, and interpretation of our cultural and natural history. Many of the world’s treasures are in danger of being lost or destroyed, causing irreparable damage to human understanding and extinction of our natural wonders. Information technology is now establishing new ways to explore complex problems and provide solid pathways to real solutions. To a greater degree, technology is solving one of the largest problematic issues concerning cultural heritage assets - nondestructive public access (Refsland, 2000b). By the virtual heritage allowing people of visiting the site with no physical touch and depredation, the dissemination of the cultural information would be achieved without the fear of irreparable damage. Moreover, a virtual heritage consists of multiple media from the digital archives of the cultural and historical data, and provides semi-permanent record preserved in its database (Oh et al., 2005).

With the recent developments in digitizer technology, the process of building digital preservation of cultural heritages has been no longer an
arduous task. Digital models of historical architectures could be obtained via long-range 3D laser scanners, archived and treated as files in computers, thereupon the architectural data would be reconstructed virtually in CAAD software environments. On the strength of the integration of reconstructed model, historical description and interpretation, spatial information (e.g. terrain datasets, maps...etc) and VR display technology, a content-rich virtual heritage system presented (Liu and Tang 2003). There would be a growing demand towards accessing an integrated multimedia content including visualized spatial data, planar drawings, digitized architecture models and documental information manifested (Rashed and Mistri, 2002; Liu and Tang, 2003). The combination of diverse media is the way to deal with these issues and the essential for composing a virtual heritage system.

2. Related Works

A virtual heritage system consisted of many sorts of media. For the most part they were 3D models, 2D images (photos/drawings), animations/movies and text.

Affleck and Kvan (2005) proposed a reinterpreting virtual heritage. The system aimed to allow the users to actively interact and interpret content. Users visiting the site interacted with the 3D model of an historical architecture, captured stills from an animation and added interpretations to the stills.

Refsland et al. (2000a) implemented a living virtual Kinka Kuji Temple. In addition to an accurate 3D model of the temple, data entities from local machine and internet traffic were visualized as artificial lives and formed an artistic interpretation to express the atmosphere around the site.

In order to express further spatial relation between the cultural heritage and its site, GIS has been involved. GIS stands for Geographic Information System and is software that displays digital map data and allows users to query and analyse that data. The adoption of GIS provided supplementary material about the site, including satellite imagery, location, terrain data, community information, and so on.

Integration of GIS and multimedia for a historical site provides the users the tools to analyze and visualize both spatial data and associated media data. Data acquired from different sources were compiled by using GIS softwares. Linking spatial data with multimedia information facilitates the inventory, evaluation, and preservation of historic sites. By means of the fusion of GIS and multimedia, the various type of collected information can be disseminated to end users with low technological requirements (Duran, 2004).
Guney et al. (2002) developed a temporal GIS system named GeoHistory for providing media correlated with time and representing temporal changes of the historical site.

3. Problem and Objective

A virtual heritage system with many sorts of media provides the possibility for the comprehensive documentation of architectural cultural heritage. However, it takes time to piece together the correlative media. Though there are many sorts of authoring software dealing with multiple media integration, it still takes a lot of time to compile the content. Moreover, contents for different purposes like architectural or historical education need to be made respectively even if the utilized media comes from the same database. Media needs to be transformed between various formats, manipulated, re-arranged and eventually exported to the presentation format (Kwon, 2001). These steps would be taken repeatedly in accordance with each modification of the data source.

This research proposed a dynamically composed multimedia system for virtual heritage. The system collects manifold media including 2D CAD drawings, photos, pre-rendered animations, 3D models and literal data from local databases and extra resources from external remote database and then automatically composes these components into a visualized UI according to the request from users and pre-designed templates. Within the virtual heritage environment, users could navigate the site, observe the historical structures and switch concerned information layers on/off. In addition to the integrated UI, it also provided possibility for the reuse of the media so that other users would be able to access to each specific archived medium via web.

4. System Framework

In the conventional development process of virtual heritages, it would take several steps to accomplish the mission. Generally, these steps could be grouped into two phases: data acquisition and media integration. By means of GIS data, it would make the media integration phase an auto-composing procedure.

The framework of the system consists of four components (Figure 1):

1. Digital Archiving: As the conventional process of digital preservation, digital data were obtained from physical heritage through 3D laser scanners, re-modeling and reconstruction. For the sake of interacting with GIS
information, every media needed to be attached with coordinates. The labeled data then would be archived into the database.

2. GIS Database: GIS data could be acquired from many sources, such as WebGIS providers, or archived data from government offices (in the case of Taiwan). The system proposed by this research supported two kinds of the data. One is the shape file, a format for vector data to be used in geographic information systems produced by Environmental Systems Research Institute (ESRI). A shape file actually consists of three files that work together to represent data in a GIS. All of these associated files must have the same name with different extensions. The mandatory three files have the following extensions: shp, shx, dbf. Shape files represent descriptive and visual information about the site, including roads, spots, traffics, blocks, townships...etc. The other is Digital Terrain Model (DTM) file, a representation of land surface point elevations.

3. Media Congregation: Media were gathered from individually sources and rendered as layers

4. Visualization: Media layers were positioned and composed according to the coordinates, and visualized into a virtual environment for interactive representation.
Figure 1. The system framework

Figure 2 shows the visualized result of the system. Left one shows the combination of terrain data, the model, a heritage plan, and an interpretative info. The other shows the relationship between the site and roads nearby.
5. Conclusion

The primary focus of this study is the auto composition and information integration for virtual heritage. The system implemented could automatically encompass various types of media and present them in an integrated virtual heritage environment. With the use of GIS, there is no need to compose the content again and again. Visualization context in virtual heritage reflects newly modified media and data spontaneously. Furthermore, as the GIS data are periodic archived information, it is simple to make the system presents the same information layer with different time division (e.g. past data). The time across data would be meaningful to heritages and also to planned buildings that still don’t physically exist.

So far, under the sponsorship of the National Center for Research and Preservation of Cultural Properties hundreds of digital media related to three cities in Taiwan have been set up in database.

Acknowledgements

This research is supported by the National Center for Research and Preservation of Cultural Properties. Thanks to Ching-Shun Tang for the digital model of Fort San Domingo.

References


