Visualization of Spatial-Temporal Information for Historical Sites on GIS

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INTRODUCTION

Historical sites are proof of history. They represent interaction between different cultures throughout history reflecting the social values, economic situations, and behaviors of a particular time. Documenting historic sites is important. It preserves information for future generations to learn from the past. A rich architectural and urban heritage provides future architects and urban planners and designers with design and planning solutions to various problems. There are many related documents describe in detail the historical sites' spatial structures, characteristics, categories, value of arts, and educational meanings. However, these documents that use paper-based static media have several shortcomings. They represent the past historical events for a specific site using descriptive lists, words, and simple marked maps to display the urban environment information despite that these historical sites should belong to a structure of spatial-temporal data. Historical sites interact dynamically with the place they locate and over time. Using the traditional ways cannot fully describe the past historical events occurred, the reasons for their occurrences, their impact on historical buildings, and the evolution of these historical building. In other words, they lack the capability to represent the meanings and changes of historical sites in a spatial and temporal manner.

CURRENT DEVELOPMENTS

From the past research of space-time, there are close relationship between time and space. The famous instance is the theory of diffusion and time geography (Hagerstrand, 1977). The time geography was process complex phenomenon at the interaction between time and space (Peuquet, 1994). Maps are the common method to represent spatial-temporal data on GIS. Recent literature and Internet sources have four keys for visualization technologies: the World Wide Web, multimedia, virtual reality and computer graphic (Orford, Harris, and Doring, 1999). When integrated with advance visualization tools, GIS can become very effective in the analysis and representation of complex data in a wide range of disciplines, from planning to resource management (Bishop & Karagaglis, 1997; Conners, 1996; Davis & Keller, 1997).

In this research, we are focusing on visualization of spatial-temporal information. In previous research work, snapshot method divides the time into several time-sections, select these time-sections to get the spatial data and sort these spatial data to analysis the interaction between time and space. However, this method has much uncertain information because the selected time-section cannot represent the key time when an event occurs. This is also a problem in displaying spatial-temporal data until now. Another method is using many dynamic symbols to display and represent the changes on the maps. This method usually represents the dot data, for example, occurring earthquake (DiBiase et al.,1992). Human eyes have much better judgment ability on dynamic change of symbols (MacEachren, 1994), When spatial-temporal data of a historical site changes represented as dynamic symbols or dominant colors, the user can find out the changes quickly and also understand the different changes at

different times. Therefore, we employ this method to represent the spatial-temporal data of historical events.

We developed a prototype implementation using the development environment of ArcView GIS software by ESRI to represent the Taiwanese historical sites in terms of spatial-temporal data. As a result, our system can be a helpful tool to represent the past historical events happening in various historical sites with a smooth timing to let users understand the changes of historical sites at the same period of time clearly as well as maintain of rich content historical sites precisely and quickly.

Keywords: GIS, Visualization, Spatial-temporal data, Historical sites, Digital Heritage Recording

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