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MIES: ARCHITECTURE REPRESENTATIONS FOR NON-PROFESSIONALS

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Abstract

Architecture plays a significant role in understanding a particular culture at a specific period of time. However, traditional architecture representations, *i.e.* two-dimensional photographs and abstract drawings or three-dimensional miniature models, are difficult for non-professionals to understand. This paper presents an architecture representation framework—MIES—that combines information technology, *i.e.* computer graphics, multimedia presentation and virtual reality technology, with human-computer interaction methods to provide effective design communications and comprehensive architecture presentations for non-professionals. MIES framework concept is first experimented in a web-based interactive design environment for non-designers to promote user participation during the development of apartment buildings. In addition, MIES framework is used to guide the development of a digital architecture museum. Both case studies have provided encouraging results to confirm the validity of MIES framework.

Introduction

Buildings are complex man-made artifacts. Given their massive size and relation to their particular locations, it is difficult to discuss about buildings or the design of buildings without using representations. Traditionally, these representations are abstract drawings and three-dimensional miniature models. Architects have used these representations extensively to communicate with professionals in the architecture-related fields as well as to convey design concepts and results to non-professionals such as clients or users. However, abstract drawings are difficult for non-professionals to understand and miniature models do not provide necessary details for design discussions. New architecture representations are needed to improve the communication between architecture professionals and non-professionals and to encourage user participation during the design process.

Moreover, architecture plays a significant role in understanding a particular culture at a specific period of time. This justifies the substantial resources most modern societies devote to preserve and document the spirit of historic buildings and landmarks. These efforts, however, are not quite flourishing. It is largely because up until now the ways to represent architecture are rather limited, again either through two-dimensional photographs and abstract drawings or three-dimensional miniature models, which inevitably restrains a layperson's appreciation of those architecture. Therefore, new architecture representations are needed to improve laypeople's understanding and appreciation of great buildings.

Multimedia Architecture Representation and Presentation

The development in computer graphics, multimedia presentation and virtual reality technology has provided opportunities for new ways of architecture representation. In recent years, many commercial products have adopted these new technologies in presenting architecture/design related materials. "Le Corbusier" multimedia CD (1997) organizes various types of data (such as sketches, architectural drawings, and photos) into a digital encyclopedia. "The Ultimate Frank Lloyd Wright" multimedia CD (1995) employs interactive games to illustrate configurational principles of Wright's designs. Interactive games are also used in "VizAbility" multimedia CD (1996) to train visual thinking. The "Sydney Opera House Virtual Tour web site (Sydney Opera House Trust, 2001) uses interactive panoramic scenes and 3D models as primary user interfaces to present a virtual Sydney Opera House in amazing details. These and other architecture related CD-ROM titles and web pages, in general, present architectural information in three ways:

1. textual renditions—descriptions in texts, generally presenting historical records;
2. still imagery—architectural drawings, or photographs, conventional architecture representations; and
3. motion pictures—recorded videos, computer animations, interactive panoramic scenes, and virtual reality environment, offering multiple views of a target object.

The above three types of architectural information are then integrated and presented through various kinds of user interfaces. These interfaces can be broadly classified into three categories:

1. cinema—subject matters are packaged in such that users, through very simple selections, can enjoy the contents as if they are watching a cinema;
2. encyclopedia—subject related matters are comprehensive and complete so that users can access desired information through organized content browsing or search mechanisms (for example: *Le Corbusier*, 1997); and
3. game—subject matters are organized into units of interactive plays, through which users can explore further information (for examples: *The Ultimate Frank Lloyd Wright*, 1995; and *VizAbility*, 1996).

Aside from the commercial implementations multimedia presentation, many researchers have examined the effectiveness of multimedia presentations (for examples: Radford, *et al.*, 1997; Rahman, 1992), as well as demonstrated promising results of using particular computing technologies to enrich representations in specific contexts (for examples: Norris, *et al.*, 1999; Shih and Lan 1997).

Employing the information technology to enrich the representation of architecture/design has long been the effort of many scholars. Sanoff (1991), as well as Mitchell (1992), explores the visualization aspect of the computing technology and its application in architecture/design. Schmitt (1999) introduces an information dimension to the representation of architecture, in addition to the conventional spatial dimensions and the time dimension. Architecture is complex artifact with a life of its own; design, the making of architecture, is a complex process. Given such complexity, representations are always necessary. A comprehensive architecture representation have to take all these into account.

The information technology is very flexible. Laurel (1993) presents how human-computer interactive experience can be enriched with theory of theater. Engeli (2000) illustrates many examples of how information technology may serve designers. Conventional architecture

representation relies on a single medium; the presentations are difficult for laypeople to understand. An architecture representation for the general public should address the issue of presentation to facilitate communications.

MIES: An Architecture Representation Framework

MIES is a framework that combines new ways of architecture representation with human-computer interaction methods to provide effective design communications and comprehensive architecture presentations for non-professionals.

MIES framework is supported by four pillars, which in turn act as guidelines to implementing architecture/design environment for non-professionals.

1. Multimedia/Multimodal: A system should utilize multimedia representations that include textual information, static images (such as traditional abstract drawings or photos), films and animations to provide users with diverse perspectives to understand or describe a building/design. A system should provide multimodal user interactions to enable different sensory input and to enhance information exchange.
2. Internet/Interactive: An architecture representation should be internet-based to facilitate timely communications synchronously or asynchronously between different locations. A system should provide interactive support so that users can actively participate and dictate the process rather than being a passive observer.
3. Ensemble/Engaging: A building/design may require various representations. These representations become more meaningful when act as an ensemble to convey a comprehensive view of the building/design. A system should encourage user engagement to attract intentions.
4. Space-time/Systematic: Records of a building/design change throughout the life-cycle of the building or the design process. An architecture representation should be able to integrate spatiotemporal information to achieve a complete representation. A system should provide systematic and consistent user interaction methods to ensure the system usability.

A Design Environment for Non-designers

MIES framework concept is first experimented in a web-based interactive design environment (WIDE) for non-designers (i.e. non-professionals) to promote user participation during the development of apartment buildings (Chien and Shih, 2000). WIDE-Kindom is an implementation specially tailored for an apartment building project, which is under development by Kindom Construction Corporation (a developer). This prototype provides five basic services: virtual open house, community information, apartment selection guide, buyer customization center, and Feng-Shui recommendations.

“Virtual open house” utilizes virtual reality technology to introduce public spaces and typical apartment units in this building project. “Community information” is a GIS-like environment that helps visitors understand surroundings (for examples, locations of nearby public transportation, supermarkets) of the building project. “Apartment selection guide” allows visitors to identify suitable apartment units in this building project according to their preferences (for examples, size, price). “Buyer customization center” and “Feng-Shui recommendations” are provided to allow visitors customize selected apartment units through

different means. Fig. 1 illustrates the user interface design of "buyer customization center" service.

a.  b. 

Fig. 1: Buyer customization center interface of WIDE-Kindom

The development of WIDE-Kindom prototype focuses on encapsulating design knowledge to provide a seamless and integrated environment with click-and-select user interface (Chien and Shih, 2001). All four supports in the MIES framework are incorporated with additional emphasis on the **I** (Internet/Interactive) and **E** (Ensemble/Engaging) aspects. The prototype has been tested by sponsors and exhibited in an industry trade show with encouraging feedbacks from users.

Digital Bao-An Gong

MIES framework is used to guide the development of a digital museum. It is about the representation of historically significant architecture using digital media. The historic building exhibited digitally in this virtual museum is a temple called "Bao-An Gong" in Taipei, Taiwan. This project aims to demonstrate that unlike photographs, abstract drawings, or even a short visit of the building the virtual building (using representations and interactions suggested by MIES) can preserve and deliver not only spatial but also temporal information of the building in a much more rich as well as interesting manner.

Two prototypes are implemented for the Digital Bao-An Gong. Prototype I is designed with emphasis on the **M** (Multimedia/Multimodal) and **I** (Internet/Interactive) supports of the MIES framework. This prototype utilizes textual descriptions, still images, panoramic scenes, recorded videos (Fig. 2-a), computer animations, and interactive games (Fig. 2-b) to present all aspects of Bao-An Gong. However, both internal reviews and brief user evaluations of the prototype I indicate that the ensemble of various types of information is weak and therefore cannot engage users as expected.

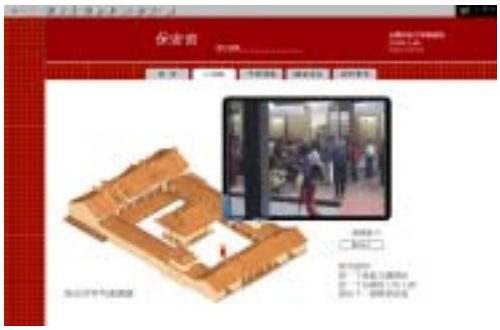
a.  b. 

Fig. 2: Interface designs of Digital Bao-An Gong prototype I

With the experience from prototype I, Bao-An Gong prototype II aims to strengthen the supports of the **I** (Internet/Interactive), **E** (Ensemble/Engaging), and **S** (Space-time/Systematic) pillars. This prototype organizes the ensemble of information through a portal—interactive panoramic scene (Fig. 3-a)—and present the information in a systematic fashion with interactive plays (Fig. 3-b). A brief user evaluation with several 10-year old children indicates the interface is easy to manipulate and can successfully convey information (such as concepts of Chinese timber construction).

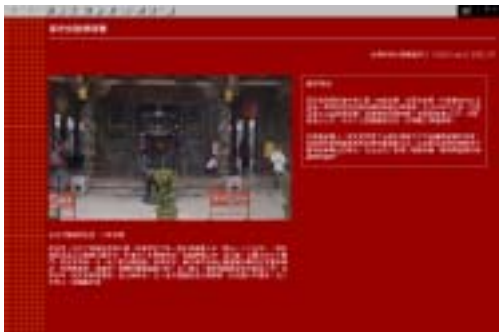
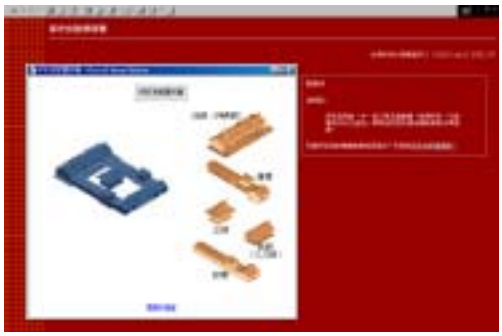
a.  **b.** 

Fig. 3: Interface designs of Digital Bao-An Gong prototype II

Conclusions

Master architect Mies van der Rohe designs Barcelona Pavilion, in which spaces flow freely into one another, with identifiable compositional principles (Flemming, 1990). MIES architecture representation framework strives to achieve the same by providing guidelines without limiting possibilities. Two case studies have provided encouraging results and valuable feedbacks to the design of MIES framework. A continuing research effort is underway to develop a measurement system for the four pillars in the framework so that the performance of an implementation based on the framework can be evaluated or predicted.

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