Design of a Location-Based Local Culture Course M-learning Platform

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ABSTRACT
M-learning can provide learners the capability to assimilate courses anywhere in any time. However, most existing m-learning systems only allow learners to passively receive knowledge without considering the temporal and spacial information of the learners. Due to the location-based nature of AR technology, AR-based m-learning systems can solve the problems by enabling learners to interact with the environment through AR interface. Local culture courses are the lectures talking about the civilization of a place. The challenge is to build a MAR m-learning system with capabilities for various learning environments which have covered and considered the learning efficiency, cultural geography, and other contexts for learners. This paper probes a novel system/App architecture, HTT, and targets on developing a context-aware mobile augmented reality HCI learning platform for local culture courses.

Author Keywords
Mobile Augmented Reality (MAR); Local Culture Courses; Scaffolding; m-learning;

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Local culture courses possess the humanistic and intellectual significance. It basically contains local affairs to focus on the integration of academic learning and physical experiences. Its knowledgeable subjects are related to time, space and event of local features and era background.

E-learning is the platform for the students to work and learn at their own pace and place without the restriction of time and location of traditional learning. However, e-learning requires support and structure to assist the students. Different approaches of Scaffolding in e-learning are proposed over the years. [1] The progress of embedded technology nowadays advances the e-learning up to the m-learning era. This paper focuses on utilizing the interactive

and convenient nature of available mobile platform to further enhance the experience of augmented reality for local culture learning and guidance. The research demonstrates the *Historical Time Tunnel* (HTT) system by integrating augmented reality and scaffolding theory to build an m-learning platform for an elementary school in Taiwan for their local culture courses.

BACKGROUND
Scaffolding
A scaffold is a temporary framework that is put up for support and access to meaning and would be taken away as needed when the student secures control of success with a task. It was first introduced in the late 1950 and was promoted by Vygotsky since 1978. There are three categories of scaffolds, including cognitive, meta-cognitive, and affective or motivational scaffolds. Cognitive and meta-cognitive scaffolds provide assistance, support, hints, prompts, and suggestions regarding the content, resources, and strategies relevant to the problem solving and learning management. Motivational scaffolds involve techniques designed to maintain or improve the learner's motivational state, such as attribution or encouragement. The scaffold for local culture courses belongs to cognitive type.

Augmented Reality (AR) Teaching and Learning
As a cognitive tool and pedagogical approach, AR is primarily aligned with the situated and constructivist learning theory. Since it positions the learner within a real-world physical and social context while guiding, AR utilizes not only scaffolding courses but also facilitating participatory to achieve that its unique metacognitive learning processes multiple modes of representation; such as authentic inquiry, active observation, peer coaching, reciprocal teaching, and legitimate peripheral participation. [2] A lot of AR-based learning applications were built on various formal and informal learning environments such as schools, universities, museums, parks, zoos, etc.

HISTORICAL TIME TUNNEL SYSTEM
The HTT system is an Android App based on Omniguider platform. The Omniguider is a MAR browser, which is available on both iOS and Android platforms, that was designed by our lab in 2010. Omniguider includes a server site which will automatically push all the relatedly required information to the user based upon his currently position.

The design goals of the HTT system include exploration, interaction, and self-learning.

System structure

The system is designed into three layers. The web layer is for the instructor to manage learning material and assembly a particular course from bank of landscapes. The Data Base layer contains all the required database systems for the entire system. The Mobile Device App refers to the HCI execution software on student's tablet. Figure 1 shows the system structure.
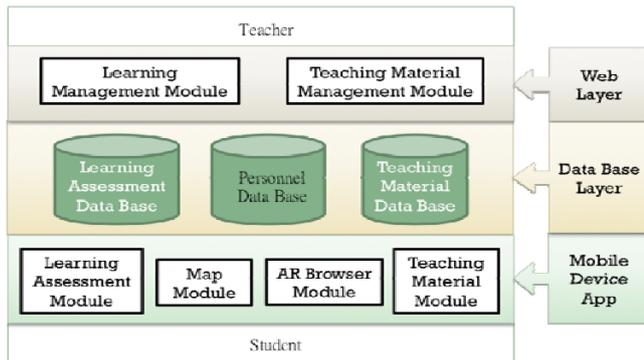

Figure 1. System Structure

MAR for Field-Trip Exploration

We design HTT system to provide an AR-based m-learning platform for the local culture courses. It satisfies the main technology trends of m-learning: location-aware learning, context-aware ubiquitous learning, and augmented reality on mobile devices. Figure 2 is the AR View User Interface. In addition, the AR interface allows the teacher to coach students to recognize geographical location of each landscape.

Figure 2: AR View User Interface

HTT system can solve the problems of traditional field-trip exploration. For the location-aware issue, GPS registers the student to the space of a landscape. It also allows students to immerse into the explored historical events of landscapes by using QR Code. After the registration, the contents are then retrieved for landscape introduction. The contents are provided in the form of Web page and video clips. In order to achieve the scaffolding instruction, a set of quiz is designed for each landscape, as shown in Figure 3. It enhances the interactivity of learning.

Figure 3. Online Quiz User Interface

In all, the HTT system achieves the effect of learning through play. HTT system also achieves one-to-one tutoring result. It solves the problem of distraction on traditional group instruction. The system can boost students' interest for further self-learning to meet the goal of scaffolding learning.

CONCLUSION AND FUTURE WORK

HTT system is a mobile augmented reality system for m-learning. It explores the combination of scaffolding learning with augmented reality technique. HTT system is the result of jointed venture with an elementary school in Taiwan for their local culture courses. Experiments show that, HTT system has obviously significant assistance to new teachers. Students can more enjoy the video clips and multimedia contents of landscape during the learning experiment.

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