Handheld Computer Supported Context-aware learning with 2D Barcodes

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Abstract

This paper reports a study that aims to construct a 2D barcode supported learning system, called HELLO (Handheld English Language Learning Organization), to improve students’ English level. The HELLO integrates the 2D barcodes, the Internet, mobile computing and database technologies. It also consists of two subsystems: an English learning management system and a mobile learning tools system. A four-week pilot study and questionnaire survey were conducted in college to evaluate effects of proposed learning system and student learning attitudes. Furthermore, the evaluation results will be described in this paper.

1. Introduction

The economy has grown rapidly in Asia recently due to the frequent commerce activities between the Asian and Western countries. After Taiwan entered the World Trade Organization (WTO), the Department of Education in Taiwan put a large number of resources into building an English learning environment for improving student English ability. In order to allow students have better English ability to meet the need of work after graduation. Most of colleges have begun to execute projects for English education. Among of those projects, e-Learning is a requisite and important item. For this reason, how to construct an English learning environment in college to increase students’ learning motivation and improve their English level is a priority to be solved. Many positioning technologies have been used to get context-aware information, such as 802.11, IrDA, RFID and GPS. In addition to this, 2D barcode technology has many benefits and it has potential to be applied in various fields. 2D barcode has many advantages including large storage capacity, high information density, strong encoding, strong error-correcting, high reliability, low cost, and ease of printing.

Therefore, this study based on QR Code and mobile computing technology aims to construct an interactive, mobile and context-aware English learning system, called HELLO (Handheld English Language Learning Organization), to meet the requirement mentioned above. Through this system and interesting learning activities, students can perform mobile context-aware learning to improve their English effectively at any time and anywhere.

The rest of this article is organized as follows. Section 2 illustrates the proposed learning scenario. Section 3 describes the HELLO system. Section 4 describes an evaluation. Section 5 draws conclusions.

2. Learning Scenario

The fundamental concept of the proposed HELLO system in this study is that the digitized learning materials are stored in a learning server. The link information between context-aware materials and learning zones is defined in 2D barcodes. Following the guide map to approach learning zones, each student carries a PDA phone having a video camera and wireless local area network (WLAN). A student can use the guide map displayed on PDA screen to approach a zone and uses the PDA phone to decrypt the 2D barcode which was printed on a paper attached on a wall or information board. The detected 2D barcode information was then sent to the learning server via a WLAN. The server detects the student’s location and then send the context-aware contents to student’s handheld learning device. The student completes the context-aware learning process by talking to the VLP. In view of this, this study attempt to explore the applicability and benefits of mobile technology to English learning, and also increasing students’ learning interest and motivation. Figure 1 illustrates the 2D barcode, the Internet, mobile computing and database technologies based context-aware learning scenario.
3. System Design

To achieve this goal, this study integrates 2D barcodes, the Internet, mobile computing, wireless communication and database technologies to construct an interactive, mobile and context-aware learning environment, Handheld English Language Learning Organization (HELLO). The HELLO consists of two subsystems— the HELLO server is a learning server and the m-Tools is a software application. Teachers and system administrators utilized personal computers to connect with HELLO server by using the Internet. The functions of HELLO server including Content Management (CM) unit, Assessment Management (AM) unit, Portfolio Management (PM) unit, Forum unit, and Push daily sentence unit. Students hold a PDA phone installed with the m-Tools to pursue mobile English learning. The functionalities of m-Tools including listening, reading, speaking, writing, context-awareness and valuation.

4. Evaluation

This study designed a course was entitled, “My Student Life.” Mobile gamed-based learning and context-aware learning were adopted as pedagogic strategies. The experimental procedure was described as follows.

In the self-study phase (first two weeks), teachers introduced the HELLO system and demonstrated how to use the learning tools. A mobile game-based pedagogic strategy was employed in the self-learning process. Students used PDA phones installed with the m-Tools. A campus map appeared on the screen after students launched the game “My Student Life” on the PDA phone. The campus map had many zones marked on the map. Students just clicked the zone they wanted, and then the m-Player opened materials related to that zone. For instance, when a student selected the zone ‘Library’, a library was displayed on the PDA phone. Students could further choose the reading room to read an article, the newsroom to read news, or the multimedia room to watch a movie at their will. The key point is that students could learn at any time and anywhere without going to a real library.

In the context-aware learning phase (rest two weeks), students employed the HELLO system to carry out the learning activity titled, “Campus Tour”. Each student used a PDA phone installed with m-Tools and followed the guide map appeared on the screen to perform context-aware learning activities. When approaching a zone, a student used the PDA phone to take a picture and decrypt the 2D barcode. The detected identification code of the 2D barcode was then sent to the HELLO server via a WLAN. The HELLO server located students and then sent the context-aware contents back to their PDA phones. The VLP appeared on the PDA screen. Then students practiced conversation with the VLPs, just like they talk with real partners in the real world. Students visited the next zone after completing a conversation with VLP at a particular zone until they had visited all zones. Students accessed context-aware content related to the location and achieved context-aware learning. Figure 2 illustrates an example of the learning activity.

5. Conclusion

This study has constructed a 2D barcode supported English learning system – HELLO with effective functions and plentiful learning materials to help English learning. A pilot experiment was performed on college students. MGBL and context-aware learning pedagogic strategies were adopted; a mobile learning game titled “My Student Life” and a learning activity titled “Campus Tour” were employed on campus in four-week experiment. A questionnaire survey was administered following all learning activities. The survey results show that most students think that the proposed system is easy to use and useful in English learning. Moreover, results indicate that using 2D barcodes technology in mobile learning is useful and interesting for providing context-aware learning experiences in those learning activities.