DEVELOPING THE OUTDOOR GAME-BASED LEARNING ENVIRONMENT BY USING UBIQUITOUS TECHNOLOGIES

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ABSTRACT

The outdoor experience game could help learner to learn the course knowledge by interact with real world learning activities. In this paper, we proposed the web-based outdoor experience game-based learning system by using the Geography Information System (GIS), Global Position System (GPS), wireless and mobile technologies. The outdoor game-based learning system could help learner and instructor easily to learn/develop the learning content/related environment setting.

Index Terms—Pervasive game, Mash-ups, GIS, GPS, GBL

1. INTRODUCTION

Nowadays, due to the advanced information technologies, it’s helpful for people to improve their quality of life, especially in education and entertainment domain. Due to the advanced ubiquitous technologies, they will help for providing various kinds of learning and game playing interaction for above domain. The application of GPS technology is started in Geocaching game. This game was proposed by Kenton O’Hara [1] which point out that Geocaching system could provide outdoor experience for learners and it also could promote character changing from learner to material constructor. Peter Kiefer et al. proposed chessboard-based game which based on geography information service [2]. This game system provided wide scope on game location architecture definition on developing the Geocaching game. Shelley Shwu-Ching Young et al. proposed the Across Mobile Platform Learning System (AMPLe) [3, 4]. This system will focused on develop the outdoor learning activities for elementary school learners. In mobile learning course design, Marco Sá proposed the TEST-IT framework in order to provide more reliable development architecture on developing the course content and related assessment rules [5]. The learner also could utilize the mobile device to assess these courses and to do their online assessment activity. Due to the discussing form above researches, we would like to develop the outdoor game-based learning environment by using ubiquitous technologies. The remainder of this paper is organized as follows. In section 2, we will illustrate our proposed outdoor game-based learning (GBL) system’s architecture, related system modules and its workflow. In section 3, we will introduce the sample demo of the outdoor game-based learning system. Finally, the conclusion and the future work will show in section 4.

2. OUTDOOR GAME-BASED LEARNING (GBL) SYSTEM

2.1. The outdoor GBL system architecture and workflow

The system composed of three parts (see Fig. 1.), they are backend server, mobile Client and course authoring tools.

2.1.1. Backend Server

Backend server composed of Game server and related Repository. Game server could provide the interactive online authoring tool and game-based learning interface for mobile client by using AJAX. Game server will utilize outside Google Map service to provide the game map information. Repository will manage the related courses
content saving status. It also has to handle the data transmission and processing from client side. The Repository also could auto provide the course information when mobile client is starting to do the related learning activities.

2.1.2. Mobile Client

We utilize the UMPC to be our testbed platform. The client has to manage the GPS data receiving and wireless connection status in order to provide the stable location information to the backend server. When processing form backend server is completed, the client could receive the game map and related course content.

2.1.3. Course authoring tool

We provide the web-based online authoring tool so that the instructor doesn’t need to install the application before using the course authoring tool. Due to the Web2.0 technology, we could provide more user-friendly interface for the instructor easily to design the course content and related game scenario.

2.2. The outdoor GBL system modules

In this section, we will introduce the data processing in Repository and related system modules in Backend server and client side in detail.

2.2.1. Data Storage in Repository and System modules in Game server – Backend server side

In Backend server side modules, the related data storage procedure in repository and related modules in Backend server which show in Fig. 2. In data processing in repository part, all existed game missions in database could be share to other instructors by selecting and setup the mission nodes. It could be useful for reducing the loading when the instructor constructing the related course content. In mission data of database design part, the Question and test part may store the quest properties of particular mission. The data field includes some related information about targets of mission and answers of related questions. In related System modules in Game server, the instructor and the learner use same database table to store the related member information by using Member information table by cooperating with Login Portal Module. The table records all basic properties of instructor/learner. Course record module would process and record related processing data from learner’s learning progress. The instructor and learner could utilize related functionalities to review and to analysis the efficiency when finishing the related learning progress.

2.2.2. System modules – Client side

In client side, it will only take care of connection with the GPS receiver in order to get the location data and to analysis it with related learning activities information data. At last, the client will send the processing information data to the server side. The GPS receive modules which include two sub modules (see Fig. 3). They are Com port Management and NMEA 0183 Parser. Due to some restrictions of bandwidth in wireless network, the route record module will focus on adjusting the receiving frequency of record. At last, the response from server would be processed and presented by Web Browser module.

3. OUTDOOR GAME-BASED LEARNING (GBL) SYSTEM IMPLEMENTATION

In this section, we will make some descriptions to introduce the workflow of our proposed outdoor experience game system. When the learner starting to do his/her outdoor experience course learning activities (see Fig. 4), he/she firstly has to login to the game system by using UMPC platform. And the current course page will show all available courses which provided by referencing current available GPS location data that the learner could select in order to do the related learning activities. When the server was received the correct location data from the learner, the backend server will deliver the current course mission which selected by the learner before. When finishing the learner’s learning activities, he/she could login to the game system through the browser in order to obtain his/her owned courses records. The mobile client interface will display as Fig. 5. The learner’s location will display as cross marker in red color and other mission nodes will also display on the game map. The game system has also provided the learning routes by routing service in order to provide nearby public transportation information in order to help the learner to...
arrive at the related mission area. The course authoring tools could help the instructor to build the outdoor experience course content through browser. For the needs, we utilize the AJAX and JavaScript to design the authoring tool interface. The course authoring system will firstly let the instructor to decide the mission area. Then the instructor will provide related guide lines to help him/her to design the game missions step by step. When the learner chooses the related course mission, the mission descriptions will show up for the learner (see Fig. 6).

4. CONCLUSION AND FUTUREWORK

The outdoor experience game could allow learners to do their learning activities in the natural environment by observing the physical learning content in order to obtain the related knowledge and its learning experience. We also built the course authoring tool for instructors easily to develop the course and game content. In the future work, we will keep continue to add the additional assessment functionalities to our proposed game system.

5. REFERENCES


