

Enhancing User Experience while Gaming in Archaeological Parks with Cellular Phones

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ABSTRACT

Traditional visits to archaeological parks, which are usually organized by schools, tend to generate little interest in young students, especially when they are faced with the ruins of ancient settlements whose current appearance no longer reflects their initial purpose. We have designed Explore!, an m-learning system which allows students to visit the park while playing a game. By exploiting the imaging and multimedia capabilities of the latest generation cell phone, the game improves young visitors' experience. In particular, contextual sounds have been integrated to recreate the historical atmosphere: users can hear sounds generated by ancient people engaged in their daily activities. The slim architecture of the system absolves the archaeological park from any need to invest in hardware infrastructure. An Authoring Tool can be used by history experts to implement in Explore! games to be played in different parks. In this demo paper we briefly present the game and the main components of Explore!: 1) the Game Application running on cellular phones, to be used during the game, 2) the Master Application running on a notebook, used by the game master (i.e. a teacher) to perform a reflection phase, which follows the game and 3) the Authoring Tool to modify/create new games.

Categories and Subject Descriptors

K.3.1 [Computer Uses in Education]: Collaborative learning- Distance learning

General Terms

Human Factors.

Keywords

Mobile learning, edutainment, children.

1. INTRODUCTION

The Explore! m-learning system exploits the capabilities of the latest generation cell phone to implement a game that helps

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middle school students (ages 11 through 13) to acquire historic knowledge while playing in an archaeological park. Gameplay permits to learn while enjoying, encourages group activities, stimulates collaboration. Traditional visits to archaeological parks, which middle schools organize as part of educational curriculum, do not arouse students' enthusiasm. In fact, by observing the ruins of the ancient settlements students are not able to image their original aspect and purpose.

The game is structured like a treasure hunt to be played by a class of students, which can freely exploring a park and discovering its hidden secrets. This type of game is perfectly suited to the archaeological park context, with wide spaces where students can freely move and use their intelligence and imagination to conjure up how life used to be there, by observing the park and memorizing places, names and functions. The game consists of three main phases: introduction phase, game phase, debriefing phase. In the *introduction phase*, the game master (i.e. a teacher or an history expert) gives a brief description of the place and explains the game. Groups of 4/5 players are formed: each group impersonates a character; in the case of "Gaius' Day in Egnathia", an example of game designed for visiting the archaeological park of Egnathia, an ancient city in Apulia, students represent a Roman family that has just arrived in Egnathia. In the *game phase*, each group is given a cell phone and the map. The challenge is to carry out ten missions, visualized on the phone screen one at a time, which require students to walk around and look for the mission target. To carry out the missions, players have to formulate hypotheses, discuss them, retrace their steps when they go wrong and correct their mistakes. If students have difficulties in reaching the place that is the mission target, an item in the Menu list allows them to ask the "oracle" for help. The oracle gives them some hints that help discovering the right place. In the ancient Roman culture, the oracle ("oraculum" in latin) was a divine communication delivered in response to a petitioner's request. Hints, provided by the oracle, are formulated for supporting both gameplay and students' learning of the underlying educational content. Players provide their answer to a mission by typing in the place code on the cell phone. After completing the challenge, the group receives "God's gift": they can explore the 3D reconstruction of the identified places on the phone and visually compare how the places probably once looked with the existing remains (Fig. 1).

The play phase must be followed by a reflection phase, separate from the true game, in which the acquired knowledge is revised and shared among students. This part of the activity is called *debriefing phase* and it is fundamental in didactic gameplay because it fosters generalization and conceptualization of the

information acquired during the game. This phase can be carried out in a lecture room in the museum or on return to the classroom.

2. SYSTEM DESCRIPTION

Explore! has been designed to be as device independent and modular as possible, with a clear distinction between game content (historical information, 3D reconstructions, sounds, and so on) and game logic. The system consists of three main modules: the Game Application, running on one of the two cell phones given to the group, provides the information necessary to perform the game; the Hint Application, running on the second cell phone, provides further hints for identifying the places in the park; and the Master Application, running on a PC or a notebook, used by the game master (i.e. a teacher) to perform a reflection phase, which follows the game.

The *Game Application* relies on an XML file that describes the game content (easily authored for each archaeological park) and an XML file stating the layout and relationships among the various audiovisual elements of the user interface. The Game Application includes the Contextual Sounds Application, a software module that defines the user's position and produces a virtual sound environment. This module can be included easily in any system that needs to generate a contextual sound environment in outdoor settings. It controls how the sound originating from a source fades as the distance from the user grows; distance is determined using the GPS coordinates of the sound sources (coded in an XML file) and the current GPS coordinates of the mobile phone. When game players walk across the park, they hear the sounds originating from the virtual sources.



Figure 1. The 3D reconstruction of the Foro Boario shown by the Game Application as award for solving a mission.

The *Hint Application* provides the game cues, which also are represented in XML. It is available on the second mobile phone. It has been implemented as a small video game on the phone's screen where Gaius is represented by an avatar that approaches one of six temples. Each temple contains clues about a specific place of interest (Fig. 2).

The third module, *Debriefing Application*, runs on a notebook and retrieves the game's XML log files from the memory cards on the mobile phones. The game master plays a "collective memory game". Several activities can be carried out: monuments and archaeological objects must be placed in the "right" place; the 3D

reconstruction of the park is visualized on the screen; the logfiles collected from the cell phones are analyzed and the winning group is proclaimed; the path an arbitrary group took across the archaeological park the activities is shown (Fig 3).



Figure 2. The Hint Application as running on the second mobile phone provided to each



Figure 3. Path that the winning group took during the game.

An additional system component, the *Authoring Tool*, allows end users not expert in computer programming to develop games to be played in different parks. A wizard process guides the user which specifies all the information that Explore! needs: the character to be impersonated (Gaius in the case of Egnathia), the game challenge, the missions, the hints provided by the Oracle. Also the environmental context can be specified: places to be discovered, their photos, 3D reconstructions and GPS coordinates, contextual sounds. Some audiovisual interface elements can be personalized to be appropriate to a historical period (for example, some icons are suited for a Roman city but not for a Greek city). After the user has terminated the process of specifying the new game, all the information is automatically described by XML files and the multimedia material is stored in a folder which must be copied in the cell phones memory cards.

3. ACKNOWLEDGMENTS

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