Chapter 100

Ubiquity and Context–Aware M–Learning Model:
A Mobile Virtual Community Approach

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ABSTRACT

This paper presents a new adaptive m-learning model supporting collaborative and context-aware learning. A seamless integration between learners' location information and a set of associated learning context dimensions is used to facilitate the provision of pervasive and ubiquitous learning services. The new model adopts nearest search algorithm in order to group spatially related mobile learners, constructing learning-oriented virtual communities and achieving a collaborative learning experience. The presented model implements two virtual community construction modes, described as client-based and server-based collaboration modes. A preliminary evaluation methodology was conducted, measuring the successful implementation of the proposed new model, and confirming the establishment of the virtual community after considering a set of learning context dimensions; such as learning collaboration type, learning style and learners' location information. Results have confirmed that both collaboration modes were successful in establishing the virtual communities between mobile learners. However, the server-based mode was more scalable than client-based mode while handling the increased number of mobile peers, in which less response time was experienced and a smaller learning grid area was formed.

1. INTRODUCTION

The advancement and convergence of mobile technology have facilitated the release of new application trends. This progress includes applications responsible for enhancing learning experience provided by educational institutions, and for deriving new challenges and opportunities for the digitally native students. The learning environment enhancement includes the development of digital educational content and resources, which are made available to learners using either fixed or a mobile learning platforms. Fixed or electronic learning (e-learning) platforms assume the access and provision of learning services through desktop PCs. In comparison, mobile learning (m-learning)

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takes the advantage of mobile technologies to increase the capability of utilizing learning opportunities without considering a predetermined location (Triantafillou et al., 2008).

The mobile access is required to maintain the availability of m-learning services to students in any location. Mobile devices can facilitate interaction and information access through wireless communication and therefore enable learning at anytime and anywhere. This technological advancement has derived educational institutes to exploit mobile devices and networks for heightening the learning experience. Hence, this has posed huge demands on designing and developing m-learning applications required for supporting ubiquitous and ambient learning (Berri et al., 2006). The success of m-learning is highly dependent on the awareness of learning context characteristics and on the existence of educational adaptation mechanisms that can be integrated into the learning applications design process (Economides, 2009). Context can be described as 'any information that used to describe the situation of an entity'. M-learning context can be referred to information related to learner's (preferences, needs…etc), the device used, network connection and parameters of the environments. Providing context-awareness into mobile learning environments can be an efficient method of refining the usability of mobile and anticipating the user's needs and proactively serves up the most appropriate and customized content and learning service.

An additional dimension that can be feasibly utilized within context parameters is the learner's location information. Including location within the learning context parameters, allows for seamless integration with learners' environment, supporting flexible learning and ensuring efficient learning information retrieval and delivery (Choi1 & Kang, 2012). The provisioning of services using location information is known as location-based services (LBSs). This was possible due to the integration of GPS functionality in most smart phones, which has enabled mobile users to utilize their positions and time for requesting temporal and spatial information services. As a result, utilizing the location-awareness of mobile devices will facilitate the option of personalized and ubiquitous learning, which will further strengthen m-learning experience.

Mobile social networking is currently widely available to users as a result of social network services being customized for mobile devices, especially smart phones (Li & Du, 2009). Therefore, mobile learning can utilize the capability of social networking improving the learning experience. In addition, social network is very useful for improving the quality of interaction between learners, by allowing them to share information, activities and experience. In this work a collaborative learning is achieved by establishing a virtual learning community, allowing a group of spatially related mobile learners having similar context factors to be grouped together sharing available resources and receiving adaptive and context-aware learning services.

This paper is structured as follows; the next section describes the literature review being considered in this work; section 3 identifies the context dimensions being utilized in the adaptive system; section 4 describes the proposed system model architecture, components and operational procedures. In addition, section 5 presents the evaluation methodology being conducted to validate the system model, and section 6 describes the achieved results. Finally, section 7 concludes this work.

2. LITERATURE REVIEW

The advances of technology have provided learners with the flexibility of learning regardless of time, space and location. For example, the revolution of mobile technology have facilitated the opportunity for developing cognitive applications such as m-learning allowing the provision of knowledge and learning resources anytime and

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