



Chapter II

Context-Aware Mobile Learning on the Semantic Web

Rachid Benlamri, Lakehead University, Canada

Jawad Berri, Etisalat University College, United Arab Emirates

Yacine Atif, Massey University, New Zealand

Abstract

This chapter focuses on the theoretical and technological aspects of designing mobile learning (m-learning) services that deliver context-aware learning resources from various locations and devices. Context-aware learning is an important requirement for next generation intelligent m-learning systems. The use of context in mobile devices is receiving increasing attention in mobile and ubiquitous computing research. In this research work, context reflects timeliness and mobility to nurture pervasive instruction throughout the learning ecosystem. In this context of ubiquity that is supported by a new generation of mobile wireless networks and smart mobile devices, it is clear that the notion of context plays a fundamental role since it influences the computational capabilities of the used technology. In particular, three types of context awareness are being considered in this work —platform-awareness, learner-awareness, and task-awareness. In this research work, these contextual elements are defined at the semantic level in order to facilitate discoverability of context-compliant learning resources, adaptability of content and services to devices of various capabilities, and

adaptability of services to task at hand and interaction history. The work presented in this chapter contributes towards this direction, making use of the progress in Semantic Web theory and mobile computing to enable context-aware learning that satisfies learning timeliness and mobility requirements.

Introduction

With the expansion of the mobile computing paradigm allowing users to access services anytime and anywhere, it becomes possible to deliver learning resources and services to nomadic learning communities. This form of mobile learning is being made more attractive with the recent advances in ubiquitous computing and Semantic Web. Mobile users equipped with wireless devices go through several contextual changes as they move around in physical and social surroundings. Context acquisition and management is therefore an important requirement for developing systems capable of sensing their environment and delivering ubiquitous services tailored to the learners' situation. Thus, context awareness is presented as a means of adapting learning services to provide 'just enough, just in time, and just for me' model of personalized learning (Low & O'Connell, 2006). Personalization is becoming increasingly important in the context of the Semantic Web (Aroyo et al., 2005). Existing techniques for learner modeling need to be enhanced to deal with the challenges created by the new form of mobile-user interaction. While the new forms of interactive multimedia and communication offer new possibilities for supporting innovative ways of learning, collaborating and communicating (Milrad, 2003; Mizoguchi & Bourdeau, 2000), the challenge is to develop new Semantic Web techniques that use well-defined standards and ontologies to deal with context and personalization at the semantic level, enabling hence intelligent handling of the dynamics of a user's conceptualization. Although, it is agreed that general-purpose modeling and reasoning with context is a complex problem, and much research work is needed before achieving any real progress in this field, we believe that there is a potential in the Semantic Web for developing such new context-aware intelligent learning systems. The research presented in this chapter contributes towards this direction, and is aimed at using the evolving Semantic Web and mobile computing to enable context-aware personalized learning services.

The main challenges in developing context-aware m-learning systems are related to the ability of such systems to model and consistently reason with high level contexts at the semantic level. Although some research attempts were made to solve some of these problems, the shortcoming of most of these efforts is their limitations to specific context elements and specific learning scenarios. In particular, a considerable amount of research in context-aware learning is now moving towards ontology-based context management for personalized learning (Mizoguchi & Bourdeau,

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