A Methodology for Enhancing Mobile Learning Through Content Semantics

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ABSTRACT

Mobile learning is becoming increasingly popular. Educational web sites can be used as supporting learning tools for students who wish to supplement their knowledge without restrictions of time and place. The continuously increasing demand for enhanced remote and mobile services, as well as the difficulty in easily incorporating current learning services for mobile users, renders essential the adaptation of educational material for these requirements. The objective of this work is to present and evaluate a methodology for producing content semantics from learning material. The proposed approach results in recommending links, which are relevant to the mobile users’ interests, by exploiting the recorded usage of an educational portal and the semantics of the learning content. The implementation results reveal enhanced capabilities in mobile learners’ web experience and usability.

Keywords: Mobile Browsing, Mobile Learning, Natural Language Processing, Ontology Learning, Recommendation Systems

INTRODUCTION

The evolution of Internet and multimedia services has led to interesting applications in education. Further, because of economic realities, educators are compelled to consider new delivery strategies and approaches to developing lifelong learners. Examining the ways of use and the extensive popularity of mobile devices, it is easily understood why mobile learning is gaining growing attention by researchers and scientists. O’Malley (2005) defined mobile learning as a learning process in which the user does not find themselves in a predetermined locality. It can be spontaneous, personal, informal, contextual, portable and ubiquitous. Additionally, it can be pervasive, so integrated with daily activities in ways that are hardly noticed. Trifonova & Ronchetti (2003) defined mobile learning as e-learning that can
be transmitted via portable appliances, and more concretely via each appliance that has small size, is autonomous, accompanies the user each moment and can be used as a means of transmitting or accepting educational material.

Along with these attributes, mobile learning has much in common with other types of e-learning on desktop computers, but with the advantages of more immediate interaction and smaller, often wireless devices. Moreover, mobile devices cover, and predispose for further growth, the need for training the community for social interaction and safeguarding of individuality (Sharples, 2000; Klopfer, 2002). The exchange of data and the collaboration with other students is straightforward, therefore learners can be grouped and socialize more easily. Generally, acting as learning tools, mobile devices can enhance the learner’s communication and cooperation skills, or increase their flexibility to perform in different working or learning environments.

Beside their important benefits, mobile appliances have constraints when they are used for learning purposes. Currently, these constraints can include browsing latency or difficulty in incorporating easily learning services designed for desktop PCs. These limitations have impacts on mobile users’ browsing behavior. Studies have indicated that mobile Internet users suffer more severely from the problem of undesired outcomes than stationary Internet users do (Albers & Kim, 2000). Even in new mobile devices, the mobile browsers mainly support a line-based navigation, resulting in a major impact on mobile users’ web experience and significant time to complete successful searches when mobile users navigate to the majority of websites. Past and recent research (Albers, 2000; Dunlop & Davidson, 2000; Nielsen, 2012) on mobile users shows that page-to-page navigation is very costly when browsing in general, thus Sharples (2000) and Nielsen (2000, 2012) advise web developers to reduce the amount of page-to-page navigation and to provide a quick way for users to navigate through conventional or small screen web pages. Although many years have passed since the advent of mobile technology, still the telecommunications operators in European countries retain high pricing policies in mobile internet and browsing cost remains high (Liu et al., 2010; Accenture-Mobile Web Watch Usage Survey, 2012).

Furthermore, learners and Internet users generally, often cope with difficulties such as distraction, lost-in-space syndrome and cognitive overhead, when trying to acquire and access learning material. By knowing how learners choose their navigation paths and the way that the learning content is organized, recommendation systems can be modeled and partially automated to predict learners’ steps, thus improving learning material discovery and simplifying management. Although there are different views on which features are relevant to knowledge discovery by learners, the majority of research (Nielsen, 2012) shows that learners are highly goal-driven when they search for information on educational sites. Thus, it is essential to improve browsing usability for learners with less effort and frustration, and, more important, to save browsing time. Enhanced management and browsing usability could be extremely useful for mobile web visitors, who browse content from cell phones or other wireless devices.

Taking into account the above issues, this work aims to address the problem of how mobile learners can be efficiently supported by an educational platform in order to overcome browsing limitations. Working in this direction, it proposes a new methodology that aims to reduce mobile users’ effort when navigating to an educational portal, by recommending semantically related educational content to their interests and leading them to their desired knowledge. Semantic web models exhibit features including expressiveness, extensibility, ease of sharing and reuse, and logic reasoning support (Yu et al, 2010). Therefore, in recent years, semantic web tools have emerged as one of the most popular and widely accepted tools for modeling information in mobile computing domains (Ye et al, 2007). In addition, ontology-based approaches have been used for learning activities in recent projects like the Concept...
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