Reliability-Based Dynamic Programming for E-Learning User Profile Assessment

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ABSTRACT

Electronic learning (E-learning) has been adopted as a new learning tool overcoming time and place limitations. Although the success of e-learning architectures has been investigated by researchers, little work has been conducted to assess the success and/or effectiveness of E-learning systems. The on-line training environment enables users to undertake customized training at any time and any place. Moreover, information technology allows the users to be decoupled in terms of time, place, and space. Here, the author proposes an assessment procedure applying a dynamic programming approach to model the problem of optimal path in the user profile and using reliability to measure the interconnections among users in an e-learning network. A dynamic program is used to find the optimal path for the user in the E-learning environment. The validity and effectiveness of the proposed model are illustrated by an example.

Keywords: Dynamic Programming, E-Learning, Information Technology, Online Training Environment, Reliability

INTRODUCTION

Modern societies have dramatically changed due to technological changes such as the development of information technology systems. Service industries have become knowledge oriented, production economies have become knowledge economies and production workers have become knowledge workers. Learners need to be flexible and adaptive if they are to function well in today’s complex and global societies.

As part of the larger drive to change the curriculum, assessment needs to be reformed as well. Biggs’ (1996) idea of constructive alignment amongst instruction, learning and assessment implies that these three elements should be based on the same underlying principles. The new assessment methods are not without problems either and some feel that the evidence against traditional tests is not as strong as has been claimed (Hambleton & Murphy, 1992), and that the claim that newer forms of assessment are better suitable to address learners’ requirements still needs empirical confirmation (Stokking, Van der Schaaf, Jaspers, & Erkens, 2004). Studies have shown that no greater impulse for learning exists than assessment (Frederiksen, 1984) and that a strong relationship exists between learning and assessment, implying that
what is assessed strongly influences what is learned (e.g., Alderson & Wall, 1993).

Though it is clear that assessment needs re-thinking, but it is not clear what requirements should be used for these new assessments. This is an important question to address, as the quality of assessment is increasingly being regarded as a very important element of the quality of education as a whole. Assessments in education may require new and other quality criteria to evaluate them. These criteria need to be more compatible with the principles and ideas of education (Fazlollahtabar & Sharma, 2008).

Internet has significantly impacted the establishment of Internet-based education, or E-learning. Internet technology evolution has affected all industrial and commercial activities and accelerated E-learning industry growth. It has also fostered the collaboration of education and Internet technology by increasing the volume and speed of information transfer and simplifying knowledge management and exchange tasks. E-learning could become an alternative way to deliver on-the-job training for many companies, saving money, employee transportation time, and other expenditures. An E-learning platform is an emerging tool for corporate training. Employees can acquire competences and problem solving abilities via Internet learning for benefits among business enterprises, employees, and societies while at work (Fazlollahtabar & Yousefpoor, 2009).

Self-regulation requires adequate monitoring strategies and meta-cognitive skills. The created E-learning environments should encourage the application of learners’ meta-cognitive skills by prompting learners to plan, attend to relevant content, and monitor and evaluate their learnings (Fazlollahtabar & Mahdavi, 2009).

Although E-learning has been developing for several years, evaluating E-learning effectiveness is critical as to whether companies will adopt E-learning systems. A considerable number of studies have been conducted emphasizing the factors to be considered for effectiveness evaluation. Several evaluation models are considered with specific aspects. The criteria used for E-learning effectiveness evaluation are numerous and influence one another (Mahdavi et al., 2008).

User modeling is a fundamental mechanism to achieve individualized interaction between computer systems and humans (Paiva, 1995). It is usually concerned with modeling several user related issues such as goals, plans, preferences, attitudes, knowledge or beliefs. The most difficult task in this context is the process of interpreting the information gathered during interaction in order to generate hypotheses about users and students behavior (Paiva, 1995), and involves managing a good deal of uncertainty. Interactive computer systems deal in general with more meager and haphazardly collected users’ data than it usually happens when humans are engaged in a face-to-face interaction (Jameson, 1996). Thus, the gap between the nature of the available evidence and the conclusions that are to be drawn is often much greater (Jameson, 1996).

Numerical techniques have been employed in several cases in order to manage uncertainty (Conati, Gertner, & Vanlehn, 2002; Herzog, 2005), and neural networks have been used in order to add learning and generalization abilities in user models and draw conclusions from existing user profiles (Chen, Norcio, & Wang, 2000; Harp, Samad, & Villano 1995; Stathacopoulou, Magoulas, & Grigoriadou, 1999; Yasdi, 2000). Ultimately, information technology tools resulting from this program must foster a demand-oriented market for instruction (Mahdavi et al., 2008). If this occurs, the market for educational technologies can be expected to expand far beyond the current bounds. Learners in particular and the economy as a whole will benefit greatly. Tools for developing instructional content and courseware will need to operate across different platforms and communicate with other tools used to build and manage learning systems (Mahdavi et al., 2008). It also manages tasks and allocates learning resources such as registration, classroom and instructor availability, monitors instructional material fulfillment, and provides the on-line delivery of learning resources (Tajdin et al., 2008).
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