EDITORIAL

Special issue on "Ubiquitous e-Learning Solutions over Heterogeneous Networks"

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The recent advent and proliferation of wireless networking solutions such as DVB/DVB-RCS, VSAT, DVB-S/S2, WiFi, WiMax, and UMTS/3G, to name but a few, has raised the expectations for delivering media rich e-learning content any time, any place. Towards meeting this challenge, bandwidth, reliability of content delivery, as well as economic feasibility are key factors that require fresh research on innovative end-to-end tele-education systems.

Accordingly, this special issue targets precisely the area of ubiquitous e-learning solutions built over heterogeneous networks—their implementation, deployment and use. The issue kicks off with the paper by Salzmann, Gillet and Mullhaupt who present a new end-to-end adaptation scheme to provide the user with the best possible interacting experience, while considering imposed constraints in the ubiquity of the solution, the adaptability to the E2E infrastructure, and the respect of the Internet best practice. They consider three dimensions in their adaptation scheme—the level of interaction (how quickly a feedback

is provided to the user), the system dynamics rendering (how accurately in time the behavior of the remote system is perceived), and the amount of semantic content (how well the distant equipment state and conditions of operation can be perceived by the client). The feasibility of the proposed solution is then shown under the extreme networking constraints of a PDA accessing content remotely over a Bluetooth link.

Muntean and Muntean address a similar theme and propose PEACOCK (Performance-based E-learning Adaptive Cost-efficient Open Corpus FrameworK), an innovative, adaptive, ubiquitous e-learning environment that provides support for the selection and distribution of personalised e-learning rich media content (e.g., multimedia, pictures, graphics and text) to e-learners. Importantly, PEACOCK integrates not only user preferences, interests and goals, but also cost considerations, as well as limitations imposed by network and access devices, to deliver true personalisation to the end-user.

Personalisation in ubiquitous e-learning environments is also the theme of the paper by Gaeta, Gaeta and Ritrovato. Based on work carried out under the auspices of the European Learning Grid Infrastructure (ELeGI) project, they present a software architecture for the delivery of personalised formal-learning experiences. Their solution, of which a first prototype has already been built, integrates various pedagogies with a variety of service-oriented grid technologies, offering new possibilities for seamless ubiquitous access to heterogeneous learning resources.

Recognising the importance of activity within the more general domain of context in ubiquitous computing, Lefrere presents in his paper scenarios for ubiquitous e-learning in heterogeneous networks. He suggests that the success of activity-based computing (ABC) in complex work domains suggests that ABC could be the basis for

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developing a learning-focussed analogue, activity-based e-learning extensions (ABLE).

Serif et al. make the point that, in order to design true, user-driven, ubiquitous e-learning solutions, novel methodologies must be put in place. Accordingly, they present a methodology for designing a satellite and wireless-based network infrastructure and learning services to support distance learning for such isolated communities. The methodology, spanning the whole spectrum between service elicitation to actual deployment and trial, has been implemented in isolated maritime and agrarian communities in Greece and Cyprus, and the experiences and results obtained by the authors in this exercise form the focus of the paper.

Last but not least, the paper by Arvanitis et al. concludes this special issue. They report on an augmented reality computer-mediated learning system, which integrates augmented reality and web-based streaming and communication, in order to support learning in a variety of settings. Their developed system is shown to assist users—and especially those with special needs—to better contextualise and reinforce their learning in school and in other settings where people learn.

These studies illustrate exciting recent developments of heterogeneous networks for e-learning. Designers and instructors cannot assume that all learners will automatically use web-based educational programmes effectively, nor can they assume that such programmes are going to be delivered over high-speed networks, or to powerful access devices. Indeed, heterogeneity seems to be the order of the day and this special issue is but a small step in attempting to delineate different approaches to handling this ever-growing diversity of context in all its manifestations: user, location, network, and access device. It is strikingly apparent that this area needs much more research to yield the form of evidence that can drive design, exploitation and proliferation of ubiquitous learning solutions. In keeping with the theme of the majority of the papers of this issue, we do, however, hope that future development in this area will not only emphasise purely technical solutions, but also effectively consider the needs of each individual user.

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