Chapter 8.2
Plastic Interfaces for Ubiquitous Learning

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ABSTRACT

This chapter presents research around pervasive and ubiquitous computing, particularly oriented in the field of human learning. We are studying several solutions to deliver content over a heterogeneous networks and devices. Converting and transmitting documents across electronic networks is not sufficient. We have to deal with contents and containers simultaneously. Related work in interface adaptation and plasticity (the capacity of a user interface to withstand variations of both the system physical characteristics and the environment while preserving usability) is presented and some examples of context-aware adaptation are exposed. We present an adaptive pervasive learning environment, based on contextual QR Codes, where information is presented to learner at the appropriate time and place, and according to a particular task. This learning environment is called PerZoovasive, where learning activities take place in a zoo and are meant to enhance classroom activities.

INTRODUCTION

In the coming years, learning through heterogeneous telecommunication networks will probably become the rule and not the exception. Studies show that information which circulated in the world is progressively being stored in a numerical form. In theory, we should take advantage of improving access to this information, since it is immediately available and consumable. But in fact, with the multiplicity of possible connections to Internet and over heterogeneous networks, is it not always the case.

The new kinds of networks such as WIFI or Bluetooth offer new perspectives of research for the ICT-based education and hypermedia community. The goal is to satisfy all types of users by proposing data-processing solutions available on almost all the products or peripherals available on the market. The rise of a great number of hardware such as mobile phones, PDA or WebTV, having variable capabilities, leads to a reflection on independent interfaces specification, in order

to avoid specific developments. The ubiquitous role of the computer makes each day more unsuitable the screen-keyboard-mouse model posed on a corner of a desk (Beaudouin-Lafon, 2000).

The large success and rise of the Internet network is mainly due to the technical standards used and the adoption of languages such as HTML, WML (WML), or VoiceXML (VoiceXML) . But, we observe some incompatibilities in spite of the standards promulgated. Indeed, on the one hand, various types of media such as texts, graphics, sounds or video can easily be used and transmitted through networks, but on the other hand, the fact that machines are not necessary from the same vendors, or do not support the same operating system, leads to situations where information processing systems and/or databases are incompatible with other data coded in particular formats. Therefore this consumes additional costs and time for each end-user, like students and teachers, whatever his platform, can obtain a product or a satisfying service. The need for easier access to information; whether at the office, home, in the train, etc., is felt all the more with the arrival of new materials, and the success of the pocket computers as well as mobile telephones. One wishes to lean towards the transformation of end-user's interface for "anyone and anywhere" (Lopez & Szekely, 2001). With the multiplicity of the means of connecting to Internet, it is necessary to conceive generic interfaces and mechanisms of transformation to obtain concrete interfaces for each platform. That's why the W3C launched an activity in the Device Independence field.

Adaptable interfaces in multi-device e-learning environment or m-learning are playing a very important role in improving the accessibility of these applications, and are leading to their increased acceptance by the users. After the switch from Learning to E-Learning, we are now facing another switch towards M-Learning. Thus, we are entering an era of pervasive computing with the challenge of providing services available anytime and anywhere. In this context, data management is obviously the heart of concerns in what is now called pervasive or ubiquitous computing.

Consequently, recognizing that mobile computing is one of the most rapidly growing areas in the software market, some researches explore the role of adaptation in ubiquitous learning and particularly in the area of mobile computing. Mobile computing has a very strong potential due to the extremely high market penetration of mobile and Smartphone. The significant development of wireless networks and mobile devices, such as phones and laptops, PDA, sensors, or Smartphone, that we know since the past fifteen years leads to profound changes in applications and services offered to users. The terminals available on the market today are more and more powerful. Their autonomy is sometimes limited, but they provide equipment increasingly rich, with multiple connections, GPS receivers, etc.

These systems operate in a dynamic environment particularly because of frequent disconnections or user mobility. They must be able to respond dynamically to changes in these different settings. They therefore must be sensitive to the context in order to be able to adapt dynamically and so provide an important quality of service to users. If only a few applications accessible to the general public have now emerged, some should be available soon in areas such as transport, health, commerce or education.

This document presents some aspects of this scientific problem and is structured as follows: Section two explains the background and motivation of our work. Section three gives an overview about interface adaptation. Section four addresses the plasticity of the user interface, context-awareness and adaptations. Section five exposes in details the problem of adapting to the platform, the user, the task and the environment. Future trends and ideas for further work are presented in section six before the conclusion of the chapter.