New e-learning services based on mobile and ubiquitous computing: Ubi-learn project

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NEW E-LEARNING SERVICES BASED ON MOBILE AND UBIQUITOUS COMPUTING: UBI-LEARN PROJECT

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Abstract

Ubiquitous and mobile learning concerns building applications in highly dynamic and heterogeneous environments to bring computation into the real, physical world. This paper presents UbiLearn a distributed Learning platform with Nomads Objects and new e-learning services based on.

INTRODUCTION

The rapid and accelerating move toward the adoption and use of mobile technologies has increasingly provided students and teachers with the ability to study away from the classroom and on the move.
Wireless and mobile technologies influence the evolution of current e-learning use and press forward the development of new mode of education enabling any time, anywhere and anyhow learning.
In this paper we present UBI-Learn a distributed learning platform with nomad objects and learning services related on.

UBIQUITOUS AND MOBILE LEARNING

Ubiquitous learning

An ubiquitous learning environment as mentioned in Shankar (2001) is an electronic global repository which has the potential to be accessed by anyone at any place and any time. Ubiquitous computing is about technology that is available to provide us information wherever and whenever we need it (laptops, personal digital devices like the electronic whiteboard, palm pilot, digital cameras, rocket e-book, mobile phones, PDAs (Personal Digital Assistants), etc.) Ubiquitous computing leads to ubiquitous learning. Technology provides abundant opportunities for sharing information, constructing knowledge and stimulating personal growth. Ubiquitous learning means that learning is not constrained by schedules and physical spaces; rather, it is pervasive and ongoing, prevalent in many interactions among students, faculty, parents, administration, staff, a wide variety of community stakeholders, etc."
The term *ubiquitous learning* means that we are going to change the "culture of learning", that we are being continually surrounded by, and absorbed in learning experiences.
Handhelds can be used anywhere inside an educational institution or outside. Handhelds can provide access to computing at the places where students' activities and learning occur.
Flexible access means opportunities to integrate learning technology into pupil daily activities (success of Gameboy and the Tamagotchi).
This new kind of technologies provides much greater degrees of freedom than the PC and single monitor set-up to design physical-digital interactions.

New applications for ubiquitous learning will provided us with facilities for creating learning environments. Applications will be able not only to transcend the constraints of space and time, but also to satisfy our changing educational needs.
Handheld computers can empower students to take responsibility for their own learning. When using handheld computers, students are more engaged in learning, and often find their own ways to use handheld computers to support their learning, both in and out of class.
Simulations, learning games, threaded discussions, and video presentations add an extra dimension to coursework. Since multimedia resources offer text, audio, and video, you can learn through different modes, making the entire process more student-centred and more effective

Mobile learning
Mobile learning: It's learning through mobile computational devices: Palms, Windows CE machines, even digital cell phone.
The vision of mobile computing is that of portable computation with rich interactivity, total connectivity, and powerful processing. This small device is always networked, allowing easy input through pens and/or speech or even a keyboard when necessary (though it may be something completely different like a chord keyboard), and the ability to see high resolution images and hear quality sound. It may be that the image is overlaid on the world through glasses that act like a Heads Up Display.
Mobile learning can be considered from two viewpoints
The first one is technical oriented perspective regard traditional behaviouristic educational paradigm as given and tries to represent or to support them with mobile technologies. A main concern from this perspective is how to create, enrich, distribute and display learning material on mobile devices; the main benefits are to personalize the way of learning (where you want, when you want, what you want, as fast as you want, how you want; etc).
The second one is pedagogical socio-cognitive and distributed cognition paradigms. In this viewpoint we face traditional designs of teaching and learning to push community oriented learning like collaborative learning, problem based learning; informal and ad-hoc learning, etc
We are interest by both viewpoints and we try to present the Ubi-learn project and the new e-learning services strongly coupled with this product.

Advantages of mobiles learning
What’s the common characteristic of pupil between 15 and 20 years old? They can be genius or looser they can be from different social categories but all of them manipulate very easily a portable phone they exchange messages and they exploit all its functionalities.
Mobile devices belong to a learner’s personal sphere like glasses, wallet or key. This means the learner can take learning opportunities directly in the situation where they occur, because he has his learning environment always at hand.
Mobile learning, offers the possibility to arrange learning settings flexibly and spontaneously, helps organisational skills , encourage a sense of responsibility, helps both independent and collaborative learning, and can be used to help track students’ progress and for assessment.. Students and teacher can jump from and individual work, to a group work, to a classroom work, they can also change place without modifying the material.

UBI-LEARN

The general objective of the project Ubi-Learn is to design a complex learning "dispositif" as defined in Peraya (1999), taking into account the dimensions of ubiquity and mobility.
Ubi-Learn leans on the emergence of a new shape of computer systems called Ubiquitous Computing as mentioned in Weiser(1991) or ambient Computing. The miniaturization of components and elements of Human-computer Interfaces, associated to the development of the connectivity (networks wireless telegraphy, network P2P[1], etc.) allows to think to interactive environments where the interaction is completely distributed in a big quantity of communicating objects
In the field of the education, we think that effectively the development of the advanced mobile telephony (GPRS[2] or UMTS[3]) and local networks wireless telegraphy (Wifi[4]-802/11 or Bluetooth), have already begun to transform ways of learning, and bring to the creation of adapted info structures.
If several scientific works have already allowed the investigation of these technological fields, it's necessary to notice that they have not yet allowed find out new educational modalities, which would really taking advantage of the mobility presented in Laroussi (2003).

RESEARCH ISSUES

We try through this study and this project to answer certain research questions, which are the following ones:
- How can we make interface for mobile learning more opened and powerful in Derycke (2002)
- How can we conceive resources adapted to the mobile learning?
- What are pedagogical paradigms that can benefit from ubiquity and mobility?
- How can we conceive distributed cognitive system by using nomads' objects?
- What is the role of mobile devices in a learning environment?
- What is the role of mobile devices in a collaborative environment?
- Language of description for a mobile and interactive learning (Scorm, EML, etc.)
- How should wireless technologies be designed to ensure that the needs of learners are met?
- What are some learner-centered design methodologies?

[1] Peer to Peer
[2] General Packet Radio Service
[3] Universal Mobile Telecomunications System
[4] WIreless FIdelity

SCENARIO

In our research project, we are in an augmented virtual class; the students can be inside or outside of the virtual class, they are equipped with a computer or with any mobile device; and can interact and have a dialogue with their colleagues, their professors or another professor.

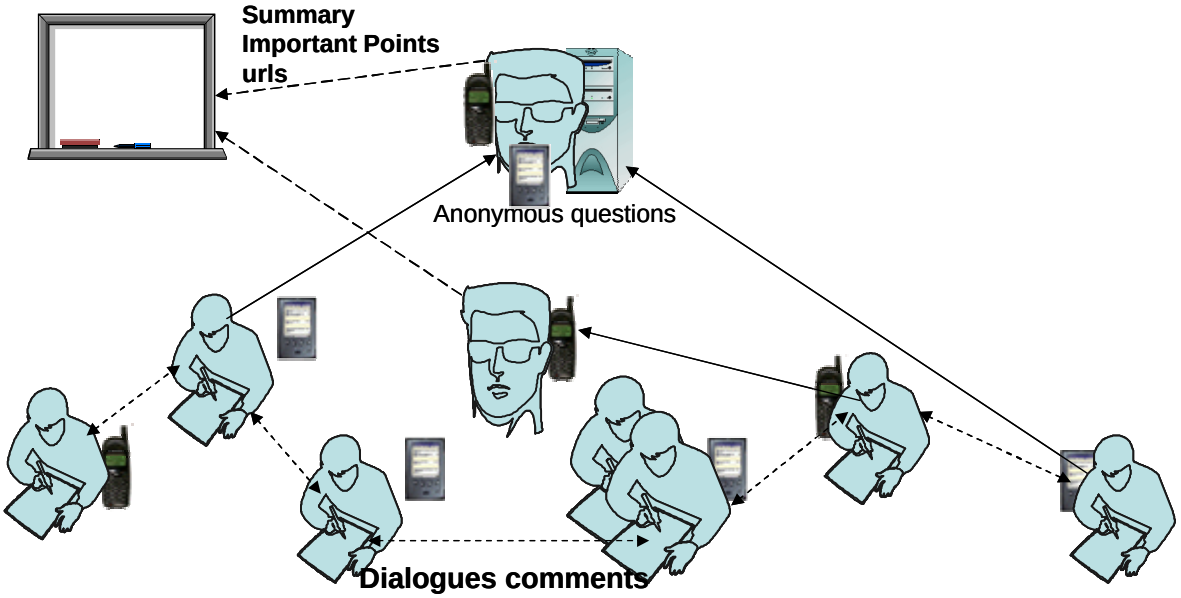

Fig1: Scenario of interaction in Ubi-Learn

Let us take an example of a language course material. Generally in learning a foreign language we inherit all the accent of our professors. With such device we can have access instantly to all word pronunciations.

In such a classroom, teacher can display adaptively and interactively his/her course slides. In a classical classroom students can interrupt him/her to ask questions. A white board can be used to display course and pertinent answers. In our augmented class, supplementary devices appear: a WIFI network, a management application for PDA and for the students. New possibilities appear argued in Laroussi (2003)

- *Differed learning of courses:* When a slide is displayed, all PDA receive a text corresponding to the slide. Text is written by the teacher and maybe a summary, a list of the important points and/or list of useful links. Student can return back to a specific slide on their PDA during the classroom if they don't understand a term or a signification.
- *Dialogue/Annotation:* During a course, a discussion between students about one concept of the course can be useful. This kind of discussion consumes lot of attention and can generate a misunderstanding of the course material. The PDA can allow an asynchronous writing discussion; this asks less attention. Furthermore, the students can annotate the text accompanying each slide. These comments can be sent to colleagues (so avoiding a discussion).
- *Cooperative and distributed course*: Certain students' questions can exceed the teacher's competencies. If a question seems interesting, the teacher can ask the help of another teacher expert in the domain. The system can determine the adequate teacher connected at this time.

RESULT

This work should allow developing a methodological approach, based on the learning and social sciences contributions, for analysis and the conception of ubiquitous and mobile environments of learning.
A prototype should allow technical and educational validation of the legitimacy and the efficiency of such learning environments

HIERARCHY OF SERVICES IN UBIQUITOUS AND MOBILE LEARNING

In Amoretti et al. (2003) authors define four levels of hierarchy for community-oriented services, the first level is a connectivity service, it can be provided to wired and wireless users. In all cases suitable authorisation and accounting facilities should be made available to allow Intranet and internet access.
The second level in Amoretti et al. (2003) is the availability of traditional web-based services directly or indirectly covering many facets of e-learning.
The third one should upon the second one and it's designed to support distributed computing and educational resources as an aggregated single environment.
The last one is related to a scenario where resources and contents are not only provided by the official infrastructure but also by the whole university community.
Ubi-learn offers also four levels of services, the first one

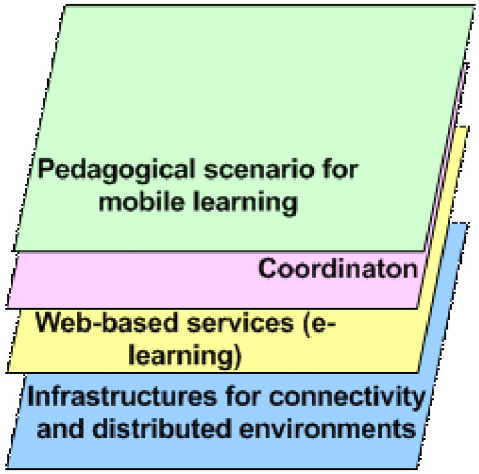

Fig2: Hierarchy levels of services in Ubi-Learn

Ubi-learn is mainly composed by four levels:
The *first layer* represents an association of system resources. Due to the dynamicity in the availability of physical devices, network bandwidth, connectivity and location, the system has a consistent description of the infrastructure available.
The *second level* analyses the relation between the service description and the physical devices. In exploiting such operation it classifies the system resources and, according with the service description, determines the suitable execution environment candidate to host the service
The *third layer* defines a coordination space and interaction rules in order to allow the application to coordinates services as in any classical service-oriented model.
Finally in the *fourth layer* is related to a scenario where resources and contents are joined together to model an adaptive pedagogical way of studying. This way will be the function of student profile, student background and student device.

CONCLUSION

In this paper we have outlined opportunities of ubiquitous and mobile computing in e-learning environment and specifically, a hierarchy of levels of services allowing distance access to mobile e-learning environment.
The proposed infrastructure eases the construction of complex distributed services with both constraints: system heterogeneity and a dynamic application
The approach presented in the form of a layered architecture shows the logical step form a heterogeneous scenario towards a homogeneous environment for executing services.
One of the objectives of Ubi-Learn is to allow users to flexibly interact with the services in the environment.
The main points we are still exploring are: geo-localisation of the best person to solve a specific problem, how to insure a collaborative navigation through a course material and how to promote the collaborative work with nomad devices?

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