'Knowledge to People and People to Knowledge' – A Life long learning experience.

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Abstract-- **Recent advances in Information Technology and associated digital, wireless communications system have created a plethora of knowledge within the European Union. However there is still a distinct lack of formalised structure of storing and disseminating this knowledge for a variety of geographical, economical, and societal reasons. This presentation aims to show a feasibility of a two pronged effort to exploit these opportunities. Firstly by creating a self-learning environment for the dispersed multilingual and multicultural society, with various levels of computer and IT literacy with directed on-line support. Secondly by using the state of the art technology to help mobility and tourism to create a harmonised society and to generate and encourage a peer-learning environment.**

Index Terms— **developing ambient intelligence; e-learning; societal challenges and opportunities; consumer electronics**

INTRODUCTION

The economies of the European Union are now essentially "knowledge-based" and depend significantly on the general level of education and professional skills of the work force. There is a need for all workers to update and extend their skills and knowledge at regular intervals throughout their careers. Professional workers often need to develop new technical skills, new management skills, and new language skills, especially in the single European market. The term "lifelong learning" has come to represent this concept. Many professionals find it increasingly difficult to take time off from work to go to a training institute or university to study and prefer the flexibility offered by distance learning delivered via the world wide web ("e-learning"). Although e-learning has much to offer and is growing steadily in usage, it has not penetrated the lifelong learning market as much as had been expected.

One of the reasons for this lack of growth in e-learning is that it suffers from a major disadvantage, namely that there is normally no live interaction between student and tutor, especially when large numbers of students are involved. Interaction with a tutor can take place by email or, in some cases, in live "chat rooms". However, even this is not appropriate when very large numbers of students wish to have their own individual questions answered by a live tutor in real time. The purpose of this project is to overcome this problem by developing a system to support live interaction between small numbers of tutors and very large numbers of self-learning students. Such a system will be able to transform the pedagogic quality of future e-learning and lead to an increased growth in the deployment and up-take of e-learning courses with beneficial effects on the European work force and economy.

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The overall aim of this proposal is to develop a system, which will facilitate live interaction between very large numbers of e-learners and a small number of tutors (or course presenters) in real time. This is quite unlike any thing that has been tried before. The system will operate in two distinct modes:

- **Mode 1**: Live lectures by experts are presented to large numbers of distance learners by means of web-casts. In order to facilitate direct interaction, the learners will be able to submit text questions to the web-cast presenter in real time. In view of the large number of simultaneous incoming questions, an intelligent multi-agent system will be developed to filter the questions and extract the most common issues ("batched queries") to be answered by the presenter. The most common questions from the self-learners will thus be answered in near real time giving an impression of two-way interaction to the maximum number of students.

- **Mode 2**: Instead of live web-casts, in this mode video lectures and other multimedia information will be made available on-line from an educational archive. Self-learners will be able to access such material asynchronously and pose live questions to a tutor. The intelligent multi-agent system will match incoming questions to appropriate on-line tutors and, in case of heavy demand, operate a query filtering system as in mode 1. The aim of this approach will be to provide direct communication between tutor and learner whenever possible, and to operate a live "batch query" approach when the rate of incoming questions becomes too high.

By implementing the above system, it will be possible to create a **common integrated framework for live interaction in multimedia e-learning**. This framework will support direct one-to-one live communication between a tutor and student whenever possible, and a lower level of interaction based on batched queries, *which still provides an impression of live interaction*, when one-to-one interaction is not possible because of demand from very high numbers of students.

This proposal will implement and test the integrated framework for live interaction between e-learners and tutors. The system will use state of the art multi-agent approaches for creating student query management software system. It will also integrate the use of video cameras in a live operational system. In addition to developing the required software systems, a subsidiary objective will be to investigate and make recommendations on bandwidth and quality of service requirements for real-time web-cast lecture delivery (e.g. using ISDN and ADSL technology).
It is proposed to develop an advanced system for live web-based teaching which will enable large numbers of distributed self-learners to be provided with live answers to their questions and queries which arise as part of their learning process. This will significantly enhance their self-learning experience and motivation. The planned system will cater for two types of situation:

(i) Live web-cast video teaching with automated learner inquiry support (see figure 1)

In this mode, the LIVE VIDEO LECTURE mode, the proposed system will enable hundreds or thousands of e-learners to submit questions to a teacher or professor during a live video lecture web-cast and receive a response. In such a situation, it would be impossible for the teacher to answer each question individually. However many learner questions will be similar and an intelligent system can be developed to assimilate and analyse the patterns of incoming questions and to present the "most common" or "frequently asked" questions to the teacher. The teacher would then answer these questions live during his or her presentation, thus giving most learners an enhanced experience of live feedback

(ii) Archived video stream on demand delivery with live tutor learner inquiry support (see figure 2)

In this mode, the VIDEO ON-DEMAND mode, the system will cater for self-learners to access archived video and other forms of multimedia study material in an e-learning environment. Instead of getting feedback from a live video presenter, the learners will receive support and answers to their inquiries live from supporting course tutors. The system will again analyze patterns of incoming questions and match questions to the most appropriate tutors.

Overall, the proposed structure will require a layered architecture to support the proposed interactive learning system. The communications layer (WWW with relevant local loop service such as ADSL or ISDN lines) will form the core of the system. Above this, will be the LIQUA system, which will manage learner queries as a form of "middleware". Above this will be the E-Learning System Interface (ELSI) which

will provide video web-casts and query dialogue boxes within a web page format. This architecture is illustrated in Figure 3.

The heart of the system will be the system for handling learner questions -the LIQUA system. LIQUA has to perform several different functions. It has to: -

(i) process large numbers of text questions submitted in real time by learners over the web

(ii) parse such questions to understand their grammatical structure

(iii) identify common patterns of questions, using pattern clustering methods

(iv) understand the core meaning of common question patterns using candidate techniques such as fuzzy cognitive maps

(v) synthesize idealized frequently asked questions which can then be answered live by the video presenter.

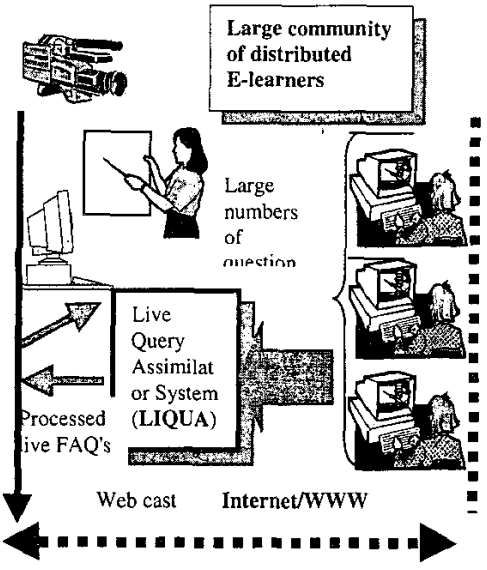

Figure 1. The concept to support live web-cast teaching. The heart of the development will be the LIQUA system to automatically process large numbers of real time student questions and queries and to forward them to the video presenter as processed live frequently asked questions (FAQs). This model will apply to live web-cast teaching to a community of hundreds or thousands of distributed learners who could be scattered across different EU member states.

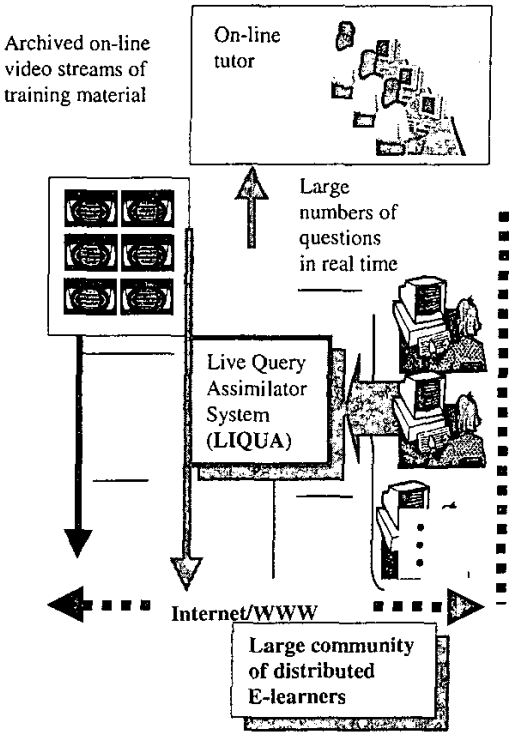

Figure 2. The concept for live tutorial support of recorded video stream training material. Tutors answer incoming queries related to particular training material. The LIQUA system matches tutors to incoming queries depending on expertise. In case of heavy query traffic, LIQUA processes only FAQ's as in figure 1.

LIQUA will be developed as a multi-agent system using an object-oriented approach.

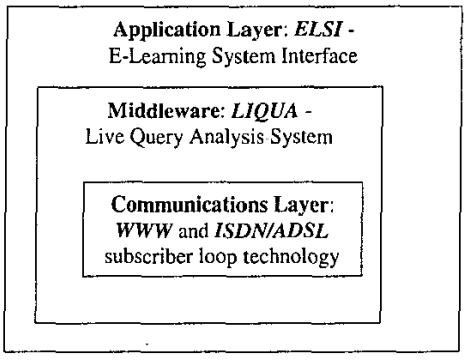

Figure 3. Layered system architecture.

The proposed system can be developed and tested using web-based language teaching as the user application. Universities with the relevant technical expertise might undertake technical system design and

development. System integration and tests will involve both technical and end-user partners. Live tests of the system may be carried out as part of the project with groups of students in an international context to prove the concept for training at an international level.