An innovative interactive e-learning platform

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ABSTRACT: The number of virtual learning environments is increasing. Many reports stress that virtual learning philosophy and technology is more effective than classical learning methodology. E-learning technologies have played an important role in the development and even expansion of on-line education systems. Current e-learning platforms are distance-learning systems without necessity of continuous contact with the teacher. E-learning systems offer a large number of tools, such as course content, platform management and, as in this case, interactive courses. The iMSi system offers more than just downloading lecture files by students. Thanks to the iMSi platform, every student can take an active part in a lecture in real-time. What is more, students can participate in off-line lectures downloaded from the system. Students can receive audio and video streaming from lectures, and it does not matter where it takes place. It is also possible to communicate with each other and to take an active part in discussions during a lecture. Students can feel as if they are actually present in the classroom.

INTRODUCTION

One of the ways to improve teaching methodology and technology lies in flexible learning, which means developing the courses with the help of flexible learning methods and the support of Information and Communication Technology (ICT). A large percentage of the population is convinced that ICT will play an increasingly important role in education, as classical teaching methods are being replaced by new ones.

E-learning technologies have played an important role in the development and expansion of on-line education systems. Moreover, it should be stressed that many universities have been involved in creating and developing on-line tools. During the past decade, special attention has been focused on integrating Internet technologies to be implemented into the teaching and learning process in higher education. Web-education technologies are now being widely applied for teaching and learning, leading to a large number of users.

A significant revolution has occurred in e-learning technologies (philosophy and systems) in commonly available higher education and training courses around the world. E-learning as a new emerging philosophy of life-long education could be realised by various means but essentially, it is about the transmission of learning content exploiting information technology (IT) [1]. Information and communication technologies (ICT) play an important role in supporting the development of distance-learning strategy. As part of this strategy, e-learning technology has been dynamically developed. It must be stressed that our civilisation expects, as a benifit of e-learning technology implementation, to find a higher dependence on technologies. Universities are making a lot of progress in enhancing learning Information and Communication Technologies (ICT) infrastructures, teaching, building virtual learning environments, etc. Distance learning in special cases is becoming ever more important than the traditional/classical one; moreover ,the number of institutions, where this system is successfully applied, is constantly growing [2][3].

Considerable progress in development of Web-based training has been observed; on-line learning, e-learning, distributed learning, Internet-based learning and net-based learning, hence strongly influencing the progress of our civilisation. The number of Virtual Learning Environments (VLEs) has increased during the past decade [4][5]. Moreover, these platforms are strongly recommended for distance learning for those who are not able to attend classical courses in classrooms and, as well, for those who wish to invest in a future professional career by using sophisticated e-learning technology. Most professional organisations are involved in implementing e-learning systems and platforms in a life-long learning strategy. While information technology revolutionised the delivery of education and training, e-learning has principally modernised flexible delivery around the world [3]. The e-learning system offers a large number of tools, such as course content, platform management and, as in this case, interactive courses.

New teaching models and tools incorporating e-learning already have been successfully exploited by a large group of universities and other professional institutions involved in the education process. There are many reasons for changing the education system from traditional teaching to e-learning; one of them, probably the most important, is knowledge-based education due to e-learning methods.

It is worth pointing out, that thousands of e-learning projects have been in progress, while they differ in their outcomes and technology exploitation. Moreover, there is a lack of a standardised way of planning, comparing and evaluating e-learning projects, their outcomes, and their effectiveness, as is stated and discussed in the literature [6][7]. The proposed E-learning Indicators Methodology (ElIM) could provide a chance for successful planning and evaluating of different e-learning projects, strategies and platforms [7]. E-learning indicators are defined by the authors as the important concepts and factors that could be used in evaluating the e-learning level when planning e-learning strategy for an institution or a university [7].

Following the step-rise of distance-learning technology, one would even assume that, in the future, distance-teaching universities would offer complete university courses as a traditional university but in virtual form. Generally, universities are progressing in integrating selected on-line components into their campus courses, using different information technologies, leading to the development of advanced distance-learning systems.

It is also widely discussed and argued that e-learning technologies have been successfully exploited by Small and Medium Enterprises (SMEs), and further, it is expected that e-business technologies should create marketing opportunities.

PROBLEM DEFINITION

E-learning philosophy is becoming more popular and useful – thanks to the development of an electronic learning environment, digitised lesson materials, software for learning, video streaming, advanced graphics facilities, functionality, interactive assessment, etc. It should be clarified that there is no system or platform covering the wide range of interest of either universities or commercial institutions [8][9].

Thus, one could conclude there are dedicated knowledge platforms on the market, also in higher education institutions. It is known that e-learning has a strong influence on our lives, and that it is largely based on digital information and communication technologies.

Some key design issues of an e-learning platform devised and developed by the authors are described in this paper. This e-learning platform solves the problem of distance learning. Many people have limited access to knowledge, depending on the level of local education, commuting to the university, the geographical and political situation where they live or a specific disability. It is clear what kind of problems could be solved by this project:

- Disabled people have limited access to knowledge. They have problems with getting to university or school. What is more, most of the pre-existing e-learning platforms do not provide enough accessibility for them.
- Other groups of people have problems with commuting to school. They sometimes do not have enough time and money for expensive transport. Sometimes there are temporary situations in people's lives when they are not able to study in a traditional way. For example, women with small children have problems with continuing their education by attending classes. Many companies have problems with courses for employees who work in different locations and they have to consider the cost of accommodation and transport, and the time needed for their employees to get to their educational establishment.
- People from some developing countries also have limited access to an appropriate level of knowledge. Often there are not enough specialists.
- Selected groups of people want to attend university courses at famous foreign universities without the necessity of going abroad.

SCENARIOS

This solution may solve the problems mentioned in the Problem Definition section. Many scenarios can be imagined, where this platform could be applied successfully, being very useful for the following:

- It is a good idea for people without any opportunities to use their valuable knowledge. Qualified disabled teachers can provide lectures from home using this solution.
- With this application, disabled people have unlimited access to knowledge irrespective of their problems with getting to university or school.
- Students having problems with commuting to school, who are not able to study in a traditional way, can study using the iMSi platform.
- Companies that are carrying out training sessions for employees can reduce the cost of accommodation and transport. Also, they can reduce the time needed for their staff to get to their educational establishment.
- People from some developing countries could have access from any place they wish.

- Students could continue their university courses at foreign universities without the necessity of being there personally.
- Due to the availability of this platform, people are able to learn (attending on-line courses) at home whenever they need to. Moreover, they could take part in a lecture in real-time, as well as they are able to take exams, to put questions to the teacher, etc. What is more, students can communicate with each other.

People could be in the same place at the same time, irrespective of where they are, and learn, just as though they are sitting side by side.

FEATURES

iMSi has many good features. The most important are:

Innovation

The biggest innovation in this application is a user-friendly interface. For example, a magnifier to zoom into some part of a document and a live video streaming feature are just two of the unique aspects of this application (Figure 1).

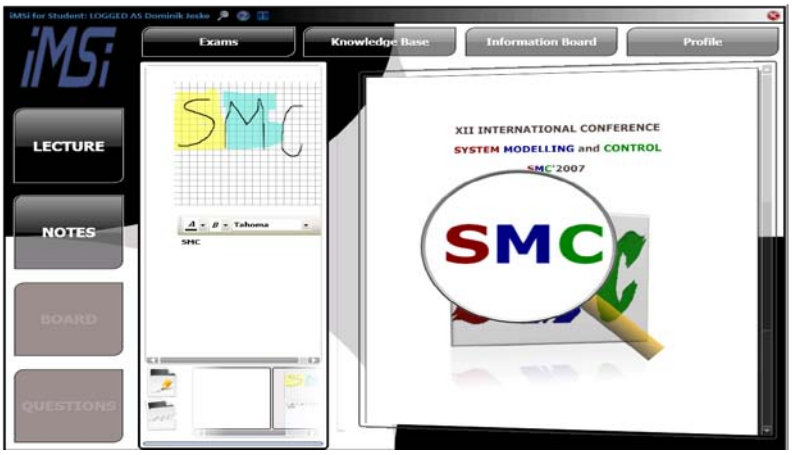

Figure 1: iMSi platform – general view of a virtual whiteboard.

Impact

The iMSi project has considerable implications for disabled people. It enables them to learn from home using the features below (Figure 2):

1. iMSi platform is user-friendly for people with poor eyesight. To copy from the platform whiteboard, the following have been provided:

- over-sized GUI elements;
- magnifier to zoom into lectures in 3D mode;
- automated voice which reads notes and lectures;
- virtual keyboard.

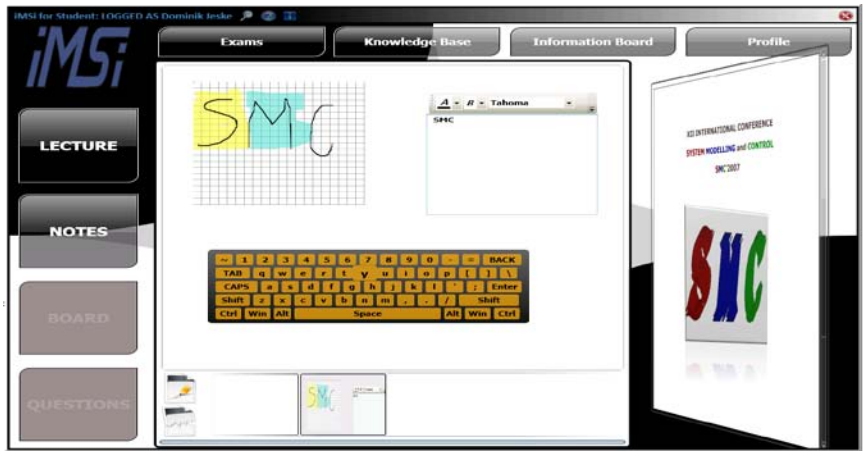

Figure 2: iMSi platform – virtual keyboard.

2. People without the ability to use their hands can enjoy the lecture by using the highly useful accessibility feature – *voice control* – which allows them to use the application with no need of a mouse or keyboard. Students can also use voice recognition to write down notes.

Effectiveness

Many features have been provided to improve the efficiency of learning, for example, the *virtual whiteboard*, where teachers can draw something that will appear in the student's application. In addition, one can quickly and easily write down notes. There are two ways of adding student notes to the lecture as presented in Figure 3:

- By adding notes directly to the lecture file – students are able to highlight a part of text and to add a text note;

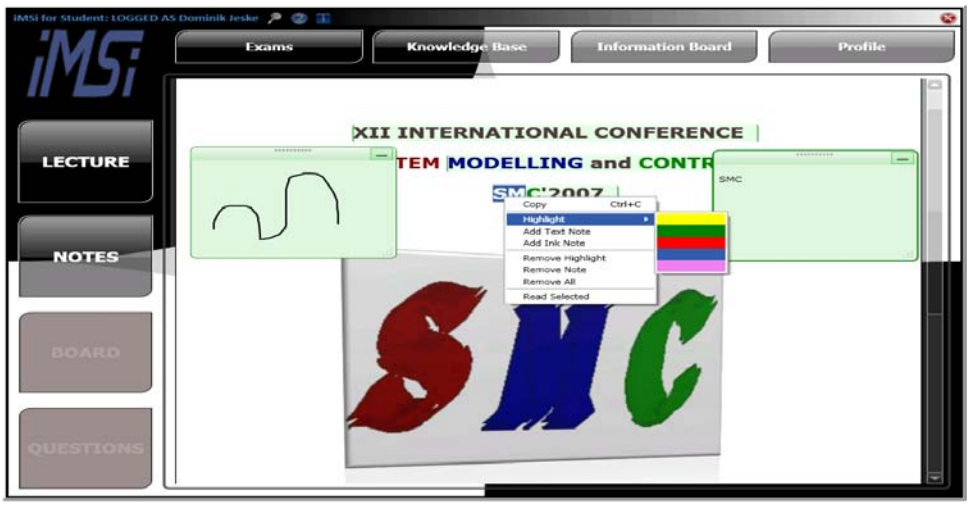

Figure 3: iMSi platform – virtual keyboard.

- In the student application there is a special tab with notes. The notes tab includes virtual sheets of paper where students can draw or write as presented in Figure 4.

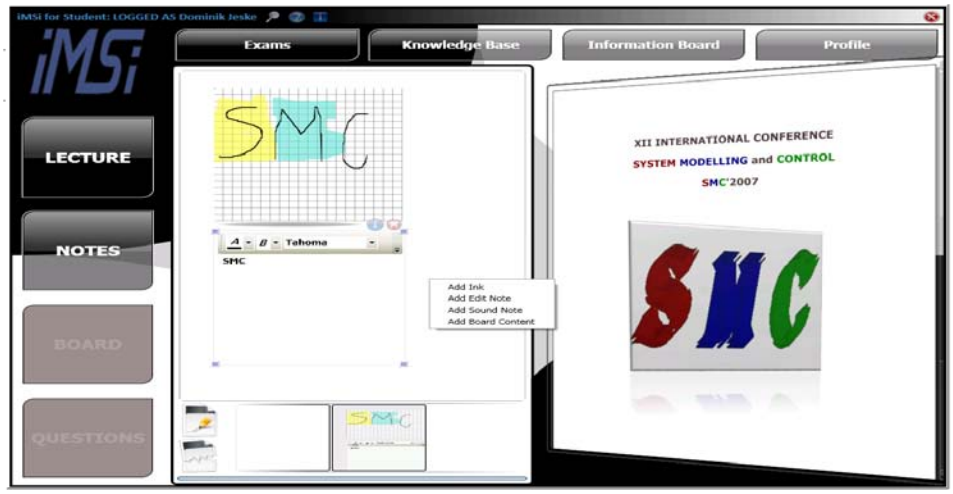

Figure 4: iMSi platform – virtual sheet of paper.

Other features which improve effectiveness are:

- Audio/video streaming – students are able to see and hear the teacher during the lecture.
- *Chat*, which enables the asking of questions directly to the teacher.
- Access to a recording of the lecture with optional subtitles.

Architecture

The architecture of this solution is divided into three layers (Figure 5):

1. Server application with connection to the database. It is a self-hosted application which provides WCF services to other layers. It is also an administrative application in which lectures, exams and people are managed. It is also the place where teachers store files for students to download.

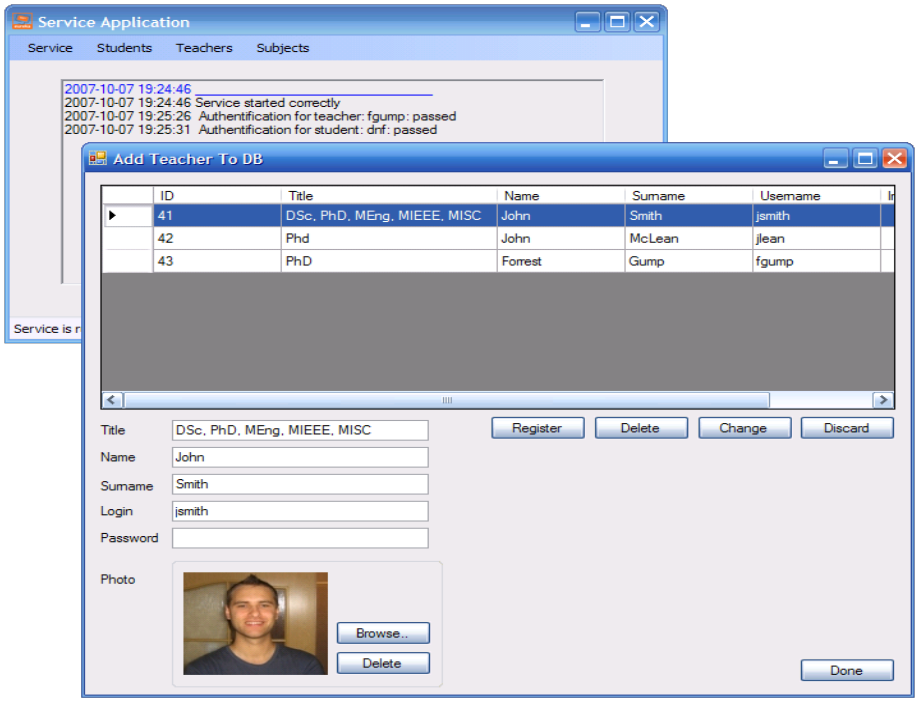

Figure 5: iMSi platform – service/teacher window.

2. The student application – this is dedicated to students. It uses services supplied by the server. It provides a user-friendly interface for students (WPF). In this layer, students can listen to a lecture, take notes and perform all other necessary activities required to learn (Figure 6).

Figure 6: iMSi platform – student application.

3. The teacher application – this is dedicated to teachers. It also uses the services supplied by the server and provides the opportunity to run lessons, prepare exams and upload files for students (Figure 7).

TECHNOLOGIES

In designing the iMSi platform, the following hardware, technologies and software platforms were implemented.

Software:

- NET 2.0 – logic of application;
- WPF – presentation layer of student and teacher applications;

- WCF – used for communication;
- Direct Show and Media Format – used to capture, code and transmit video/audio stream;
- Sapi Ver. 5.3 – speech API – used for voice synthesiser and voice recognition (recognition only in Windows Vista);
- SQL Server 2005 – database server;
- XPS – format of documents used by our application.

Figure 7: iMSi platform – teacher application.

Hardware:

- Digital camera – used to capture the lecture;
- Tablet (optional – can be used with *notes* and *board*);
- Microphone – used to capture the lecture, voice control and to record notes.

CONCLUSIONS

This demand-orientated e-learning iMSi platform of distributed architecture provides a number of advantages for the user, namely: support in didactic issues; integration of all required activities along the structure of a learning module; support in communication and collaboration activities within the team, etc.

In this paper, selected results of the iMSi platform invented and created by the authors are described. These results are shown in the various views given above: virtual keyboard, student sheet, teacher board, etc. At each board, it has been tried to identify innovations in product, as well as processes.

In reviewing the project, it can be stated that it has great possibilities in making teaching objects more illustrative through visualisations and animations, thus leading to the improvement of students' motivation. In general, the project is expected to improve the quality of learning by using advanced ICT.

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