

A New Presentation System with Interactive Educational Activities

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Abstract

Current technologies include Tablet PCs with new input - touch-screen display with stylus offer different types of electronic presentation systems. This allows teachers and students to modify the educational materials, but students are still not active in the education process. In addition, the presentation systems are implemented more generally and the lecturer has to prepare all materials and pictures before his/her presentation. This paper presents a new interactive electronic educational system that uses Tablet PC, primarily targeted for design and test topics. This system allows integration of interactive work with students based on real-time textual and graphical anonymous polls. The developed presentation system was evaluated and shows very good and useful feedback from students.

Categories and Subject Descriptors

K.3.2 [Computers and Education]: Computer and Information Science Educations

Keywords

electronic interactive system, education, design and test, polls

1. Introduction

Current technologies using PC tablets offer some electronic presentation systems for education that is comfort-

able for teachers and more attractive for students. Teachers can involve many interesting materials, techniques and figures into their lectures. They can add remarks, figures or highlight important things by hand into the presentation. Also students can write comments into the lecture materials. If a teacher or a lecturer concentrates his/her presentation only on giving students as many materials as possible it will not be beneficial to students. The teacher has to be in active contact with students during the lecture and he/she needs a feedback from them. This can be achieved by anonymous tests or questionnaires. There are some electronic educational systems with the mentioned functionalities. Using such systems the teacher can work together with students over a defined problem or examples. The best way is to distribute an example or a question to the students, wait for students' answers and evaluate them with important comments to the best and worst results. Such examples or questions should be anonymous for giving the teacher helpful feedback on the students' knowledge. Such type of electronic presentation systems use Tablet PCs, the best technical tool for interactive communication and using specific pen - stylus for writing on the touch-screen display [1, 2, 3].

Some of the well known systems for electronic presentation using Tablet PCs are e.g. Classroom Presenter [4], DyKnow Vision [5], WIMBA [6], InkSurvey [7] and the system FitBoard [8] which are shortly described in the next session.

The paper presents a new presentation system with possibility to work with students during lectures. The system was developed for topics as design and test of digital circuits. The paper is organized as follows. The first section describes three selected electronic education systems. The second one describes requirements, structure and functionality of the proposed presentation system. The developed and implemented system and its structure is presented in the third section and the next one describes experiments with this system. The paper is concluded with summary and future works.

2. Related Work

The Classroom Presenter [4] has been developed at the University of Washington. This academic presentation tool was primary developed for evaluating Tablet PCs in education process during lectures. It allows lecturers to work with materials by using different basic functions for stylus, gum eraser, felt pen in various colours and line-widths. This functions help teacher to explain the lecture

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more clearly. User interface of this system is very simple and intuitive with emphasis on good visualization. Classroom Presenter can open PowerPoint 2003, Open XML presentations and its own binary format. Saving of modified presentations is supported only into its own format, which is incompatible with other applications or any other software. Application supports distribution of the information from the main PC with the presentation to other connected PCs (students' Tablet PCs). Such connectivity and functionality allows students to follow teacher's presentation on their own PC and to make remarks and useful comments. Besides, the students can answer questions asked by teacher using built-in program interface. Communication between the teacher and the students can be realized through an existing or own internal network.

DyKnow Vision [5] is a commercial tool for electronic presentation like Classroom Presenter. It offers tools and functions for displaying screens and presentations. It also allows joint cooperation of students over one display screen. DyKnow offers a new interesting function - possibility to copy presentation with some remarks done by teachers using stylus or hands on display. DyKnow Vision also supports importing presentation files from Office PowerPoint. The main problem of using the DyKnow Vision is time licenses for this application from the DyKnow company for individual computers. Best possibility is to use licensed school computers, but then students cannot use it outside of the school or on their personal computers.

The InkSurvey tool [7] is implemented in the web environment and primarily has been developed for examination. These can be realized using traditional multi-choice tests or drawing a simple picture. It is used in academic environment and allows different types of learning. A sequence of questions can be activated for all students. Students that mastered basic level of questions can continue to the higher level of questions. This functionality is suitable for the following type of teaching - JiTT (Just in Time Teaching), education based on interaction of tasks on web and active students in a class room.

The Classroom Presenter and DyKnow Vision allow interactive presentation in the form of presenting with writing and drawing something into the prepared lecture materials before a lecture. Questions or tests during interruption of the lecture need to be prepared as imported materials in an application and stored in a special format. Users of these systems are constrained by functions and requirements of the selected application. This disadvantage was eliminated in the new proposed electronic presentation system allowing dynamic interactions during a presentation. The next issue is a network model. The Classroom Presenter uses the local centralized model. It means that server for students' connection has to run directly on lecture's computer and it can be overloaded by clients' communications. It is the second disadvantage of the application because it depends on the number of connected students (clients). The application was developed with small hardware requirements thus more connected students can cause network overloading, mainly if wireless connection is in use. The main advantage of this model is independence on the used environment. Ad-hoc network or an existing local network can be used for common communication created by the users' computers involved in the common process.

All available systems/applications offer general usage. If we want to use the selected presentation system for a specific topic, we need to prepare an automatic support and specific libraries. Our goal is concentrated to design and test of digital circuits. The new system has been developed with network support and libraries for logical circuits design and test and it is described in the next section.

3. A new presentation system

One of the requirements is for new interactive presentation system is the creation of a library with basic and complex logical cells, graphical models of digital circuits using these basic cells. Such library is not supported in the previously described presentation systems (they use only graphical schemes drawn by hand [8, 9, 10]). Besides of the graphical tools and network support, it was necessary to solve presentation formats. The previous and mentioned presentation systems work with PowerPoint and own native binary formats. Usability of various formats during and after presentation was the second requirement for the newly developed system. The proposed system has to work with any application and format that can be presented on the display and modified presentation has to be saved as PDF file. The third requirement is usage of standard tools, like stylus, gum eraser and felt pen for creation drawings and graphical schemes on lecture's slides or new added slides. The proposed and implemented application allows creating digital circuits in interactive ways. It means that the users can redesign a digital circuit, i.e. add or delete some gates or lines. A new digital circuit can be saved into the graphical library. The basic window - one slide with question from on-line presentation is in figure 1.

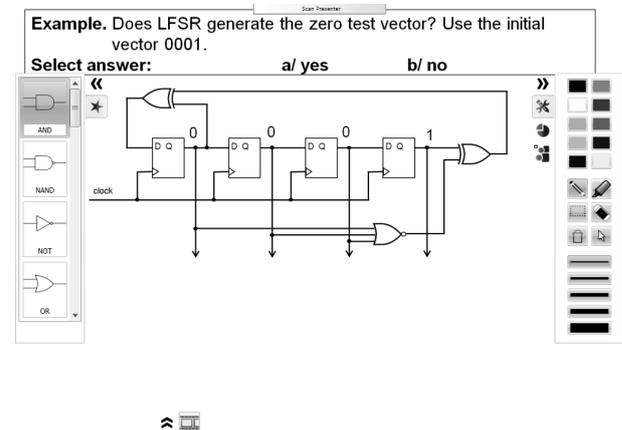


Figure 1: Example of the main window.

3.1 Implementation

Application for the new electronic presentation systems was primarily designed for using with Tablet PCs. This can be seen on user interface, which uses larger than normal buttons and the whole application can be used comfortably with just pen. The keyboard is only used for writing text for polls. The polls can be prepared beforehand so during presentation, teacher doesn't have to use keyboard at all. This allows the most comfortable use of application during presentation.

Based on analysis of different tools and frameworks for development, this application was implemented using Microsoft .NET Framework. User interface uses Windows Presentation Foundation, which allows use of special interaction elements such as drawing canvas in the application.

The final application consists of one executable file and additional library files used for extended functionality such as file import - export. Shapes saved in a graphical library are also saved in a separate file. This allows users to simply change the library file and get whole new set of shapes.

The teacher and students use the same application which results in simpler distribution. On application start user selects mode in which he wishes to use the application. Depending on his choice, certain required parts are run, such as network server or network client (figure 2), and user interface is optimized.

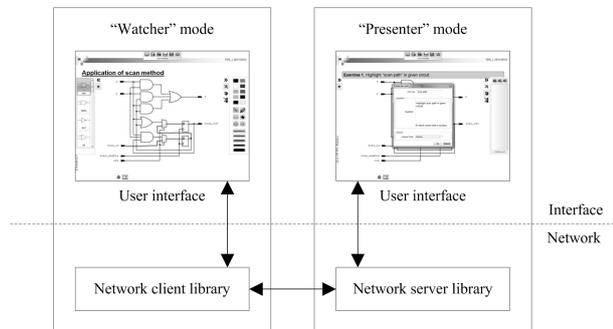


Figure 2: Communication flow

"Presenter" mode allows teacher to open presentation or just begin creating new one from scratch. It also creates network server which uses broadcast messages to advertise itself into local network. Application in "Watcher" mode can then use these messages to connect to this server and its presentation using comfortable user interface. In case presenter and watcher are not on same local network or broadcast messages cannot reach watcher, client can use direct connection option and connect to any IP address. This also allows watcher to connect to presentation over the Internet.

3.2 Experiments

The proposed and implemented presentation system was experimentally evaluated during one regular master course "Testability of digital systems", provided at the Faculty of Informatics and Information Technologies of the Slovak University of Technology. Students used tablets and personal computers for evaluation of the new electronic presentation system. For experiment a separate ad-hoc

network was created by lecturer's tablet. During test, up to fifteen client computers were connected to presentation at the same time. Presentation was running smoothly and no connection problems were registered. Different types of textual and graphical questions have been prepared during the regular lectures. The goal of these questions was to acquire anonymous feedback from students to presented and previous design and test topics. The lecture was dynamic, active and clearly showed knowledge and theoretical skills of students from the presented methods and algorithms. After the end of the experiment, we received positive feedback from students. According to them, user interface was intuitive and they needed minimum time to become familiar with using the application.

4. Conclusion

Our new presentation system was developed directly for education of design and test topics. The main advantages of the system are open graphical library for digital circuits and tools for creating and answering pools in textual and graphical forms. Poll answers can be statistically evaluated and properly visualized. Future work is mainly targeted on visualisation improvements and network subsystem tuning. Using the interactive functions of the developed presentation system is mainly suitable for specific courses with smaller number of students when the answers to exercises can be effectively explained by the teacher.

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