WEB E-LEARNING SYSTEM BASED ON CONCEPT OF ONLINE WHITEBOARD

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Abstract: With the development of information technology, the implementation of distance learning has been remarkably improved. The learning activity therefore becomes easier with higher quality via better performance network. In this paper we introduce a concept of Online Whiteboard to support collaborative activity in Web-Based E-Learning System. The Online Whiteboard is a common workplace for sharing notes, images, drawings and chat over the internet/intranet, to support an effective learning of students in distance learning. With this whiteboard a teacher not only can explain learning materials remotely and synchronously to students who are enrolled in a course, as if in the conventional classroom, but also can make communication with students asynchronously. Further, the proposed tool also has many advantages for developing knowledge-based collaboration learning system.

1 INTRODUCTION

Distance learning using Web-based contents delivery technology over internet or intranet is able to provide a virtual learning environment, by which anyone from everywhere of the world can access and participate in the online learning or education activity at lower cost in order to get more knowledge synchronously or asynchronously.

Distance learning is one of alternative methods at each level of education in order to improve the quality and the productivity of education itself. In the higher education, we will meet many problems when using traditional education method, because the participator has different education and working background. Therefore, facilitating a virtual space for learning where students can participate in it from everywhere at their paces via network is one of effective methods for solving these problems.

Collaborative learning is a type of a group learning that plays important role in sharing knowledge among students or between teacher and students by transferring opinions (ALIC, 2002) (Hadiana, 2002). All students can be motivated in acquiring knowledge although they are learning the same themes from the separated place connected to internet/intranet.

We have been developing a learning system called WebLS - Web Learning System (Haruki, 2000), by which teacher can put learning materials on the website with various formats such as Word file, PowerPoint file, and Adobe PDF file. The teacher can also rewrite learning materials directly using the editor tool provided in WebLS. In this paper, we introduce another tool, called Online Whiteboard, which can facilitate teacher and students to prepare and present learning materials on Web in real time. It is also to support collaborative learning activity among students so that students can get more knowledge.

There are many advantages of WebLS with Online Whiteboard when using it for distance learning:

- Multi platform using Web browser supported by java technology
- Supporting Multi document learning materials
- Collaborative learning
- Whoever, Whenever, and Wherever can access the system via internet
- Open Source, to be developed furthermore according to specific requirement in performing distance learning.

Until now, our research focuses on the function of online presentation that is really needed in the higher educational activity, especially in postgraduate program. Presentation on a theme in education is a kind of group learning that students and teacher sit together to discuss about a theme, while drawing on a whiteboard with a variety of text, coloured-pens, and shapes. Therefore, we are developing an online

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presentation tool called Online Whiteboard to support such kind of group learning activity based on Web.

In the following sections, we begin with a review of related research works, and then describe the concept of our proposed Online Whiteboard, its design, and the implementation in distance learning using WebLS.

2 RELATED RESEARCHES

Recently there are some similar works on Online Whiteboard developed by many vendor of software, such as NetMeeting (Microsoft), Breeze (Macromedia), and Lotus Sametime (IBM). In general, the Online Whiteboard tool in these software applications includes the functions as shown in table 1.

Table 1: Whiteboard System Comparison.

Function	Net Meeting	Breeze	Same Time
Drawing	○	○	○
Multi Pages	○	○	○
Navigation	○	○	○
Saving contents	○	○	○
Standalone and Group mode	○	○	○
Annotation per page	×	○	×
Asynchronous Q&A mode	×	×	×

○: Available ×: No Function

All of the above tools are basically targeted for supporting general purpose meeting, but not specifically for conducting distance learning. Therefore, they have lack of functions in supporting education activity. For example, there is no crucial function of asynchronous question-answer (Q&A) related to the content of Whiteboard, because this kind of function is necessary for supporting self-paced learning after finishing presentation. Learning on a theme should be carried out mutually during and after online presentation in order to improve students' knowledge achievement. The Macromedia Breeze has a simple annotation function just for general content of Whiteboard. It is necessary to facilitate an annotation function for each page by which the presenter can augment the content with further description, in order to clarify the relationship between the annotation description and the page content on the Whiteboard.

3 CONCEPT OF OUR SYSTEM

In the higher education level such as postgraduate program, the collaboration between teachers and students plays important role to share their knowledge and to change opinion each other about a theme. This method not only encourages students to show and to explain what they are thinking in mind, but also it is useful to correct each other about their accepted knowledge. Without conducting collaboration the accepted knowledge would be stagnant and have a lack of correctness.

One of the most important collaboration methods in the higher education is presentation. Many learning materials can be used for presentation, such as journal, research report, et al. After learning these learning materials, students can make presentation based on their views on these materials. During the course of presentation, there would have a discussion organized by teacher, in order to change opinions, correct understanding and extent the relative knowledge by each other about a theme. The discussion on the same theme can be continued in different time asynchronously.

Therefore, our research concentrates on developing a tool, called Online Whiteboard, supporting such kind of learning activity. This tool can be executed at many platforms of operating system and network, in order to support Web-Based E-Learning System. This kind of tool is necessary in the distance learning system using general network platform, such as Internet or intranet, so that many users who will act as students or teachers have the same chance to use it for conducting learning activities in real time. This is the basic consideration of our Online Whiteboard concept. That is, many users are allowed to participate in collaborative E-Learning easily via internet/intranet with different bandwidth of network.

In general, there are two types of distance learning methods: synchronous and asynchronous system (Haruki, 2002). Both of them have their individual advantages and disadvantages. The presentation using Online Whiteboard is a synchronous process to conduct learning process in the same time. Moreover, it is also an asynchronous process to review and reuse the results of presentation. In the future, with the better infrastructure of network, there would have more demands on the real time software applications of E-Learning, which should be considered in the implementation of Online Whiteboard.

When developing Online Whiteboard, we have solved the problem of existing different platforms of network infrastructure by considering the different network bandwidth, that can influence the access of various speed of network.

3.1 System Configuration

The Online Whiteboard system has been configured as shown in figure 1. It consists of three basic modules as follows.

- **User module:** it controls user access, decides the user mode and allocates user into a session of course.
- **Presentation module**: it controls which data to be displayed and distributed to all users in the same session of course. Basically there are two kinds of data used in Online Whiteboard; one for contents of presentation, and another for controlling the session.
- **Data module**: it has functions to manage data used during presentation, and to save data for reusing in the future when users need to review the past presentation's contents. Leaning data includes uploaded learning materials, such as PDF file, PowerPoint file, HTML file, TEXT file, etc, that saved in the file system of Web server. On the other hand, some of data required by system to manage learning process, text based chat data are stored in the database server.

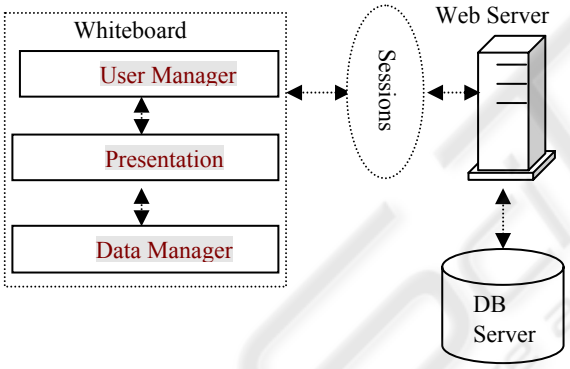

Figure 1: Online Whiteboard Configuration.

The data of all courses used for Online Whiteboard will be under the control of the Web server. This design differs from other Online Whiteboard systems, such as NetMeeting, Breeze, and Lotus Sametime, mentioned in section 2. It is considered to keep client users' resources at minimum, and also to make management of courses easier.

3.2 Features

The Online Whiteboard is benefit for supporting distance learning, because the distance learning, especially the synchronous type, needs this kind of tool in order to assist collaboration between teacher and students or between students in enhancement of student's knowledge understanding.

The benefits of Online Whiteboard in general are including:

- Anyone, anywhere, anytime availability. Teacher and students using computer connected to Internet are allowed to access into our system, and participate in learning using Online Whiteboard. The system automatically synchronizes the current content of Online Whiteboard for students who participate in it late.
- Combination of synchronous and asynchronous mode of distance learning. Using synchronous mode, users can select text or voice chat to communicate between them.
- Multiple mode of education. As a standard Online Whiteboard, it supports synchronous online presentation in a group of users. Additionally, users are also allowed to use standalone mode when they want to review the result of previous presentation asynchronously, so that users can find benefits from the previous knowledge generated from the discussion on a presentation theme.
- Multiple purposes. This tool can be used not only for E-Learning, but also for multiple proposes of presentation such as online meeting
- Adapt to multiple platform. Since we use Java-based platform in the development of the system, so that our system can be used by web browser on any platform of operating system.

3.3 Functions

There are several functions included in our Online Whiteboard. First, we created the basic functions to implement Online Whiteboard similar to the conventional whiteboard. In addition, we added some typical functions of Online Whiteboard on Web. The supported functions are as follows:

- Slide presentation for PowerPoint learning material.
- Drawing various kinds of objects and writing comments. All objects can be re-scaled, removed, moved, and changed on their properties.
- Multiple pages with navigation tool. Many pages are available to support a course that needs multiple contents.

- Storing all contents in the Web Server.
- Selectable modes are standalone or group learning mode. Standalone mode is useful for students to learn according to their condition.
- Annotation text per page, to write any additional important description related to each page of presentation.
- Chat by text and chat by voice tools. According to the network condition users can choose one of these two types of chat tools.
- Asynchronous Q&A function regarding each page of presentation in order to improve understanding of learning material. This function is useful especially when student learns at self-paced in standalone mode.

4 IMPLEMENTATION

Online Whiteboard is basically implemented using java technology of applet in order that it can be executed in many client platforms of operating system using Web browser.
As shown in figure 2, currently we have E-Learning platform of WebLS. Online Whiteboard, which has function of text and voice based communication between users via internet/intranet, is embedded in WebLS.

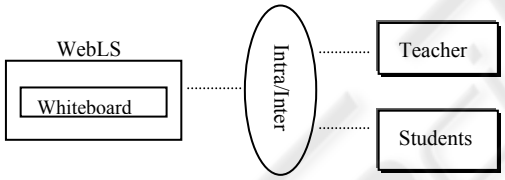

Figure 2: Whiteboard Position in WebLS.

Online Whiteboard can be used not only for distance learning using WebLS, but also can be used as an independent tool for supporting other collaborative learning system, because it is developed as separated software module. It can be embedded with other systems to perform online presentation.

4.1 User Interface

The main interface of Online Whiteboard consists of two tabs: one for Online Presentation and another for online Whiteboard. Each form as shown in figure 3 is divided into three parts.
Upper part is drawing tools by which users can choose various operation of Whiteboard, such as drawing shape, line, and writing a text with different colours.

Middle part is for displaying the contents of presentation or whiteboard. It is the main frame of

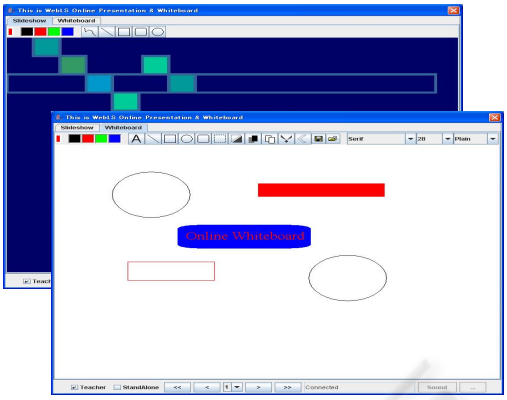

Figure 3: Online Whiteboard Interface.

Online Whiteboard where user can create important information during the communication with others. Each shape is an object so that users can easily change its size, move its position, copy and erase it, and other manipulations.

Lower part is for controlling communication between users. It consists of displaying page/slide number, communication mode group/standalone, and presentation navigator.

The other text based collaboration forms are also displayed in the separated window as shown in figure 4, where users (students and teacher) can communicate each other about a theme related to the course. These two forms are chat form and asynchronous Q&A form.

Chat form mainly includes additional explanation from the presenter to all participants about the content of learning materials displayed on the Online Whiteboard. If the page on the main Whiteboard changes, automatically it will be displayed on the chat form. It is also available to confirm an online question related to the displayed page just by clicking the button of question mark "?".

Q&A form is for users to make a text of question regarding each page of Online Whiteboard. This form will be appeared by clicking the button of "AsyQA". Moreover, the question and its answer can be also done asynchronously after the presenter finished the online synchronous presentation.

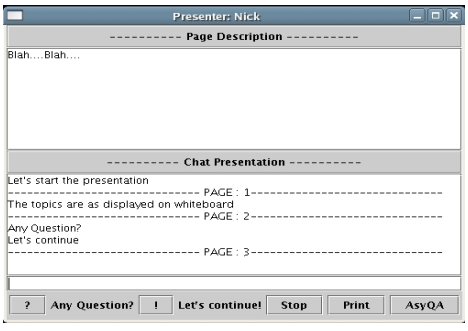

Figure 4: Collaboration Tool.

Preparation process of Online Whiteboard:

- User prepares learning material using PDF or PowerPoint format in the local computer.
- After finishing the registration, user logins into the WebLS.
- Create a new course
- Upload the learning material to the server where the Whiteboard system exists in it.
- Open the Online Whiteboard and put a text of additional explanation.

To participate in learning a course, the followed process will be done:

- Access to the WebLS homepage, and conduct authentication process.
- Choose a course that wanted to participate in.
- Choose presentation mode with Online Whiteboard, then the system will set the preparation for learning.
- Students will download the necessary learning materials from the server. The learning materials will be shown by a java applet form. Online Whiteboard is ready, where teacher or presenter will put on additional data related to the course.
- Start the learning process.
- All buttons displayed on the below of Whiteboard will be set enabled only for teacher or presenter. That is, the control authority of changing page/content of Whiteboard belongs to teacher. The teacher can give out this authority by clicking the button of "Teacher".

4.2 Platform

Client-Server architecture is basic design in the developing Online Whiteboard tool. Many users can access into the server and use our system from their Java-enabled Web browsers in order to view learning materials and participate in learning. The server includes components as below:

OS	:	Linux
Programming	:	Java, Servlet, JSP
Database	:	MySQL
Web Server	:	Tomcat powered by Apache
Others	:	XML, HTML

We have been developing our system using Open Source Software, and Java is selected in our research as programming language in order that the Online Whiteboard can be executed in various platforms of operating system using applet.

5 CONCLUSIONS

Online Whiteboard is an alternative useful tool to conduct e-Learning based on collaboration among participants, in order to acquire knowledge as well as to improve the quality of education using distance learning on Web. Users can use this tool without installing additional software because this tool is developed using java technology of applet so that it can be executed on many platforms in the client computer using Web browser.

In current research we focus on Online Whiteboard using chat of text and/or voice for mutual communication. In the future, we will consider other multimedia functions so that collaboration learning can be facilitated with other media such as video, etc. We are also planning to add the function of recording voice and video as alternative annotation tool. This kind of function will be useful for teacher and student to prepare an online presentation with text and voice in order to make learning process more interesting and accept more types of knowledge.

More experiments are needed to be conducted to check and improve the performance of our system in many different network platforms as well as in large scale of learning environment. In addition, by taking into account more users' requirements, we can develop more satisfied Online Whiteboard for supporting collaborative E-Learning on the Web.

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