

Shared Virtual Presentation Board for e-Communication on the WebELS Platform

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Abstract: In this paper, a shared virtual presentation board (VPB) for e-Communication application on the Web-based e-Learning System (WebELS) platform is introduced. WebELS is a general-purpose e-Learning system to support flexibility and globalization of higher education in science and technology. In WebELS, the Meeting module consists of online slide presentation and video meeting, which the combination of both creates a so-called virtual room for e-Communication applications where meeting participants convene via the Internet. Online presentation features synchronized remote control for scrolling function, zooming function, cursor movement, shifting of slides back and forth, and even controlling the playback of video embedded on the slide. It also features online annotation to enhance the versatility and usefulness of online presentation. Online annotation allows the presenter to overwrite figures, draw objects or write mathematical equations to further elaborate what is being presented in a synchronized manner. This paper discusses the features of online presentation and the development of a virtual presentation board (VPB). VPB is a shared object that resides on the WebELS server system and is periodically accessed by WebELS client system in order that attendee's presentation viewer can replicate that of the presenter.

Keywords: e-Learning, e-Communication, online presentation, online annotation, cyber meeting, WebELS

Introduction

It has been a common knowledge that learning acquired in the universities become out-of-date in shorter years, and scientists and engineers are required to obtain new knowledge continuously after graduation. Lifelong education is definitely required from the point of views of both individual and the nation for sustainable technological growth and development [1]. However, employees who are working in industries have limited opportunities for learning advanced knowledge due to time and location limitations which traditional classroom-based education cannot provide answers to this kind of social demands. Internet-based e-Learning/e-Communication technology has great possibility to solve this problem, since it has a variety of benefits based on the recent progresses in the areas of advanced internetworking technologies, multimedia information processing technologies, and sophisticated software technologies, at higher quality and lower cost at a global scale [2].

In recent years, various online presentation tools for e-communications have become widely available. The most popular technology is based on screen-sharing [3], which gives the participants the opportunity to see the presenter's screen as it is. The advantage of screen-sharing technology is that presenter can show various applications on his computer and be seen by remote participants. Presenter, however, have to be careful that sensitive and confidential information is not displayed as it can be visible to the participants. Another

drawback of screen-sharing technology is the reduced graphic quality that smaller text or objects cannot be clearly seen as it has no zooming function. Screen sharing technique also requires higher bandwidth for streaming encoded screen images.

On the other hand, content download technique, as employed in Web-based e-Learning System (WebELS), have a number of advantages. In this technique, contents are downloaded before the meeting starts by the participants from the server, and only the virtual presentation board (VPB) data is transferred between the client and the server during the presentation. VPB data is composed of control signals and annotation data in the order of tens of kilobytes, therefore this technique can be used even in low-speed network environment.

In this paper, we present the development of VPB for the online presentation on the WebELS platform. WebELS is a general purpose e-Learning platform to support flexibility and globalization of higher education in science and technology especially for PhD education by means of advanced information and communication technology [4,5]. WebELS consists of three modules, i.e., WebELS Learning for self-learning, WebELS Lecture for Internet-based online distance lecture and WebELS Meeting for Internet-based online meeting. In WebELS Meeting, the online presentation uses VPB to achieve remote synchronization of slide events between the presenter and the attendees. E-Communication on the WebELS platform is made possible by combining the online presentation and video conferencing functions to create a virtual room, where meeting participants convene via the Internet. This paper focuses on the online presentation that uses the shared VPB data.

1. WebELS Meeting System Overview

Figure 1 depicts WebELS Meeting as a web-based content-centered e-Communication system. The fundamental requirements for e-Communication system include online presentation, online annotation, video conferencing and chat messaging. With these features, users in remote location, i.e., presenter and attendees, that share the same virtual room over the Internet can experience real-time online meeting.

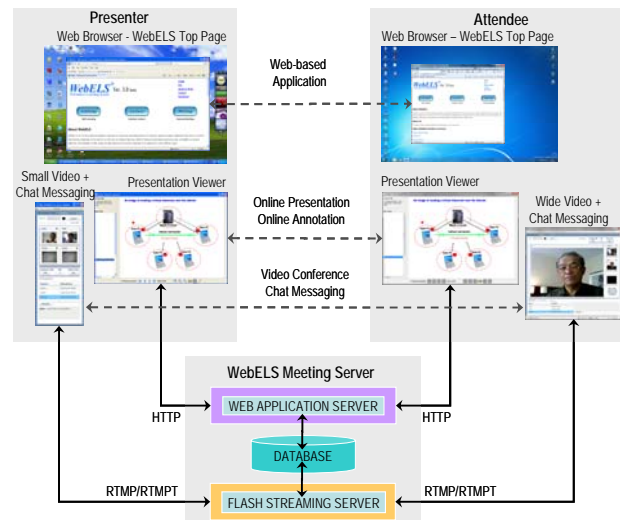


Figure 1. WebELS Meeting as an e-Communication System

The online presentation system implements the concept of a Virtual Presentation Board (VPB) which will be discussed in succeeding sections. This board is a data file stored at the server and updated by the presenter by sending all information in its presentation viewer

every time there are slide events. Attendees of the same content retrieve the shared VPB data by polling the server, and thus attendees are able to reproduce in their display panel similar to what is in the presenter.

e-Communication is made possible by combining the video conferencing and online presentation in the same virtual room. Video conferencing and online presentation panels are designed to be independent with each other, because one video conferencing panel can be used with multiple presentation contents.

2. Synchronized Online Presentation

WebELS Online Presentation features the following important characteristics in implementing an effective e-Communication system:

- Slide Synchronization – The most important and basic requirement for online presentation is the remote slide synchronization. The presentation control panel is equipped with slide control buttons (next, back, first slide and last slide) that enables shifting of slides back and forth by the presenter.
- Cursor Synchronization – An effective presentation guides the attendees on which part of the slide is being presented. Conventionally, a laser pointer is used for this purpose. In WebELS, a bold red crosshair cursor is used as a pointer that appears when the presenter clicks at a certain position on the presentation display panel.
- Online Annotation – Aside from pointing to a particular point on the slide using a cursor, there would be a necessity to overwrite figures, draw objects or write mathematical equations to further elaborate what is being presented. Writing annotation on the presentation display panel is simply done like a freehand drawing. It is done by pressing the left-hand mouse, and holding it steadily while dragging the thin crosshair cursor to form the desired object. See Fig. 2 for online annotation example.
- Slide Zoom Function – Attendees sometimes use text documents for presentation. However, text document may not be easily readable or visible as a slide presentation. Slide zooming function would then be necessary in order to enlarge part of the slide that is of interest.
- Video Playback Function – Video content added to slide presentation enhances the interest of the attendees on the presentation. In WebELS system, various video content formats (MOV, AVI, MPG) can be embedded onto the slides. Video playback functions such as start, stop and pause are also made to synchronize remotely between the presenter and attendees.

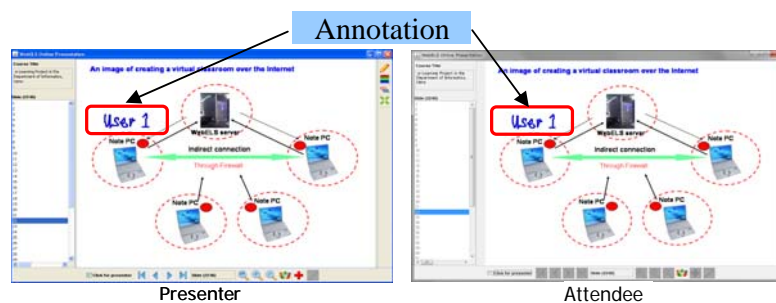


Figure 2. Presentation Viewer with Annotation

3. Implementation and Data Structure

3.1 VPB Concept Implementation

Figure 3 shows the WebELS Meeting as a client-server system that implements the content download technique. Before the meetings starts, each participant downloads the viewer applet and the presentation content from the server. Virtual Presentation Board (VPB) data is shared among the participants as the meeting is undertaken. The implementation concept of VPB is to make copy of what is displayed on the presenter's presentation viewer, send this copy to the server, where every user can download this copy and reproduce on their presentation viewer. The presenter is the source of VPB data, wherein any slide events in its display panel, a new update of VPB data is sent to the server. Slide event objects include slide number, cursor position, slide zoom information, scrollbar position, video playback information, and annotation information. For the attendees to reproduce copy of the presenter's display panel in a synchronized fashion, the system pools the server and retrieves the VPB data file every one second. As the VPB data is in the order of tens of kilobytes, the online presentation works efficiently well even in narrow bandwidth network environment as opposed to screen sharing technology that requires higher bandwidth.

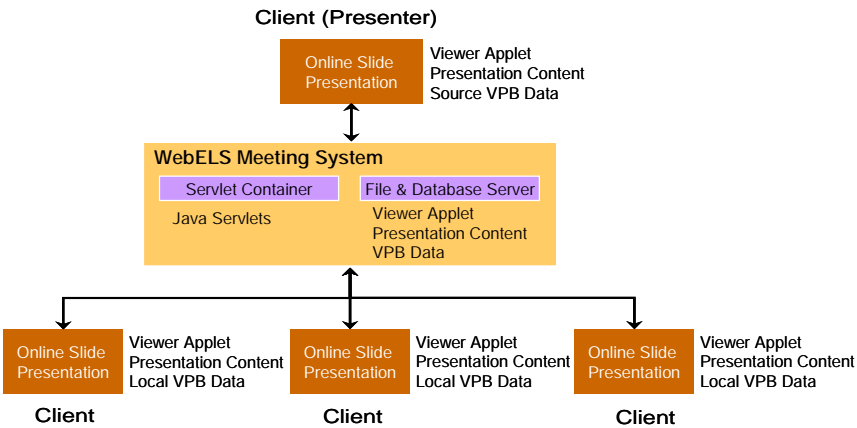


Figure 3. Virtual Presentation Board (VPB) Concept on WebELS Meeting System

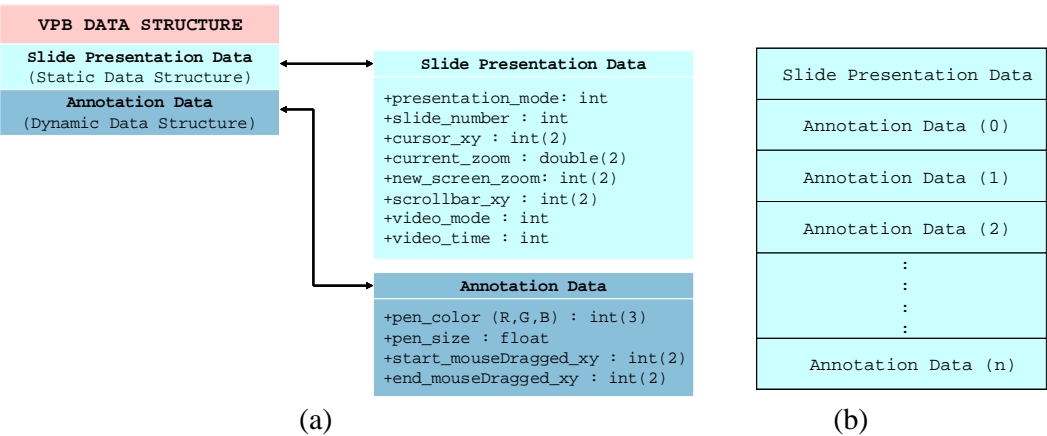


Figure 4. (a) VPB Data Structure, (b) VPB Data Stream

3.2 VPB Data Structure

Figure 4 (a) shows the Virtual Presentation Board (VPB) data structure that consists of static and dynamic data. Static data structure is used for slide presentation objects that include presentation mode, slide number, cursor position, zoom data, scrollbar data and video function. The part of the VPB data structure that has dynamic memory is used for the annotation data that represents pen color, pen size, and cursor xy position. It uses a vector type memory that is appropriate for growing array of objects. The data stream is shown in Figure 4 (b), where the slide presentation data comes first, and then the annotation data in a repeating pattern.

4. Practical Evaluation

WebELS has been used by a number of domestic and international organizations and universities for distance exchange lectures and meetings. Recent distance lecture was conducted between the National Institute of Informatics (Japan) and the Tsinghua University (China). The exchange lecture was successful using the online slide presentation and the video meeting functions. Furthermore, because of the multi-point access, and no firewall and proxy setting requirements, WebELS is considered to be an effective collaboration tool for higher education in international cooperation between universities and academic institutes.

5. Conclusion

This paper presented the WebELS Meeting System and the development of a shared virtual presentation board (VPB) for e-Communication on the WebELS platform. VPB is a data structure that defines several objects that represents how the presentation viewer displays the slide content. WebELS implements the content download technique, wherein presentation viewer and content are downloaded prior to starting a meeting, and the shared VPB data is only used to synchronize remote slide events during an online presentation. Because VPB data is in the order of tens of kilobytes, content download technique works efficiently well even in low bandwidth network environment, in contrast with screen sharing technology that requires high network bandwidth.

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