Borderless Canvas: Development of a Multi-display Discussion Software for Knowledge-emergent Presentations

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With the growing possibilities for ICT to support knowledge-emergent activities, this study introduces a multi-display discussion software “Borderless Canvas,” which facilitates the development of knowledge-emergent capabilities through these activities. Utilizing ZUI (Zooming User Interface), this software allows all the discussion participants to share a “zoomable canvas,” which displays presentation slides created by Microsoft PowerPoint, and to freely view the slides and write comments on the “canvas” with an electronic pen, unimpeded by the usual hierarchical barrier between the presenter and the audience, thus deepening the discussion between them. By preparing additional public display screens in the room, the presenter can also display slides coming before or after the main slide being shown, making the display of slides on-site more dynamic. This paper describes the contributors’ motivation and rationale for this project and provides details on the subject software.

Introduction

In recent years, the ability to make presentations has become an increasingly important social requirement, and this need has been widely taken up in the educational sphere (Kishi, M., & Kogure, A., 2007). Up to now the focus in presentation skills training utilizing ICT has been on showing how the presenter can communicate information in an effective and impressive way (Kurihara et al., 2007). It of course goes without saying that these skills are very important, but in slide-based presentations and lectures that are actually carried out in real life, the following problems often appear.

1) It is difficult for the audience to actively ask questions about detailed points or offer their opinions during the presentation itself. As a result, the presentation becomes quite one-way, and during the final question-and-answer period, the audience often fails to ask questions or express their views, thus preventing the discussion from reaching a deeper level of detail and significance.

2) A great deal of information is often incorporated into the slides used during the presentation, and since presenters often go through the presentation at a fast pace, the presentation proceeds without the listeners being able to understand the contents clearly.

3) It is difficult to grasp the connection between the information presented in one slide and that provided in another.

These problems manifest themselves in a dissonance between the information presented by the presenter and the understanding of that information by the audience. The root cause of this basic problem is that the development of

¹ This is a particularly serious problem in Japan, where the culture places a premium on valuing harmony even during a discussion, with the result being silence.
ways for facilitating “audience commitment” has not been included in past research on presentation skills training and education, which focused too much on the presenter, or on presentation methodology.

Based on the understanding that the real process and goal of a presentation should be the “greater commitment by participants in the presentation process and, through the exchange of diverse opinions, the emergence of new knowledge,” the authors of this paper have been developing discussion software, which supports these knowledge-emergent activities through ICT and, facilitates, through these activities, education for fostering knowledge-emergent capabilities. To date, the authors have developed prototypes for the basic system (Kurihara, K. & Igarashi, T., 2007).

Related Work

Examples of previous research that has also paid attention to the commitment of the audience during the presentation process are the commonly used ARS (Audience Response System), Classroom Presenter (Anderson et al., 2004), Classroom Learning Partner (Koile, K., & Singer, D., 2006), and Livenotes (Kam et al., 2005) systems. ARS, Classroom Presenter, and Classroom Learning Partner are presentation systems that enable the audience to answer questions that the presenter has prepared in specific places in the presentation slides by selecting multiple-choice answers or writing down the answers with electronic pens. Livenotes is a system that facilitates the exchange of related information among the audience for each presentation slide through the shared use of an electronic whiteboard.

The authors of this paper recognize the importance of, and are following up on ways for, securing these kinds of information channels between the presenter and the audience and among the audience members. In addition to that, the authors believe it is desirable in knowledge-emergent-type presentations for there to be no assumption of a gap in authority between the presenter and the audience. Thus although the presenter assumes the main role for moving the presentation forward, mechanisms are introduced that allow the audience to become actively and collaboratively engaged in the discussion to the extent that their input can influence the process of the presentation.

Software Design

The Borderless Canvas system that the authors have developed has the following features (see Figure. 1).

1) Borderless Annotation Sharing: This function turns the presentation from one in which the audience just “listens” to the speaker to a presentation in which the audience “discusses.” This function not only allows the presenter to make pen annotations on each slide but also the audience to write down their questions and comments for showing on the public displays during the actual presentation itself and to share and discuss their comments with all of the participants (presenter and audience) in real time. The special feature of Borderless Annotation Sharing is that with no barrier between the presenter and the audience, anyone can write questions or comments at any time or on any slide, distinguishing it from existing pen annotation and electronic white board tools.

2) Borderless ZUI Information Space:

By using the Tablet PC provided, an audience member can become independent from the presentation being given by the presenter in order to preview or review the presentation contents in real time by freely shifting to previous or following slides. Again different from existing tools, this “zoom in, zoom out” function, which uses the ZUI (Zooming User Interface) (Perlin et al., 1993), allows multiple slides to be seamlessly and simultaneously shown on one display, allowing the participant to get a clear overview understanding of the relations among the slides.

3) Borderless Display Extension:

If several large public display screens can be prepared, the presenter can show the audience previous or ensuing slides or an overview chart of the entire presentation so that the audience is able to understand completely the contents of the presentation. Moreover, since several audience members can write comments on any of the slides displayed simultaneously for discussion by using the special function described in 1) above, the audience can compare the various comments, and this can facilitate knowledge emergence. Furthermore, special preparation
beforehand is not necessary for adding display screens; it is possible to increase or decrease freely on-site the number of displays in accordance with the number of usable displays that happen to be available.

4) Other Features:

As a preliminary sounding board for further discussion, the system allows the users dragging and dropping files created by Microsoft PowerPoint to automatically lay out the slides on the zoomable canvas. Moreover, since this software uses ClickOnce technology, which starts up the Windows application directly from the Web browser, its availability is quite high.

Interface

The Borderless Canvas system is simple. As shown in Figure 2, the system is operated by the same client software for all the participants (presenter and audience) and PC terminals connected to the public displays.

1) Group Authentication: Users access the Borderless Canvas site through a Web browser, enter the group ID and password known by all the participants, and log in (see Figure 3 left).

2) Setting Roles: When the roles at the start of the presentation (presenter, discussant, overview; a public display screen showing the entire presentation, etc.) are decided, the direct client application is activated through the ClickOnce technology. Since the roles are provisional, they can be flexibly changed during the presentation (see Figure 3 right).

3) Annotation and View Navigation: The client application configuration is shown in Figure 4. Users can write comments with the tablet pen or erase comments with the eraser tool at any time. For view navigation, by moving
the wheel widget knob at the bottom right corner of the screen left or right, the user can zoom in or zoom out the view. To change the view, the user can drag the slide on the screen by pushing the button on the side of the tablet pen, or change the slides one at a time either forward or backward by using the appropriate function key. If the user has the role of presenter, the changes of the view are shown to all clients. However, changes displayed to audience members who are writing comments or changing views independent of the presenter will be delayed for ten seconds after the most recent comment or view change is completed.

Figure 4 (Left) Client Application Showing a Slide. (Right) Functions of Client Application.

Architecture

The Borderless Canvas is a client server system. The client software, which is run from the website, signals the server every several seconds, so that the situation for each client is updated within the same time period. Compared to communication methods that use ad hoc networks, which require that the communication setting must be done on-site, the Borderless Canvas system has the advantages of presenting low technical barriers when starting up, allowing a scalable number of simultaneous connections, and permitting participants in distant locations to connect to the system.

Test Cases

Several examples of actual usage of the Borderless Canvas system are described below.

Knowledge-emergent Presentations in Graduate School Lectures

Figure 5 shows examples of the Borderless Canvas system being used in graduate school lectures at the University of Tokyo. The student presenter is giving a presentation on her survey of research documents. The other students comprising the audience are making comments on the presentation, thus helping to deepen mutual understanding among all the participants and promote discussion on areas for improvement.

Making wide use of three large public displays, the presenter is able to make a very informative presentation that clearly connects the contents of the various slides shown. Viewing the slides, the audience members write their questions, opinions, and impressions on their individual Tablet PCs. At times, the presentation turns to discussion among the audience and the presenter based on comments they have written down. The written comments are displayed on all the public displays and Tablet PCs in sequence. The presenter is able to respond flexibly, putting emphasis on certain places in her presentation, while confirming the opinions and questions the audience members write down during the presentation. Moreover, by being able to proceed independently from the pace of the presenter, the audience members can get an overview of the materials on their own Tablet PCs and go back to previous slides to confirm points, thus allowing them to get a fuller and deeper understanding of the presentation contents.

Different from usual presentations, through these ways the presentation at its completion fully reflects the comments and questions of the audience. Moreover, since the comments written down during the presentation all remain, after the presentation itself is over, the presenter and the audience can confirm one-by-one the individual issues and points of contention raised and then discuss them in detail, thus setting the stage for the promotion of further knowledge emergence.
Group Work and Comparisons

Figure 6 shows an example of the Borderless Canvas system being utilized for group study in a class at public junior high school in Chiba Prefecture. At one point during a lesson based on the presentation of slides, the students were divided into three groups and asked to give their views on the information presented. Each group then summarized its group’s opinions on a Tablet PC distributed to each group. The opinions of each of the three groups were then immediately displayed on three public displays, and the students were then able to directly compare the results. With their teacher skillfully leading the discussion, the students actively studied the various opinions and, in doing so, acquired new knowledge.

Off-the-cuff Multi-display Lectures

Although this case is a little different from the original use and procedure of the knowledge-emergent presentation, even if Tablet PCs and other resources are not available to distribute to the audience, the Borderless Canvas system can still be effectively utilized. Figure 7 shows a lecture to undergraduate students at Senshu University in which the instructor, who has prepared a usual slide-based presentation, is making the presentation by displaying three consecutive slides on three public displays, one on each display, set up in the classroom. Able to see the slides in sequence, the student audience can get a better overview understanding of the information presented. Moreover, since each slide is shown for a longer period of time than in typical presentations, the students have more leeway time-wise for note taking. The instructor is also able to show at one time a number of itemized points whose relevance extends over multiple slides.
Summary

This study presented a detailed description of the Borderless Canvas system, a multi-display discussion software. Allowing users to flexibly utilize the computer resources available to them, the Borderless Canvas system supports activities that facilitate the deeper understanding by all participants, who are not divided by the usual barrier between presenter and audience, of the contents of presentations and promote the new emergence of knowledge. This software has been regularly utilized for graduate school lectures at the University of Tokyo since October 2008. It has also been used on an experimental basis at a junior high school in Chiba Prefecture and in undergraduate classes at Senshu University, and an evaluation of this experimental usage of the program is forthcoming.

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References


