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リアルタイム遠隔教育支援環境RIDEEのスクリーンサイズにおけるGUIの改良

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コンピュータの普及と通信技術の進歩の中で遠隔教育の役割は教育者と学生の双方にとってますます重要になってきている。そこで今回会津大学で開発されたリアルタイム遠隔教育支援環境（RIDEE）の資料表示方法の見直しを行った。資料がより扱いやすく見やすいように参加者それぞれのパソコンの解像度に合わせて資料スライドサイズを変更することとスライド表示部分以外を出し入れできるようにすることの二種類の提案を行い、改良と実験を実施した。その結果、従来のRIDEEより優れた解像度で資料スライドを表示することが可能になった。

The Improvement of Real-time Interactive Distance Education Environment by Full Screen Size GUI

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The role of Web-based distance education becomes more and more important with the spread of computers and the progress of communications technology. A Real-time Interactive Distance Education Environment (RIDEE) was developed at University of Aizu. In my work, an experiment was performed using RIDEE improved by two kinds of approaches for the more functional and usable GUI of RIDEE. They are to change the slide size to the resolution of each user's PC, and to mount the function of the component putting in and out according to need. As a result, it was found that the new RIDEE was able to display a document slide with resolution superior to previous.

1. Introduction

Recently, Web-based distance education has gained attention with noticeable progress in computer network technology and interest in lifelong education. For example, it has become possible to make interactive communication with not only text/graphics but also audio/video through the development of communications technology, such as the Japan Gigabit Network (JGN)[1] maintained by Telecommunications Advancement Organization (TAO) from April 1999 to March 2004. Also, coverage of the Net is 66.8 percent in Japan, and coverage of broadband connection is 17.5 percent[2]. It is increasing every year. In addition, the number of universities that have introduced a distance education component has increased steadily in the past 5 years in Japan. This is because the competition among universities has increased, with fewer children at college age, and the needs of working people to improve their career. Their students can take a course using the delivery of moving pictures, sounds and texts on the Net without any geographic constraints. As a result, some companies also conduct businesse by remote meeting system to reduce costs. It is one of the efforts to address global warming. Moreover, with the development in computer network technology, a large amount of data can be transmitted easily and quickly. Therefore, distance education using a network camera and synchronous handouts is projected to be positively used.

Though a computer-based distance education has a lot of applications in the world, it is classified into

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synchronous and asynchronous types. In the synchronous class, participants use network cameras and synchronized handouts. Though learner and lecturer are subject to substantial temporal constraints, the lecturer can teach as in a face-to-face class. In the asynchronous type, participants use streaming video and documents to study. Because they can study without restriction by time, this type is convenient for working people. Additionally, a distance education combining the synchronous and asynchronous type has been approached in recent years. For instance, WIDE University offers remote classes and meetings based on the synchronous and asynchronous model on the Web[3]. Most of the Web-based distance education systems are currently mounted on a browser such as WebEx[4]. It is functional because it does not need to be installed.

At the University of Aizu, a Real-time Interactive Distance Education Environment (RIDEE) has been developed by my laboratory. It is a system which supports a remote synchronous classroom, in real-time, in a high speed network like the Japan Gigabit Network. In a lecture supported by the existing RIDEE, the participants can share materials composed of still pictures (slides), and they can ask the lecturer a question actively. According to the literature[5],[6], it is performed by using several functions, RIDEE-CCP (RIDEE Communication Control Platform), RIDEE-FCS (RIDEE Floor Control System), RIDEE-SPS (RIDEE Slide Presentation System) and RIDEE-UIM (RIDEE Understanding Information Management system).

However, unlike the development of the new systems, very little attention was given to the total GUI of RIDEE to be easy to see and use. Moreover, it was not necessary for the document slide size to be a fixed length in previous RIDEE because the resolution of the PC improved. It is desirable to be easier to see the document slides in the distance education system for the understanding of the remote class. Therefore, the total GUI of RIDEE was reviewed for the document slides displaying that considered resolution.

The purpose of my work was to devise the functional GUI of RIDEE to solve this issue, and to realize an object-oriented system.

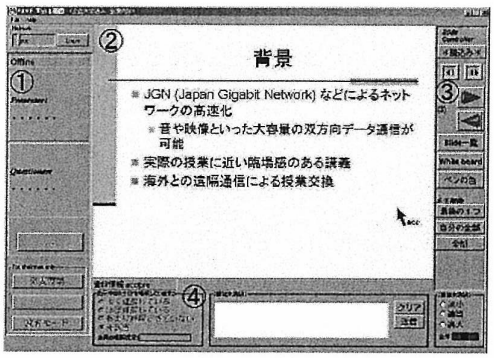

図 1 The GUI of previous RIDEE

2. RIDEE

RIDEE is a distributed computer system supporting lectures, computer exercises, and seminars over the JGN and has been applied to academic conferences, tele-seminars and several distance lecture experiments. According to this description[7], the participants of a remote lecture and seminar can do the following, using RIDEE installed on their own computer.

- They can take a remote class and lecture with documents consisting of JPEG slides.
- They can discuss the shared documents and ask questions.
- They can address the presenter directly and questioner over RIDEE on the computer.
- The presenter can get feedback on all participant?fs comprehension of course content.

Figure 1 is the GUI of the previous RIDEE. It was made of four parts, a floor control part, an education mode part, a slide control part and a slide display part.

(1) The floor control
Login control and acquirement of a right to question and presentation are supported by this part.

(2) The slide display
Slides are displayed in this part.

(3) The slide control
This part provides the user with loading slides, switching slides, changes the color of the mouse cursor, displaying comprehension

gathered from participant ' s slides and offers synchronization with the speaker.

(4) The education mode
This part collects participant comprehension. Participants input their comprehension level in four levels for each lecture slide.

The frame was designed to a fixed length of 1024 x 768 with the resolution XGA (1024 x 768). The size of the view area of the slide was set by fixed length 720 x 540. Recently the resolution of display becomes higher. The resolution WXGA (1280 x 800) is popular in a laptop. There are some laptops of the resolution 1920 x 1200. Thus, the slides of RIDEE can display higher resolution than the previous RIDEE.

3. The New GUI of a slide display system for real-time interactive distance education

Two correction methods, to improve functionality are presented.

3.1 A function of adding and removing display features

To provide the user with wider slides, feature of the slide display are improved to be able to be added or removed as necessary. There are two proposals about the method changing the display.

- Automatic
  When a mouse cursor goes into a part of a hidden component, the component automatically comes out of the slide display component. When the mouse cursor goes out of a component, the component is automatically hidden.
- Manual
  The component is added or removed by clicking on a button. Unlike the automatic way, this allows the component to appear if the mouse cursor leaves from the component.

3.2 Expansion of frame and changeable slides

The size of the frame is altered to display high-resolution slides in a high-resolution screen. The size of slides is made to ensure that they fit automatically into the size of the frame.

However, there are possibilities for the following problems in this way. Figure 2 shows the image of these problems.

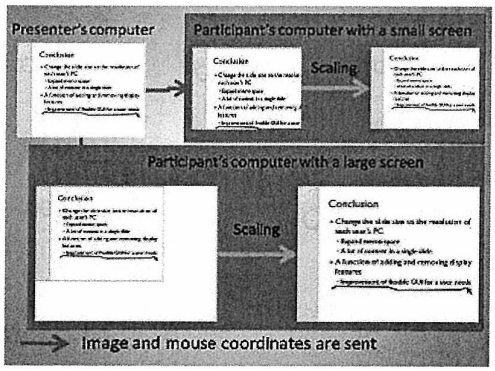

図 2 Display Synchronization among computers with different screen size

- Positions of synchronized mouse cursor
  There is a possibility that the display resolution of the each participant ' s PC is different depending on the case. Therefore, the positions of the synchronized mouse cursor are different on the screen of the teacher side and the student side. In consideration of this problem, a change is necessary to the individualized relative coordinate from the absolute coordinate of the synchronized mouse cursor.
- Synchronized input string
  In the above case, synchronized input string is necessarily displayed on the relative screen.

4. System Design

The inspection system was made with a RIDEE system based on suggestions as follows.

4.1 User Interface

The new GUI was performed on RIDEE as follows.

- The floor control part, the slide control part and the education mode part were divided into a left component, a right component and a bottom component, and the function of adding or removing features was fixed to each parts.
- The size of the slides was made to ensure that they fitted automatically into the size of the frame.
- The minimum of the display resolution is XGA (1024x768).
- Each component has a button and a panel.

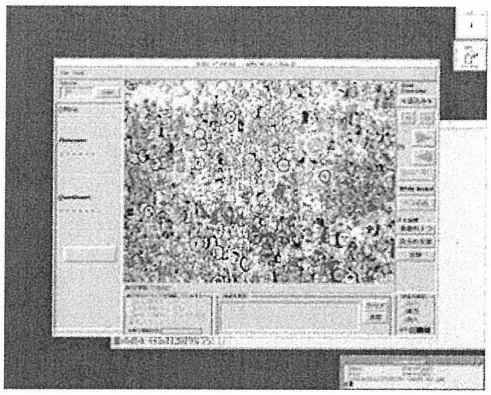

図 3 A screen shot of previous RIDEE by 1280x1024

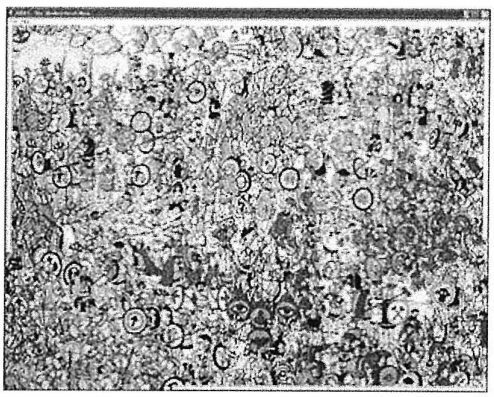

図 5 A screen shot of new RIDEE by 1280x1024(2)

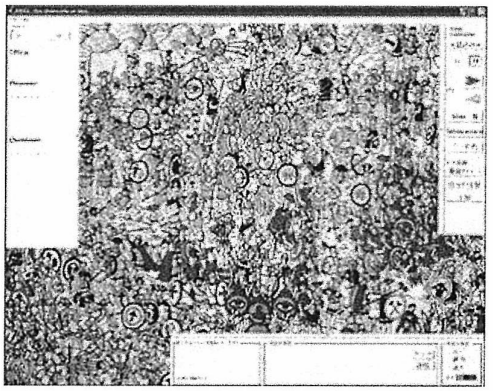

図 4 A screen shot of new RIDEE by 1280x1024(1)

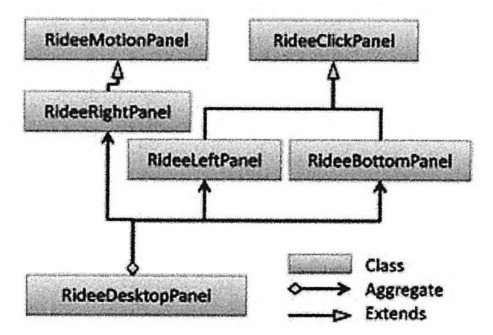

図 6 The Class Diagram

Their button was equipped with an arrow whose direction is changed with the appearance or disappearance of a component.

Figure3, Figure4, Figure5 show screen shots of the previous and the new RIDEE. They were executed in a display whose resolution is 1280x1024. The new slide display part was about three times as large as the previous slide display part. When each component is stashed like Figure 5, only a button is left in the display.

4.2 Detail Design - Class Design

RIDEE is coded in object-oriented language, Java, to ensure general versatility and scalability. Therefore, this GUI system was improved based on object-orientation. Figure 6 shows class construction for the programming. The function for each class is explained as follows.

- Ridee Motion Panel

  This is an abstract class equipped with a button and a panel. When a mouse cursor goes into this component, it appears at the surface of the slide. When a mouse cursor goes out this area of it, it disappears without the button. The button was set as an arrow icon that switched with each change in appearance or disappearance.
- Ridee Click Panel

  This is also an abstract class possessing a button and a panel. It appears or disappears at the click of this button. The button was set as an arrow icon with the same function.
- Ridee Right Panel

  This is a class inheriting Ridee Motion Panel. A slide control panel is set on this feature.
- Ridee Left Panel

  This is a class inheriting Ridee Click Panel. A floor control panel is set on this feature.

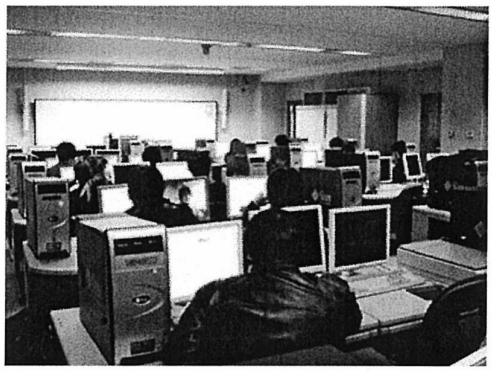

図 7 The complexion of the experiment

- Ridee Bottom Panel
  This is a class inheriting Ridee Click Panel. A panel showing comprehension is set on this feature.
- Ridee Desktop
  This is an aggregate class of Ridee Left Panel, Ridee Right Panel and Ridee Bottom Panel. Those panels are set on the slide display panel.

5. Experiment

5.1 Method of experiment

The intent of these tests was to compare the value of the system to a previous system. A new system was designed and manufactured in the method as mentioned above. Then, the system was implemented in actual distance lecture to 16 university students of Aizu. Each one of the students was provided with one workstation in operating RIDEE. This interactive distance classroom was performed by setting a web camera in front of students and a lecturer. After class, I conduct a survey in the form of an online questionnaire about the new GUI of RIDEE. The questionnaire items were as follows.

Q1. Could you switch over the slides easily?
Q2. Could you see the slides easily?
Q3. Was the space to memo in the slides big enough?
Q4. Could you operate the function of adding or removing on RIDEE easily?
Q5. Which did you use most easily: the automatic or the manual? (1:automatic 2:manual)
Q6. If you found problems or can suggest improvements in the system, please write them freely.
Q7. What do you think about using the RIDEE in a face-to-face class and not a distance class?

5.2 Result

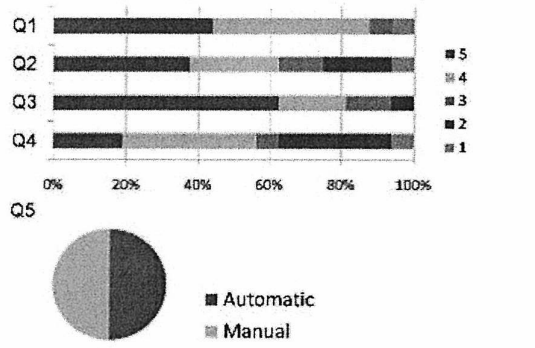

図 8 The result

Q1 to Q4 were evaluated in five stages. Q5 asked about alternative of automatic or manual. Figure 8 shows the questionnaire result from Q1 to Q4. Because the result indicates high evaluation about Q1, I consider this system having no problem for the operability of the slide control. For Q2, the evaluation of 4 and 5 grades accounts more than 60%. Providing wide space to note on the slides has a high evaluation in Q3, because the slide size was bigger than the slide size of the existing system. In Q4, the function of the component addition and removal was highly evaluated with over 50%. In Q5, the manual and automatic operation was evaluated at fifty-fifty. Some refinements were notably suggested in Q6: to organize the three components in a convenient form and to give user the ability to change a configuration design. In Q7, the slide display function and the slide control function of RIDEE were highly evaluated, there were a lot of opinions that I wanted to use in the normal class.

5.3 Discussion

Before the experiment, the distance class was conducted without rehearsal and prepares for the experiment were not enough. Accordingly, the experiment of the remote class was not implemented smoothly. Thus, there is a possibility that bad in-

fluence has been reflected on the questionnaire result. Considering the factor, the results obtained show that the usability was advanced by the modification of slide size of RIDEE, altered to display high-resolution slides in a high-resolution screen. The resolution 1280 x 1024 of the slide becomes nearly three times wider than the slide size 720 x 540 of the previous RIDEE in the experiment. However, getting a high evaluation over 50% at the function of the component addition and removal, the results indicate there was reformability of general GUI about the features. In the future works, improvement of flexible GUI for a user is particularly necessary as a synchronization of the mouse cursor, a frame of variable size and a unified component. In addition, RIDEE is considered of value to help in the normal class because there were many agreeable opinions in using RIDEE for not only the remote class but also a normal class.

6. Conclusion

In my work, there were two proposals. They were to change the slide size to the resolution of each user?fs PC, and to mount the function of the component that allows for addition and removal of features according to need. New RIDEE was improved by Java and demonstrated in a type of distance education. As the results of the questionnaire show, it was found that the new RIDEE was able to display a document slide with resolution superior to previous. However, the GUI of RIDEE requires further study as 5.3 in order to provide effective at Web-based distance education.

参 考 文 献

1) Japan Gigabit Network web site [Online] http://www.jgn.nict.go.jp/jgn_archive/index.html
2) Honkawa Data Tribune web site [Online] http://www2.ttcn.ne.jp/~honkawa/6300.html
3) WIDE University School of Internet web site [Online] http://www.soi.wide.ad.jp
4) WebEx web site [Online] http://www.webex.co.jp/jp/index.html
5) A.He, A.Kara, Z.Cheng, K.Go, A.Koyama, T.Huang, and A.Imamiya, "RIDEE-SPS: A Presentation System for Real-time Interactive Distance Education Environment", Information Processing Society of Japan, Vol.44, No.3, pp.700-708 (2003)
6) " Improvement of Realtime Interactive Distance Lectures Support System ", graduation thesis, Univ. of Aizu(2007)
7) RIDEE User ' s Handbook pdf [Online] http://www.u-aizu.ac.jp/~aiguo/ext-projects/ext-ridee/RIDEE2006_Operation.pdf