A Study on the Effective Lecture System based on Interactive Exchange of Messages and Annotations

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Abstract. The conventional computer-supported lecture system has many restrictions in collecting the participants' opinions or answers interactively. This problem of a lack of interactivity or feedback is the more serious as the more attendees are joined. In this paper, we propose an effective lecture system which provides interactive communication methods among many participants in large lecture environments. In the proposed system, all attendees can present their opinions or get feedbacks in real-time. Moreover, the whole processes of the lecture can proceed automatically in the ubiquitous computing environments, and therefore we can minimize unnecessary time-consuming procedures which are not part of the lecture itself.

Keywords: Interactive lecture, Graphical annotation, Ubiquitous computing environments.

1 Introduction

The remarkable development of the computer technologies has influenced the lecture styles at university campus. Nowadays, it is very common phenomenon to see that the university class proceeds in wireless and ubiquitous computing environments utilizing various multimedia, Web and many other computer technologies to improve student learning.

The current university environment is a good place, as mentioned in [5], to apply and develop a computer-supported education system based on well-constructed ubiquitous computing environments. However, the lecture scenario of the previous works has some restrictions regarding interactivity and real-time feedbacks [6]. In [4, 8], to solve the problems, they proposed an active learning technologies as the contrary to the passive learning for improving the interactivity in a lecture. In the system, the learners have the opportunity to participate and to make decisions about the whole learning processes.

In [13], they proposed a system in which each student has a lightweight, wireless device that can be used to interact with the lecturer during a lesson. This system can be very effective in the quiz-styled lecture that needs immediate interchange of short messages between the participants.

As the input tool on the wireless devices, [10] and [12] introduced a stylus pen and a keypad for easy document generation. In [9], they proposed a mobile phone-based learning system which allows students to write and submit their answer messages in the form of text or photograph.

The electronic whiteboard, as proposed in [11], has been used conventionally in the computer-supported education system to enhance teaching and learning. A Web-based collaborative lecture note was developed in [2].

In [3], they designed and implemented the user interface device to represent the personal data in mobile device based on multiple display screens that provides the interactive shared space in ubiquitous computing environments. In [7], they developed a prototype system to personalize the shared workplace devices in ubiquitous computing environments.

In this paper, as the extension to the previous our work in [1], we propose an interactive lecture system to enhance the students' learning based on advanced graphical annotations and feedbacks which can be effectively applied to the large lecturing environments.

2 A Scenario for Interactive Lecture

In order to introduce the motivations of our work, we present a lecture scenario which actually can be happened at a classroom equipped with ubiquitous computing environment.

As soon as students pass through the entrance door of a class room, their attendances are checked automatically by an identification system. A lecturer, without checking attendance, starts a lecture directly.

During the lecture, he can give quizzes or propose a discussion topic on a projector screen after just clicking the widget button on a touch screen panel. The Students, after writing down their answers or opinions, submit them to the lecturer by using GUIs on each of their wireless devices. Message windows containing answers from the students are displayed on a main screen in the order they arrived.

The lecturer displays maximum ten numbers of message windows on the screen at a time, and then adds his comments onto each of the windows using text or various graphical annotation methods. Each message windows can be freely positioned and zoomed in or out by clicking or dragging on the touch screen panel.

These all series of processes of lecturing are shared with students on the projector screen, and then after finishing the class all lecturing information are automatically stored into a database, so that all participants can access them.

To realize the scenario mentioned above, our lecture system supports the functionalities as follows: ID-based user identification and database interoperation, User message interchange among the participants, Graphical annotation methods for interactive feedbacks.

3 Graphical Annotations and Interactive Feedbacks

3.1 Preparing User Messages and Internal Message Handling

Students who participate in a class can submit their messages, such as answers to a quiz or opinions to a discussion, to a lecturer using their wireless devices. Messages, as shown in the Fig.1, can be written in text using keypad (A), or drawn using stylus pen (B), and it is also possible to give colors to the messages (C). Each of text and drawing messages is internally processed in different ways using two layer modes. One layer is used for representing the text and the other for the drawing data. When we store the messages, each type of data on each layer is saved in separate files. When loaded, the two layers are called separately and then overlapped to display the messages.

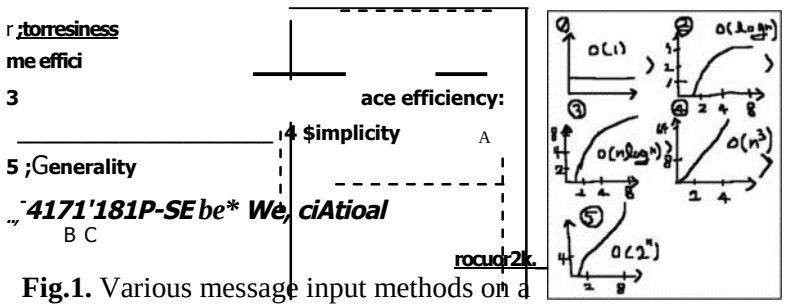

Fig.1. Various message input methods on a wireless device

3.2 Touch-based Graphical Annotations

A lecturer can start a discussion by just clicking a widget icon, as shown in the Fig.2. The widget icon, to increase the accessibility, is positioned on the foremost application window.

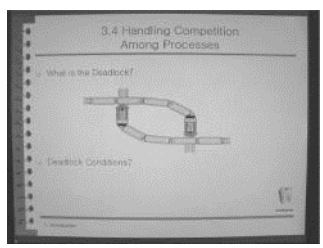

Fig.2. Widget icon for starting discussion

In order to provide an effective learning for students, it is very important to give interactive feedbacks. The proposed system supports feedbacks using graphical annotations written or drawn by a pen or a finger. A lecturer can add annotations to

each of the windows containing students' answer messages with text or various meaningful symbols using colors. Fig.3 shows the results of the lecturer's annotations.

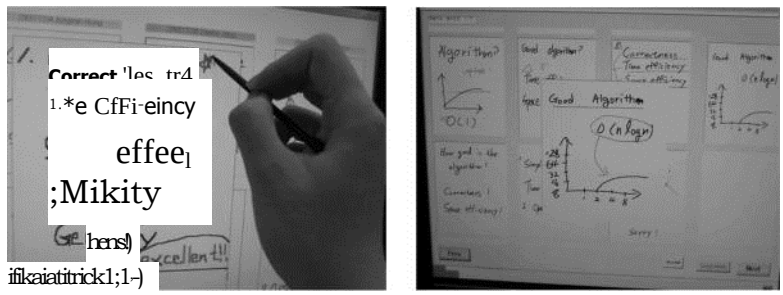

Fig.3. Lecturer's annotations

All the results of the annotations added by a lecturer are stored into a database by associating with the corresponding answer message and therefore they can be accessed later by students. In order to store the annotations with user messages, we use multiple layers internally which are associated with a separate file respectively. As shown in the Fig.4, the first layer A represents the user message, and other layers B and C contain annotations which were added over several times. The number of annotation layers can be various according to the annotations counts. Every layer is implemented transparently so that the contents on it can be seen when it is overlapped.

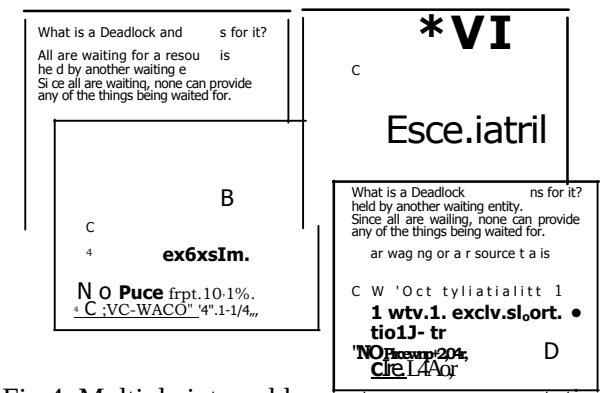

Fig.4. Multiple internal layers to process annotations

4 Conclusions

There have been many meaningful accomplishments in computer-supported education area. However, the previous works have many restrictions in collecting the participants' opinions or answers interactively in large lecture environments where there are many participants.

In this paper, we proposed and implemented an effective lecture system which provides interactive communications among many participants in large lecture environments. In the proposed system, the students can freely express their answers or opinions with text or drawing tools on their wireless devices. The lecturer can give

feedbacks to the students with meaningful graphical annotations interactively. In addition, the whole processes of a lecture can proceed automatically in the ubiquitous computing environments, and therefore we can minimize unnecessary time-consuming procedures which are not part of the lecture itself.

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