Proposal of an Automated Record Integration System for a Programming Exercise Class

Noriyuki Matsuda, Hirokazu Taki
Faculty of Systems Engineering, Wakayama University
930 Sakaedani, Wakayama City, 640-8510, Japan
{matsuda, taki}@sys.wakayama-u.ac.jp

Abstract

To reuse an electronic educational material, a teacher has to understand its availability and methodology. This paper proposed the technique of integrating electronic class text, such as HTML/XML, into automated records of activities in a class. Our hypothesis is that an activity has influence on both the automated records and the class text. We designed structured record expression and event rules. The system integrates a class text into the records by forward deductive inference.

1. Introduction

To reuse an electronic educational material, a teacher needs to understand how it influences students and how it should be used. At the same time, it is too high cost for the material author to prepare documents explaining its availability and methodology for adapting to each case [1]. Our research purpose is to decrease such costs of the author by an automated capture technique of activity in a classroom.

In the Classroom 2000 project, G. D. Abowd evaluated the effectiveness of automated capture technique to make rich records of a lecture for student’s and teacher’s reusing [2]. Several ubiquitous systems were developed that captures occupants’ activities automatically and evaluated through real lectures. One of the results indicated that it is important to increase semantic information in order to access the records smoothly.

This paper proposed the automated records integration technique to associate with captured records based on occupants’ activities. To reuse automated records, they should be expressed as semantic information instead of recorded data. An access log file of an httpd program is too hard for a teacher and students to read the activities. An activity of a class has influence on the class text, and also automated records. Proposal technique is to estimate events happened in the class from the automated records and to integrate these records.

We attempted to evaluate our system in the recursive programming exercise at Wakayama University. The captured records are the class text (XML, HTML) and movies, pictures, sound in a classroom. The current target activity is a Question-Corner in the class that is a brief lecture about frequently asked question.

Section 2 describes the goal of the automated record integration system. Section 3 discusses a capturing method of the classroom. Section 4 discusses an automated records integration technique.

2. Goal of the system

Figure 1-(a) shows the output of the automated record integration system. The system requires records data captured in the class, such as movie files which recorded a view and sound of a lecture in a class, pictures which were captured images on a whiteboard and class texts in XML/HTML. The class texts include explanation about recursive picture, definition, procedure, exercise problems, BBS page for question and discussion about the contents of the class.

The system integrates records associated with event Question-Corner that was happened in the class. In Figure 1-(a), the class question page was linked into a part of movie data and an image, a part of the class text in HTML/XML. Hence, the goal of the system is to automatically associate these records with class content information. We are expecting that this integrated records are effective for teachers’ and students’ reusing the class text.

3. Automated Capture of a Class

3.1. Overview of the classroom

The class has 63 students in a classroom. A teacher browses class texts and class BBS page on the teacher’s computer. Each student has a computer, and browses class texts through a browser, solves problems in the class texts. Students can ask questions the teacher any time in a class and can submit questions into the class BBS page.
3.2 Sensor implementation

Sensor implemented in the classroom records teacher’s and students’ activities automatically. In our classroom, we implemented nine sensors: S1 to S9 in Figure 1-(b). Form S1 to S3 are hardware, from S4 and S5 are software in the students’ computer, from S6 to S9 are software in the teacher’s computer.

S1 captures the image on the whiteboard. S2 and S3 records sound and movie of an event Question-Corner. S4 records login name and login time, logout time, a hostname. S5 records time and date when a student did not touch the keyboard and mouse. S6 records the URLs that are displayed on the screen in the class room. S7 records students’ access to the class text. S8 records students’ question activities, such as question title and text, time, a URL of the class text that has relation to the question. S9 records an announcement from the teacher to the students.

A person who implemented a sensor defines contents of observation. Definitions of S6 to S9 are below.

(ID, Name, Path, FileType, {Format of a record})
(S6, ‘MBAccess’, /record/S6, TXT, {time, hostname= {str}, url})
(S7, ‘NoteAccess’, /record/S7, TXT, {time, hostname= {str}, url})
(S8, ‘QUESTION’, /record/S8, TXT, {time, hostname= {str}, message= {str}, url, q_thread= {int}, state= {'START', 'STOP'}})

3.3 Event Question-Corner

We had event “Question-Corner” during the programming exercise class. At first, a student clicks the button in the section of the class text when he/she has a question about the section. Then BBS page is appeared in the student’s browser. He/She registers the question title and text in the BBS. During the class, the teacher observes the student’s questions in the BBS page. Only a teacher’s BBS page has “Announcement” buttons for each question. When the teacher wants to have a brief lecture about an important or frequently asked question, the teacher clicks the “Announcement” button of the question and writes a message to inform all students of Question-Corner event, for example “We will have a brief lecture to explain about how to stop a recursive procedure”.

When a student receives the announcement of a Question-Corner, he/she decides to join the lecture or not. When a student decides to join the lecture, he/she moves the back of the classroom. Then the teacher start the lecture about the question announced.

4. Record Integration

In five days, approximately 3,700 records were automatically captured. A Question-Corner event is estimated by the rule which ties a student account data, the student’s question, the teacher’s announcement, the whiteboard image, sound data. The system estimates an event by using the forward deductive inference when a record is regarded as a fact and an event is regarded as an inference rule.

5. Conclusion

This paper describes the technique of integrating semantic information into records. We are planning to evaluate the system in reusing. Currently, against 13 Question-Corner events, the system integrated all records successfully. Most students said that they were useful for learning. Some students were dissatisfied that some movies started over 10 seconds before the event. The improvement of the accuracy of the integration and the robustness of the system for many classes are important issues for the next phase of our research.

References