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

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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. Currently, we have held evaluation experiment. We designed structured record expression and event rules. Our system integrates a class text into automated records by forward deductive inference.

1. Introduction

To reuse an electronic educational material found on the internet, the teacher needs to understand how it influences students and how it should be used. At the same time, it is too high cost for an 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, the records should be expressed as semantic information instead of set 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 then 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. And Section 4 discusses an automated records integration technique.

2. Goal of the system

Figure 1 shows the overview of the automated record integration system. The system requires records data captured in the class, such as the class text in XML/HTML[5] and movies, pictures, sound data. The class text includes explanation about recursive pictures and definition, procedure, exercise problems, BBS page for question and discussion about the contents of the class.
The system outputs the integrated records as an event in the class. In Figure 1, the system integrated records associated with event Question-Corner that is happened at estimated time 10:56. The record data, image file “001.jpg” and “002.jpg”, “003.jpg”, a sound, a movie, are made when teacher had a Question-Corner. Hence, the goal of the system is to automatically associate records with event information for reusing.

3. Automated Capture of a Class

3.1 Classroom
The class has 63 students in a classroom. The room has equipment. The teacher browses class texts and the class BBS page on teacher’s computer. Each student has a computer, and browses class texts through a browser, solves a programming problem. Therefore, a progress of each student learning is different. A student asks question a teacher any time in a class and also submits a question into the class BBS page.

3.2 Sensor implementation
Sensors implemented in the classroom automatically record teacher’s and students’ activities in a class. In our classroom, we implemented nine sensors. 3 hardware sensors S1-S3, 2 software sensors S4-S5 in the students’ computer, 3 software sensors S6-S9 in the teacher’s computer are used.

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 when a student did not touch the keyboard and mouse. S6 records the URLs that is displayed on the screen in the class room. S7 records student’s 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.

3.3 Event Question-Corner
We have event Question-Corner during the programming exercise class. 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. A student registers the question any time.

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 a teacher wants to have a brief lecture about a question, such as important or frequent question, the teacher clicks the “Announcement” button of this question and writes a message for the brief lecture. We call such brief lecture Question-Corner.

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
At first, records are structured before the integration. The structuring is based on a sensor definition as below.

(ID, Name, Path, FileType, {Format of a record})
(S1, ‘BB-CAPTURE’, /record/S1, JPG, {time, url})
(S2, ‘W-MIC’, /record/S2, WAV, {term, url})

A person who implemented a sensor should write a sensor definition. Writing a sensor definition is only the first time. In 5 days, approximately 3,700 records were automatically captured.

The records and sentences are associated with the event Question-Corner. A Question-Corner event is estimated by the rule which ties a student account data and, the student’s question, the teacher’s announcement, the whiteboard image, sound data.

The system estimates an event by forward deductive inference that is structured record as facts, an event rule as an inference rule. The rule for the event Question-Corner was defined. The system automatically integrated Question-Corner event and these records, sentences.

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 is an important issue for the next phase.

6. References