A Programming Practice System with Function of Grasping Progress of Students' Program Writing and Its Experimental Use

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Abstract— In programming practices, some students give up making programs or do anything except making programs. It would appear that such students cannot figure out the details of assignments or do not know how to construct programs for the assignments. The teachers and teaching assistants should advise such students timely and quickly. However, they cannot do so, because too many students participate to programming practices.

The authors propose a programming practice system. Using this system, teachers and teaching assistants can grasp progresses of students' program writing. The system consists of a Web page for each student containing a programming editor and two Web pages for teachers and teaching assistants containing progresses of students' programs writing. The Web page for each student automatically and periodically sends his/her program to the server of the system. The Web pages for teachers and teaching assistants receive progresses of students' program writing from the server.

The effectiveness of the system is shown by the experimental use. The authors have used the system in our programming practices. As the result, using the system, teachers and teaching assistants become to provide necessary advices students timely and quickly.

Keywords— programming education, timely advices, e-leaning system, programming practice, programming practice system

I. INTRODUCTION

In programming practices, some students, in the case of our classes, about ten percents students, give up making programs and do anything except making programs. It would appear that such students cannot figure out the details of assignments or do not know how to construct programs for the assignments. The teachers and teaching assistants should advise such students timely and quickly. However, they cannot do so, because too many students, in the case of our classes, about one hundred students, participate to a programming practice.

Several programming practice systems have been proposed [1-3]. There systems check programs to find syntax error and semantic error after students submitting their programs. Therefore, these systems cannot assist programming practices before students submitting their programs.

II. PROGRAMMING PRACTICE SYSTEM

The authors propose a programming practice system PROPEL (PROgramming Practice Easy for Learners). Using this system, teachers and teaching assistants can grasp progresses of students' program writing such that they can provide proper advices students timely and quickly, if necessary.
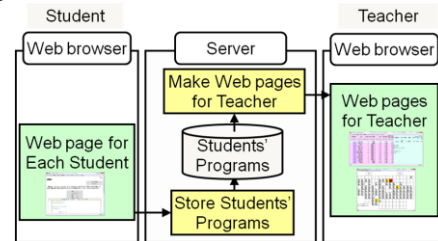

Fig.1 System configuration diagram of PROPEL

The system consists of a Web server, a Web page for each student containing a programming editor, and two Web pages for teachers and teaching assistants containing progresses of students' program writing. Fig.1 shows the system configuration diagram.

A. Web page for each student

The Web page for each student contains a programming editor and several other functions necessary for program writing, shown in Fig.2. The editor component has developed based on the EditArea [4], an open source programming editor. The authors have added the save function using Ajax [5] to communicate the Web server without reloading the Web page. Each student can write his/her program using this editor. In addition, he/she can compile and run his/her program on this Web page [6]. The program that the student is just writing and is not yet completed is sent to the Web server of PROPEL automatically and periodically.
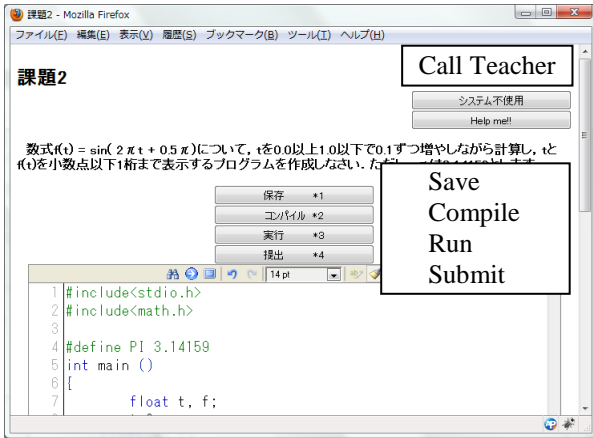
Fig. 2 Web page for each student

B. Web pages for teachers and teaching assistants

The Web page shown in Fig.3 contains the seating chart in the practice room and the students who teachers or teaching assistants should advice something quickly. The Web page shown in Fig.4 contains progresses of students' program writing containing the names of students participating to the programming practice, the number of their program lines, the last times their programs have changed and total times for writing the programs, The right part of this Web page shows a program list written by the student who teachers have selected. The information shown in these Web pages is kept up to date.

III. EXPERIMENTAL USE

The authors have used the system in two our classes of programming practice. The results are shown in Table 1 by analyzing the records of students' program writing stored in the system and a videotaped record the authors have taken. The teacher used the PROPLEL about every two minutes and advised the students whose program writings were not advanced, six times at the first class and eight times at the second class. The teacher could advise several students before they submitted their programs, two times at the first class and one times at the second class.

IV. CONCLUSION

The authors proposed a programming practice system PROPEL where teachers and teaching assistants can grasp progresses students' program writing such that they can advice students quickly and timely. The effectiveness of the system has shown by experimental results.
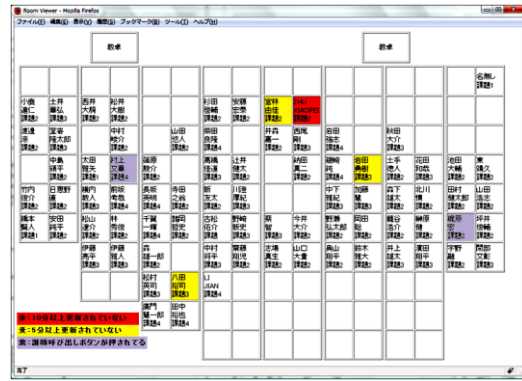

Fig.3 Web page for teachers and teaching assistants of PROPEL (1)

Fig.4 Web page for teachers and teaching assistants of PROPEL (2)

Table 1 Experiment results

	1st class	2nd class
Number of students participating practice	34	44
Practice time (seconds)	25	25
Frequency of teacher using PROPEL	11	12
Frequency of teacher advising some student	6	8
Before student submitting program	2	1
After student submitting program	4	7

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