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Interruption-response visualization using click-stream analysis

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Abstract: In a large practical engineering class, it is difficult for the instructor to give learners additional instructions while they are doing their work. Therefore, it is useful for instructors to be able to track the responses of learners after they give instructions. To accomplish this, a click-stream visualization technique based on Web access log analysis can help instructors examine the extent to which learners have received the information they were given. In this paper, we propose an interruption-response visualization method for a large practical engineering class, using log analysis.

Keywords: Log Analysis, Click-Stream Visualization, Teaching Support System

1. Introduction

While Educational Data Mining and Learning Analytics are widely recognized as important tools to improve educational environment [1], in some case, a conventional log analysis is still useful for specific practical class with closed network. In a practical engineering class, it is important for learners to practice what they have learned in lectures. However, it is difficult for instructors to manage a large practical engineering class such as making electric circuits or embedded systems, because the level of skill and knowledge differs from learner to learner. Therefore, a teaching support system and detailed and fully illustrated tutorial manuals are needed to help learners practice their skills independently [2-3]. In particular, a Web-based tutorial manual is advantageous because the content can be easily revised. Furthermore, this system enables instructors to track learners' behavior and progress using click-stream analysis recorded in the Web server [4]. Nevertheless, even if the tutorial manual is carefully written, instructors might still have to give some additional information to the entire class. Because learners are generally focused on their work individually in these classes, many might not pay attention to the new instructions. In this research, we propose a Web access log visualization method using click-stream analysis to analyze how learners respond to the instructor's directions.

2. Click-stream analysis for a teaching support system

Figure 1 shows an illustration of a large class in practical electronics engineering at our university. Every student must take this class, and more than 100 students practice their skills in the same room (Fig. 1). Only a few instructors are in charge of teaching this class. Therefore, Web-based teaching materials are useful for them (Fig. 2).

Fig. 1. Overview of the class.

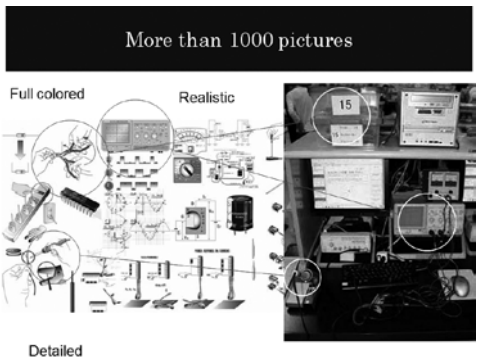

Fig. 2. Teaching materials and apparatus.

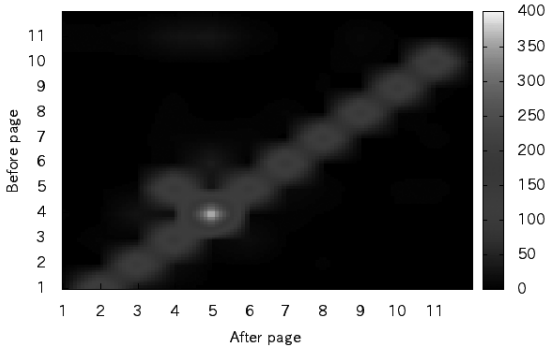

Fig. 3. A page relevance analysis

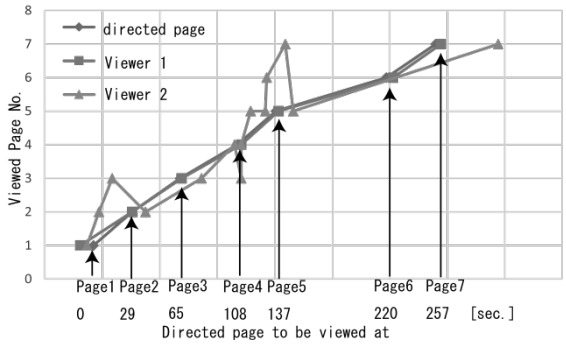

Fig. 4. Click stream during the irregular direction

Learners can choose a page of the instruction manual by clicking on the thumbnail. As shown in Fig.3, we can observe page relevance utilizing click-stream analysis on integrated data of more than 100 viewers of the tutorial manual. In this case, this figure indicates that most of the viewers proceeded according to page order, except that some went backward, from page 5 to 4. On the other hand, Fig.4 shows a typical case that students were interrupted by irregular direction of extra page viewing during their work. Each page must be viewed at directed time, but some viewers had wobble forwarding according to the time sequence. In this case, viewer1 could follow the direction, however, viewer2 sometimes did not follow the instructions. From these results, we found that it is possible to track the learner's behavior and how he or she responds when an irregular direction is given.

3. Conclusions

In this study, we propose a click-stream visualization technique for analyzing how learners follow an instructor's directions and how they behave when an additional instruction is given irregularly. This technique is effective in identifying students who are unable to follow unpredictable instructions.

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