Interface to grasp misunderstandings for teachers in Quiz

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Abstract— **In this paper, we discuss the interface of e-learning systems that make teachers to grasp students' misunderstandings quickly in quizzes. Teachers need to grasp students' misunderstandings to make their lectures effective. One of effective method for it is a quiz, which means a simple paper test. Though it is effective, it is troublesome for teachers to distribute answer sheet, collect them, read them, and so on. We aim to develop an e-learning system to reduce the load of teachers in the quiz. Especially, we aim to reduce the load to read answers. There are many answer types of quizzes: multiple choice, descriptive answer, and so on. We focus on a short descriptive answer style. It is effective to grasp misunderstandings, since it force students to answer by their own words. On the other hand, it is hard for teachers to read all answers quickly, since descriptive answers have a various expression and format. In our previous work, we proposed the basic system to reduce the load. In this paper, we enhance the system. The previous system provides answer even before their submission, and teachers can find clues of misunderstandings quickly. Though the previous system is effective, it brings teachers heavy loads that are caused by frequent update of the screen. The new system provides two views: a list of all answers including incomplete ones, and a partial list of answers that have similar words. Teachers can point a focused answer or keyword easily with proposed interface, and get a list of similar answers. It keeps the effectiveness of the previous system, and reduces the heavy load by the partial list. As a result, teachers can improve their lectures even in their lectures.**

Keywords— **e-Learning, descriptive answer style quiz, text mining**

I. Introduction

To make classes effective, teachers should grasp a status of each student. Here, status means understanding, thinking, interest, and so on. According to the status, they improve their classes: comment on misunderstandings, give a supplementary explanation, adjust progress or difficulty of the class work, and so on. To make the improvement effective, it should be done quickly.

Quizzes are one of effective methods to grasp the status, especially students' misunderstandings. Though effectiveness of quizzes, they are troublesome. Teachers often ask their students a question. Generally, only a few students answer the question by an oral or on a blackboard. Teachers grasp only a few misunderstandings. It is hard to make all students to answer.

For quick improvements, it is necessary to reduce the interval from setting a question to improve the class. Computers can do it for quizzes in a multiple-choice answer style. They can count each choice and show the summary to teachers in a moment. Teachers can improve their classes immediately after submission of all answers. Though teachers are supported by the system, they should carefully make a question and selections to grasp misunderstandings correctly. Hence, teachers do not quiz easily.

On the other hand, Descriptive answer style forces students to answer their own words. Answers would contain enough information to grasp misunderstandings with less preparation. Teachers need to prepare only a question. We deal with descriptive answer style. Especially, we focus on a short descriptive style, whose answer consists of one or two sentences per each answer. Though less preparation, grasping descriptive answers is a heavy load for teachers. Despite of the heavy load, it is preferable for quizzes. It forces students to answer with their own words. Hence, teachers would get more clues to grasp students' understandings. In addition, students can submit answers in a short time. It shortens the interruption of the class by quizzes.

Many researchers try to analyze descriptive answers by computers [1, 2]. Most of them aim to support teachers to scoring long descriptive answers like reports or essays. Ishioka developed the automated Japanese essay scoring system called Jess [1]. The system evaluates essays according to their rhetoric, organization, and content. Tsubakimoto developed the system that assists rating for many term papers by using information visualization techniques [2]. Though these systems are useful for scoring answers, they would be unsuitable for quizzes in the short descriptive answer style. Teachers use quizzes to grasp misunderstandings of students from short descriptive answers. Contrary, these systems focus on the scoring of long text.

In this paper, we propose an interface of an e-learning system that helps teachers to grasp typical misunderstandings from descriptive answers quickly. In our previous paper [3], we developed the e-learning system based on the idea: teachers can grasp misunderstandings even from incomplete answers. Teachers can grasp answers quickly with

the system. In this paper, we aim to reduce the load to grasping by expanding the system. First, we try out the system, and analyze its drawbacks. Then, we propose an expansion.

This paper consists of 4 sections. It the section 2, we introduce our previous method. In the section 3, we expand our previous system. Finally, we conclude in the section 4.

II. Previous system

In this section, we describe our previous e-Learning system. The system supports teachers in a large class to grasp students' misunderstandings quickly [3].

Though exercises in descriptive answer style are effective to grasping students' misunderstandings, they are hard to read in a large class. Teachers find each misunderstanding mostly by corresponding characteristic phrases. Actually, expert teachers often foresee the future mistake even from an incomplete answer.

The previous system is based on the idea: teachers can grasp misunderstandings even from incomplete answers. It provides answers to teachers even before their submissions. It would hasten the phase for grasping misunderstandings. It provides raw answers, since summarizing answers may hide useful clues from teachers.

We developed the system as a web server. Students answer questions on web browsers that are provided with AJAX (Asynchronous JavaScript + XML) techniques. Teachers read answers on a special browser that is developed with JAVA language. These browsers communicate with the web server to get or provide answers.

The student's interface is shown in Fig. 1. Its view looks like conventional systems (i.e. moodle [4]) that provide a question, a text box to input an answer, and a button to submit. Students read the question, answer it in the text box, and push the submit button. The difference from conventional systems is its internal action. The interface sends the answer every a few seconds regardless of its submission.

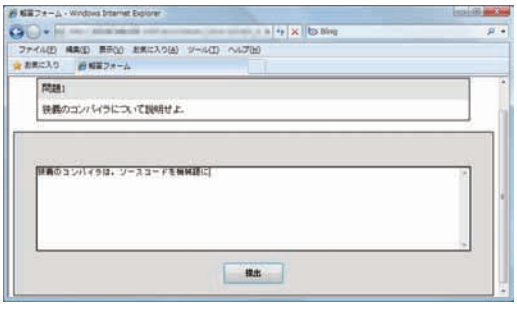

Fig. 1 Student's interface

The teacher's interface is shown in Fig. 2. Its view provides a table of answers, which include incomplete ones. Contrary, conventional systems provide only submitted answers. Each row consists of student ID, a mark submitted/not submitted, and raw answers. The table is updated every a few seconds.

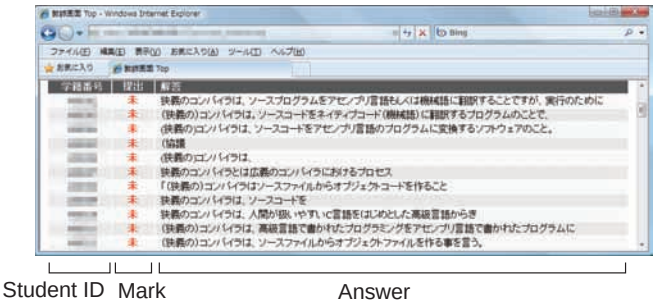

Fig. 2 Teacher's interface

Grasping misunderstandings consists of two phases: find clues related to a misunderstandings and (roughly) counting the number of answers that include the clues. The previous system supports only to find clues. By the test operation, we find that it is hard to grasp the number of answers. Users say, "Frequent update of the teacher's view confuses me." We aim to solve the problem.

III. Proposal

A. Basic Idea

The problem of the proposed system is not frequent update itself, but too many changes on the screen. Teachers should look many answers to count the number of answers that have the same clues. If all answers frequently increase their words, teachers easily lose reading answers by looking separate answers, especially by scrolling the view. Teachers would read same answers again and again, and their loads are increased. It lessens the effect of the system.

We propose the system that shows similar answers nearby. Teachers can seek the clues with a little eye movement. They would not lose reading answers. However, rearranging answers should not be done in the original view. Changing original view would cause the problem again, since teachers memorize answers by their location. In addition, the system emphasizes keywords according to teachers' requests. In many cases, clues for misunderstandings are particular phrases. emphasizing keywords would help teachers to find these phrases.

We improve the system by adding partial view to the teacher's interface. On the original view (Fig. 2), teachers find a misunderstanding answer quickly, and select the answer. Then, the system provides a new view that contains only similar answers to the selected one. Teachers easily find answers that have same clues to the selected one with less eye movement than the previous system. By providing the number of answers in the new view, teachers can easily grasp the number of students who have the misunderstanding. Since the original view is kept, teachers can continue to find another misunderstanding easily.

The similarity of two answers is measured by the number of common words especially nouns. It is a basic method in the information retrieval techniques. Since answers are not complete, it is hard for the system to analyze them in detail.

B. Interface of the proposed system

We explain the interface of the proposed system.

First, the system provides a base view, which shows all answers including unfinished ones. Fig. 3 shows a table of answers, each column shows selection status, student ID, submitted/not submitted mark, the number of characters, and answer, respectively starting from the left. It is the same action to the previous system. The view may have a scroll bar to handle many answers.

Second, a teacher finds an answer with a clue of a misunderstanding, and selects it by clicking on it.

Third, the system provides a partial view, which shows only similar answers to the selected one. The partial view consists of a table of answers, an information area, and a refresh button (Fig. 4). To avid scrolling, similar answers are selected to fit in one screen. The view provides similar answers in the descending order of the similarity in the same manner to the base view. The fourth column shows similarity, and others are same to the basic view. For convenience, common words are emphasized. The selected answer is shown on the first row. The refresh button is used to reselect answers. The close button is used to close the view. The new view is shown in an independent window to the base view.

Fourth, the system shade answers in partial views on the base view. It makes them easy to distinguish others. Fig. 5 shows the base view with shaded answers: student ID is 1010, 1012 and so on.

Teachers repeat the selection, or close a partial view as their needs. They can emphasize keywords by using their mouse pointer to indicate a word on the base/partial view

Here, answers increase their words with time. It changes similarity of answers. To avid conflict, the system keeps answers in each partial view, and informs answers to remove from the partial view, or answers to add to another view.

The new teacher's interface would support teachers to find clues of misunderstandings by a base view. Teachers count the number of answers with a clue on a partial view.

IV. CONCLUSIONS

In this paper, we aim to develop an e-learning system that helps teachers to grasp typical misunderstandings in quizzes. Especially, we focus on a short descriptive answer style.

We improve the previous system by reducing teachers' burden that is frequent update of the screen. The burden causes miss-recognition of the number of the same mistakes. The proposed system provides two views: a list of all answers, and a partial list of answers that have similar words. The former keeps the effectiveness of the previous system, bringing teachers' awareness for typical misunderstandings. The latter reduces the heavy load by arranging similar answers nearby. Teachers would grasp typical misunderstandings quickly. On both views, they can indicate keyword to emphasize by using mouse pointer. Since clues of misunderstandings would be a characteristic phrase, it would help teachers to find clues.

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Fig. 4 Teacher's view without any operation

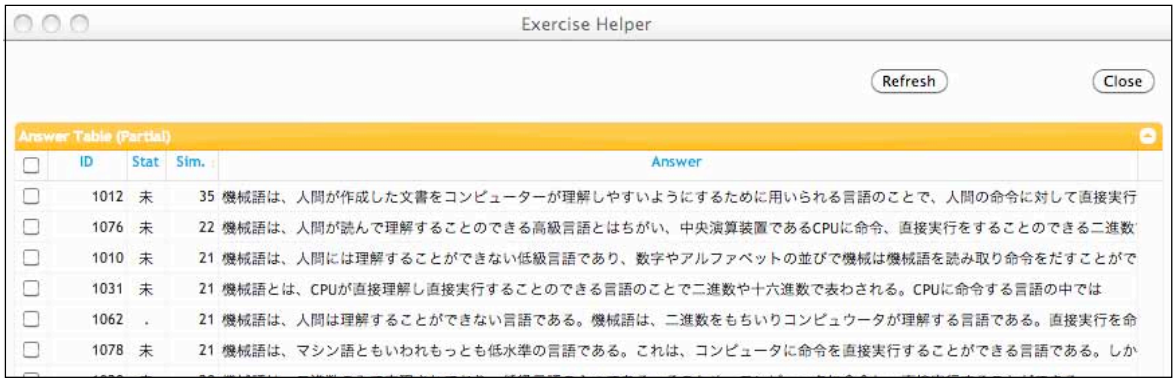

Fig. 5 Teacher's view for similar answers

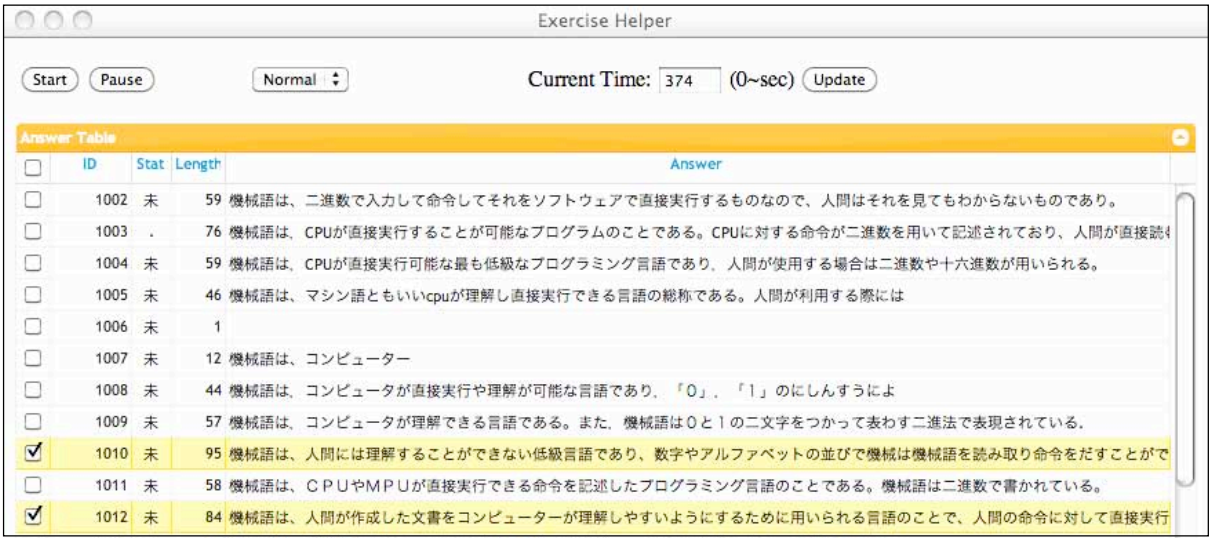

Fig. 6 Teacher's view after extraction of similar answers