Development of Marking-support Soft in Task-given-type Examination

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Abstract

A task-given-type examination is a system of compiling questions for examinations. In this system, teachers show students some samples of examination questions beforehand, which in turn, teachers choose questions for an examination from these samples, and then give them to the students at the examination. It is very important to develop supportive software for marking, because this system requires more questions than others and, respectively, more time for marking.

In this paper, the software for marking answers is described. With the system support users scan answer sheets into a computer as digital images with a scanner or digital camera. Users put answers into score boxes for each question manually. The result of our experiments shows that with this software support almost the same amount of time is needed as in the case of manual marking, however software-based marking is easier and more accurate.

1. Introduction

1.1. Background of this research

We have already proposed a system called the task-given-type examination (named by authors. see References [1][2]). A task-given-type examination is a kind of examination system where teachers show samples of questions in advance to students, and examination questions are given to students chosen among these samples. The merit of this system is as follows:

[1] Students are able to understand what they should study very clearly, which intensifies their eagerness to do well.

[2] The quality of examination questions improves compared with ordinary examination questions because the questions are more thoroughly checked and chosen.

And this is how to put the task-given-type examination into practice:

[step 1] Make some samples of examination questions.
[step 2] Present these samples to students.
[step 3] Choose appropriate examination questions from among these samples.

[step 6] Make an analysis of the results, and give some pieces of advice to the students.
[step 7] Return answer sheets to the students.

In this research, we aim at making a software on [step 5] to help markers. In task-given-type examinations, longer time is needed to mark the answer sheets. The reason: In task-given-type examinations, students should have read the questions in advance. Therefore, less time may be needed when they figure out the questions, and as a result, more questions are required than ordinary examinations. This may lead to an increase in time and errors in marking. Therefore, softwares for supporting marking is important in task-given-type examinations.

1.2. Background

To automatize marking, we already have a mark-sheet method and a PC-based method (the way that students take their examinations on the web, and teachers mark answers on the web). However, both methods have demerits. Firstly, in the mark-sheet method, [1] only multi-option questions are adoptable, [2] markers need to input the correct answers and scores to mark, and [3] expensive equipment is required. Secondly, we considered the PC-based type of marking, and we are convinced that this type of examination has three disadvantages:

[1] To carry out the examinations, a heavy amount of equipment (such as an equal amount of PCs as the number of students) is needed(see Reference [3]).

[2] Examination questions are limited to a few types compared with normal (paper-based) type. (See References [4])

[3] Both students and teachers need to have skills at using computers. (see References [5])

1.3. Research goals

In this research, we developed a software to make the marking work of written examinations more labor-efficient, which is done by using a scanner with ADF (Auto Document Feeder; a machine to scan many papers at the same time). The outline of this software is as follows: Arranging correct answers to every question, and allocating them into score boxes.
2. The marking-support system

In this chapter, we would like to explain the marking-support system.

2.1. The conditions where this system is adoptable

The conditions where this system is adoptable are as follows:
1. All students must fill in one type of answer sheet, and they must put their answers into a particular section of the answer sheets. This means that they are not permitted to put their answers into other sections of the sheet or write in any blank areas.
2. Each question’s minimum score must be 0. No score should be under 0.
3. Markers can calculate the total score by simply adding up all the points of each question.
4. Only a few lines of an answer are allowed in the descriptive type of questions.
5. Important information should not be omitted even if the answer sheets are converted to black and white.

2.2. Equipment to put this system into use

To make use of this software, the setups of a scanner and ADF or digital camera(s) is required.

2.3. The main screen of this software

This is the main screen of our software. (See Fig.1)

Figure 1. The main screen

3. How to use this software and the prosess of marking

The marking process goes through each step which has a designated touch button, therefore we would like to describe about each button as a way of explaining the process of marking.

3.1. [step 01] Starting up the scanner software

Initial start up of the OCR software which is set in the "set" screen. Scans answer sheets into hard discs as bmp images by using a scanner and OCR software.

3.2. [step 02] Resizing of scanned answer sheets

Resizes images of answer sheets into 90% of resolution.

3.3. [step 03] Cutting answer sections from the image of the answer sheets

All students are supposed to fill in one type of answer sheet, and all questions must be written in each specified section. In this step, users should specify the section where they want to cut out. They should specify these kinds of sections: Information about students (such as their names), answers, and a special “check” area where you can confirm that the scanning is all correct. One area is represented by a pink rectangle and is shown in Figure 2.

Figure 2. Snapshot

3.4. [step 04] Marking by the image of the answer sheet

[step 04] When markers push the "mark" button, a screen of marking answer sheet is displayed (See Fig.3).
In this step, we would like to explain how to grade the answer sheets.

First, markers should click "question N" which is on the left side of the screen. Then, the images of the question number clicked are arranged and displayed on the screen. When you want to mark a certain image, click the image and turn it to pale blue, and push the button "classify to here" on the side of the score which you want to mark.

Markers must not mark and grade students' names. However, it is necessary to make the system recognize which answer sheet belongs to whom, when reading the score in the paper. Therefore, push the button "Distribute by names" (See Fig. 4)

3.5. [step 05] Marking, and making a model answer sheet

By pushing this button, the marking and making of a model answer sheet are carried out. Thus the results of marking are written into the jpg-images of the answer sheets.

Figure 5 is an example of the marked answer sheet. At the same time, the system draws up a model answer sheet, which is the medley of different students who scored the best in each question.

3.6. [step 07] Grade record

This button opens a file which is specified in the "set" of "CVS file of grade record" by a related software. In the CVS file of the grade record, total score, ranking of the score, T-score, and points of each question are written.

3.7. [step 08] Covering the model answer

The model answer sheet consists of each student's answers, so it belongs to nobody. Therefore users cover it using seals on the personal information (such as names and student IDs) and make use of it as a model answer sheet which can be published.

3.8. [step 11] Make web pages (for the itself and each student)

The make "web pages" the button displays two kinds of pages: the examination itself and each student's.
The overall web page displays the whole information about the examination, such as the number of students who take the examination, the image of a model answer sheet, the average score, standard deviation, the best score and the worst, and a table of frequency distribution. Individual web pages show information about each student, such as the marked answer sheet of them and the model answer sheet.

4. Experiments

To make sure of this software's efficacy, we experimented on one model case to compare this software with a normal hand-based type marking on the time consumed.

4.1. The procedure of the experiment

We divided this experiment into two parts: one is the preliminary examination for subjects to get used to this software, and the other is the experiment on the time consumed.

4.1.1. Preliminary examination. We gave 5 filled in answer sheets (Excel) and a textbook example to the subjects of this experiment. Figure 5 represents the examination questions we used in this experiment. In this examination there contains various types of questions such as ones answered by words, a TF type, multi-option type, correcting type, and describing type.

We explained to the subjects about the outline of our software, and made the subjects mark 5 sheets in order to get used to using it. On average it took then 10 minutes for them to understand everything. After that, we made them mark the answer sheets by hand; they had to grade 5 sheets with a red pen and write the total score on the papers.

4.1.2. The Experiment. For the final experiment, we provided 17 answered sheets and a textbook answer sheet. The questions were roughly the same as the ones on the preliminary examination. However, the subjects who answered the questions were totally different. That is, completely different people answered the former examination and the latter.

Experimenterd timed and recorded each step along the side of the subjects, such as:

Software-based type marking
- [step 02] Resizing of the scanned images of answer sheets
- [step 03] Cutting answers out of the image of answer sheets
- [step 04] Marking answer sheets
- [step 05] Grading and making a model answer sheet
- [step 07] Confirming grade records

(B) Hand-based type marking
- Time to mark
- Time to open a file of students list (CSV file) and fill it in with total scores of each student.
- Time to confirm the total score

4.2. Results of the experiment

This is the result of the experiment, which was done by 14 people (see Table 1). Time consumed is shown in seconds.

<table>
<thead>
<tr>
<th>Subject No.</th>
<th>Total time A (sec)</th>
<th>Total time B (sec)</th>
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<tbody>
<tr>
<td>No01</td>
<td>50</td>
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<td>No02</td>
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</table>

Also, we present a graph of the total time of using soft-based marking and hand-based marking (see Fig.6). Time consumed is shown in seconds.
Figure 6. Comparison between a software based and hand-based type of marking

We also asked the 14 subjects to evaluate which type is “easier”, “more accurate” and “faster” by pointing from 1 to 7. The larger number implies a more affirmative feeling for this software. The average of these results were 4.9, 5.4, 4.6.

4.3. Discussion

After the experiment, we came to the conclusion that this software requires almost the same amount of time (1.04 times) as a hand-based type of marking, if we don’t consider the time for scanning answer sheets (530 seconds were consumed to scan 17 sheets). Furthermore, we are convinced from the results of the questionnaires that users preferred this software to hand-based marking, because they thought that this software enables them to mark easier, more accurately and faster.

5. Conclusion

We developed a marking-support software for written examinations. We marked exam examinations both with this software and by hand, while timed. The result shows that almost the same amount of time is needed. Also there are many users who felt that this soft-based type of marking is easier and more accurate.

6. References