Test students' attention in class using a mobile application

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Abstract

The purpose of learning in courses is for the students to understand the notions presented, to make connections with other notions explained in other courses, to customize the presented results and to apply them, in order to solve different problems. In order for the teacher to adapt his/her course presentation, it is necessary to know the level of preparation of the students at different moments of time. One way theteachercan find out how much he has caught the students' attention is to give them a quick test at the end of each course. In this way the teacher can check if the teaching strategies have been adapted to the categories of students in the course. To minimize the testing time it is useful to use IT technologies. Among these technologies, a very fashionable options the one that uses mobile phones. In this paper we will present a mobile application that facilitates the teacher's work for a quick test with technical means currently used by each student. The mobile application created by us allows the presentation of tests selected by the teacher for different groups of students. The answers to the test questions are sent by e-mail to the teacher.

Keywords

Android, Java, Mobile programming, Test, Learning, Question,Answer

1. Introduction

Learning is closely related to the presentation of the course. Adapting the course according to the students' learning capacity and understanding of the notions taught in the course is a very difficult task for the teacher. The teacher must have a permanent feedback from the students in order to use the strategies and means most suitable for the type of course and the category of student to whom it is addressed, detailed aspects of this aspect are presented in [1], [8] and [20].

In recent years, technical support has become a great advantage for the teacher. In addition to the technology provided by the university, school or other institutions, it is an advantage that students have devices themselves, such as mobile phones. The platforms with the course supports and the means of storing the students' activity can now be accessed through these devices as well. Aspects related to the use of these devices in the learning process are presented in [4], [6] and [18]. For some categories of children who cannot keep an eye away from this device, it is really good for the teacher to direct their attention to the use of these devices for learning, in [9] and [11] various situations are presented.

The problem of evaluation with the achievement of as many objectives as possible is complex and with many solution options. In [2], [3] and [5] studies are presented in this regard, among the options discussed are the means provided by platforms, test generators - means that involve the teacher to a greater or lesser extent. In order for the evaluation to be as accurate as possible and to achieve the purpose for which it was performed, it must go through several essential steps:

- Creating the test by the teacher or test generators
- Use of appropriate means to transmit the test
- Testing and receiving answers by the teacher
- Centralization of test results, transmission of results and their analysis

How to perform the steps presented above is presented in [12], [13] and [19]. Many tools have been created for the automatic generation of tests, some integrated into platforms, others independent of platforms that use various algorithms, such as genetic algorithms, algorithms specific to graph theory or algorithms that use various advanced programming techniques. In [7], [14] and [17] are presented models that use various variants of the genetic algorithms taken from [10]. A test generator using tree algorithms is presented in [15], and in [16] a generator based on the dynamic programming method is presented.

This paper aims to present a model for quickly testing the attention of students in class using their own mobile phones and an email service. The application is created using the Java programming language and the Android operating system. The model can also be implemented for other operating systems and appropriate programming languages. In short, the mobile application has two components called teacher, respectively student. With the first component, the teacher enters the test questions, and the application creates files with these questions. The second component provides the interface with the test questions specified by the teacher, takes the answers from the student and sends them to the teacher via email service.

2. Presentation of the rapid test model

The questions used to form the tests have the structure from table 1.

Table 1
Attributes of questions in tests

Name of the attribute	Short description	Type	Example
ID	the ID of test of the question	String	3
SQ	statement of the question	String	How long is the longest bridge in China?
A1	the text of the first answer	String	Around 50 km
A2	the text of the second answer	String	Around 55 km
A3	the text of the third answer	String	Around 80 km
S	correct answer	int	2

For the composition of the test, questions with 3 answer options were preferred, one of them being correct. After entering the questions, Json files are created with the questions of each test. When the evaluation begins, each student will receive the test ID and then the acceptance to start the test.

The model presented in figure 1 has 2 main routes:
- The entering by the professor of the questions' data and the creation of the files with the questions for each test. The main aspects of this stage are presented in section 3.
- Reading the questions from the file with the ID introduced by the student, displaying the attributes of each question and gathering the answers within the time set by the professor. The answers are sent to the professor through email, in figure 1 the files with answers are specified with Res. The main aspects of this stage are presented in section 4.
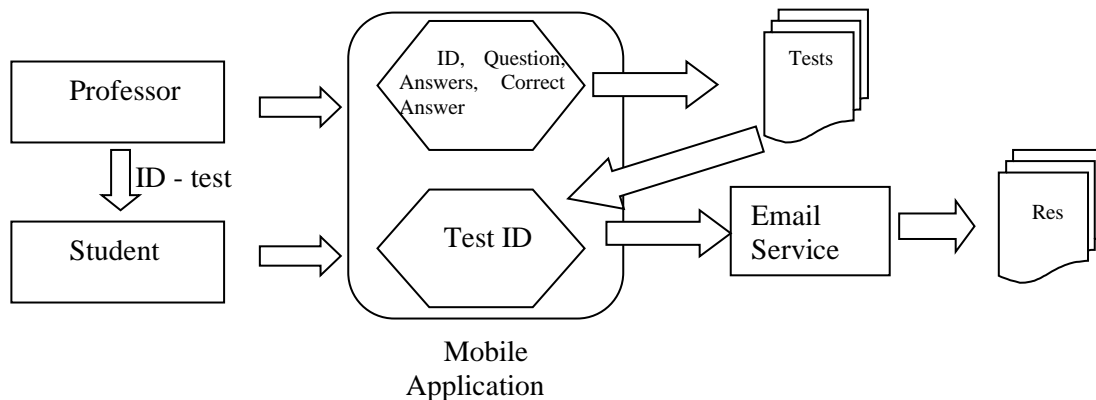

Figure 1: Learning Testing Model

Figure 1 shows the tests saved in the files with the name given by the IDs used by the mobile application to test students. The files resulting from the students' testing are sent to the teacher for marking and creating useful statistics for the course.

3. Teacher component of the mobile application for quick testing and feedback

To implement the model in Android Studio using the Java language, **Teacher Activity** will create a list L with all objects associated with the questions retrieved from the interface of the application presented in figure 2. The attributes associated with the questions are presented in table 1 from section 2. Thus, for the i-th question entered by the professor we have:
- L[i].ID - the ID of test of the question
- L[i].SQ - statement of the question
- L[i].A1 - the text of the first answer
- L[i].A2 - the text of the second answer
- L[i].A3 - the text of the third answer
- L[i].S - correct answer

In the application's interface, presented in figure 2, when pressing the button Next Button the question introduced by the professor is added to the list L, and the Done Button generates the Json file for the list L.

The Json files created for tests with the IDs received from the teacher will be used by the **Student** component of the mobile test application.

An example of a question that the teacher can enter is the following:
    "question": "How long is the longest bridge in China?",
    "answer1": "Around 50 km",
    "answer2": "Around 55 km",
    "answer3": "Around 80 km",
    "correctAnswer": "Around 55 km"

Figure 2 shows the interface at the beginning of the application and the interface for entering a single question.
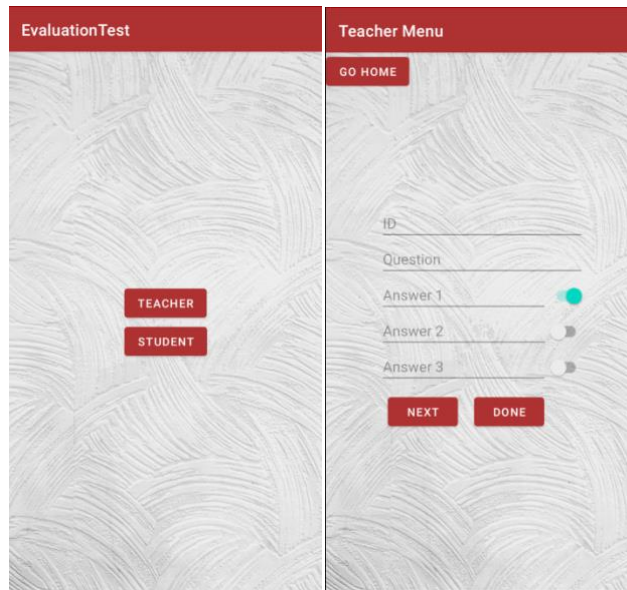

Figure 2: Scheme of use of the mobile application for teacher

The image on the right of figure 2 shows the **on**/**off** button to mark the correct answer. In this way the objects created for each question are used to create the test files and associate the question with the file name via the ID. Algorithm 1 presents how the Teacher component works.

ALGORITHM 1: Teacher Component Algorithm

Step 1. Read the data for questions and building the list of their objects: L

Step 2. Sort the objects from L by the ID attribute

Step 3. k = L[0].ID; N = L's size

Step 4. Adding L[0] in the file with the ID k

Step 5. for i=1 to N – 1 execution

               if L[i].ID = k then

                       - Adding L[i] in the file with the ID k

                       else

                       k = L[i].ID

                       - Adding L[i] in the file with the ID k

               endif

       endfor

Algorithm 1 sorts the list L, then through a loop creates the test files. These files will be used by the students at the tests. Except the sorting, algorithm 1 is linear, because it traverses the list L twice, so the runtime of the algorithm is at most $O(N \cdot \log N)$.

4. Student component of the mobile application for quick testing and feedback

To implement the model in Android Studio using the Java language, Student Activity contains:

ID -> the name of the saved file
Start Button -> opens the activity with a questionnaire

Figure 3 shows the application input interface. By activating the Student button, the test ID (equivalent to its name) is required. Using these IDs the teacher can assign different tests to different groups of students.
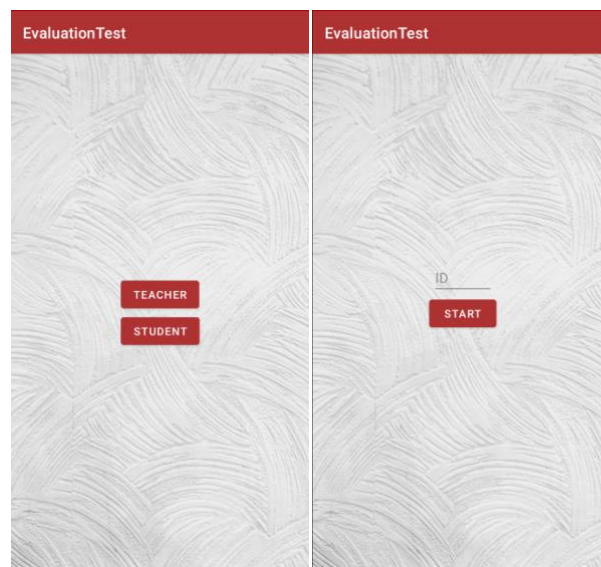

Figure 3: Scheme of use of the mobile application for student

After the ID has been validated, the test runs question after question with keeping the results and creating a file with the student's answers, as seen in Figure 4. In the interface you can see for each question its serial number, statement, answer choices and the NEXT button that confirms the choice made and the transition to the next question. At the end of the test, an area will appear on the screen requesting the entry of the student's email address, in order to transmit to the teacher the centralized results of the test.
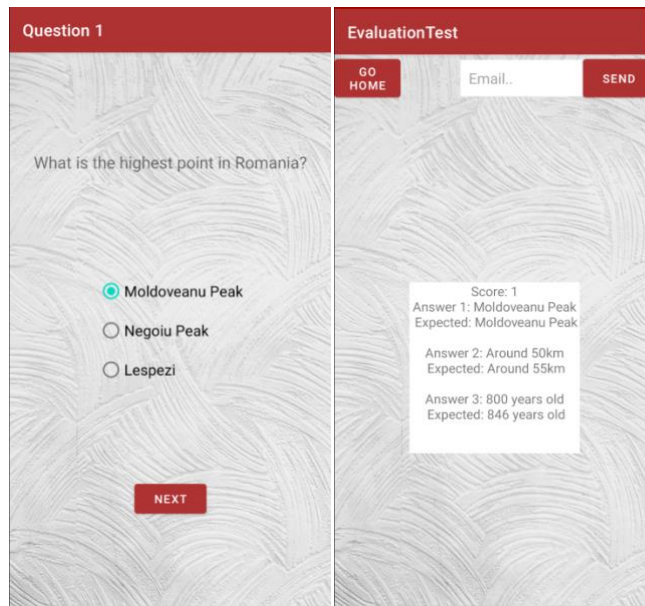
Figure 4: Questions and final results

Algorithm 2 presents how the Student components works. In this algorithm we will save the student's answers in the list L (with the IDs of the selected answers)

ALGORITHM 2: Student Component Algorithm

Step 1. read the ID of student test in variable IDstud
Step 2. if IDstud is correct the tests continues
Step 3. The list L is created with the questions' objects from the test with the ID IDstud
Step 4. N= the number of elements from L
Step 5. Ls is a a void list; i=0
Step 6. while (i<N and time has not expired)
      We display the attributes of object L[i]
      We add in Ls the answer to the question from L[i]
    endwhile
Step 7. write the report with the results of the test using L and Lstud
Step 8. Sends through email to the professor the reports with the results using L and Lstud

Algorithm 2 is linear, because the list L is traversed thrice and Lstud twice. The list Lstud has at most N elements, so the runtime of the algorithm is O(N).

After receiving the result from each student, the teacher has a file with the test results in Json format. These results can be interpreted and used both for student evaluation and for adapting teaching strategies for future courses.

5. Conclusions

The rapid test model using a mobile application can be used in both online and face-to-face courses. The novelty element of this paper is both the presented model and the mobile application with the two teacher/student components. For the next period we want to complete the mobile application with a new *statistics* component, which will provide a centralization of students' results and a summary of those results using graphs and diagrams.

An important concern in the development of the model proposed in this article will be the realization of a similar application, but for other operating systems and a web application with the same functionalities.

Another research direction we will consider is the testing and development of the application described in this article compared to the existing ones.

6. References

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