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A set of programs for examining students

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Abstract

The paper presents the structural assumptions and the mode of operation of a set of programs designed to examine students. The application allows to hold a full examination in a typical computer classroom. The set consists of three programs, one of them intended for the examined persons and one for the examiner. The third program is an auxiliary tool for creating a question database. The set has been prepared to operate in the WIN98/XP environment.

1. Introduction

Currently, a number of programs is available, which allow to test students' knowledge [1-4]. The present project is another proposal of this sort of software.

The creation of the examination set was influenced by a number of factors. The most important one was the need to facilitate the process of examination of large groups of students. Because of the particular content of the author's lectures, examination tests had to include precise figures, the preparation of which consumed a considerable amount of time. Moreover, due to slight but constant changes in the lecture contents, the figures in the successive tests also had to be changed. Another issue was fighting the problem of cribbing by examined students, which necessitated the preparation of alternative sets of questions. Another difficulty was the relatively long time devoted to checking the tests. Obviously, this problem could be eliminated by the use of a multiple-choice test. Yet in the case of examinations held by the author, the use of multiple-choice tests was rendered problematic because of the limited number of figures which could be inserted in a copy of an examination test.

The above-mentioned inconveniences prompted the author to apply a computer method of conducting an exam. Two arguments were decisive in the resolution to write the author's own application:

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- one's own set of examination programs will be best adjusted to suit the specific character of the author's lectures and the manner of conducting examinations,
- one's own application is connected with the possession of the source code, which always allows to adjust the program structure to meet new requirements.

2. Principles of the project

Considering the above-mentioned issues, the following assumptions were adopted while designing the project of the examination set:

- the examination set should consist of at least two programs: an examining program, designed for the examinees, and an examination management program, designed for the examiner,
- graphic interfaces of the examination set programs should be as easy to use as possible,
- the test questions should include textual and graphic elements, regardless of the fact whether they will be used together or not,
- the questions database, consisting of graphic and textual files, should be easy to create with the easiest and always available tools, e.g., programs such as 'Paint' and 'NotePad' of the WINDOWS environment;
- the examination management program has to create and supplement an archival file, which will allow precise retrieval of all phases of the examination and the results of the persons taking it,
- the exchange of data between the set programs will be done via a diskette,

and more precisely:

- the examining program should allow to pose up to 30 questions and permit to correct the answer to each question twice,
- the examining program should allow to choose one or several correct answers out of 8 possible ones,
- it should be possible to set separate scoring for each question, ranging from 1 to 10 points,
- the set of questions given to an examinee should be a subset of a larger database and should be chosen at random.

Based on the above-presented principles, a set of programs was created - its main elements are 'BASE' and 'EXAMINATION' programs. The program 'BASE' is designed for the examiner whereas 'EXAMINATION' is for the examinees. The program 'BASE' allows to set the general conditions of an examination, to establish a random set of questions for an examined person, and

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to assess the results of his/her work. The program 'EXAMINATION' is a simple graphic interface, designed for the examined person, which allows to browse through the selected questions and to check the chosen answers. To facilitate co-operation with the above-mentioned programs, the set also includes a program called 'CREATOR', which can be used to create a question database.

When the project of the set was being prepared, an effort was made to make it proof against all attempted interceptions of the database or attempts to obtain illegal help. To achieve it, the set prepared for the WIN98 environment methodically blocked all access to the network, keyboard and the desktop window. The diskette with the randomly selected set of questions could be registered in the 'EXAMINATION' program only once.

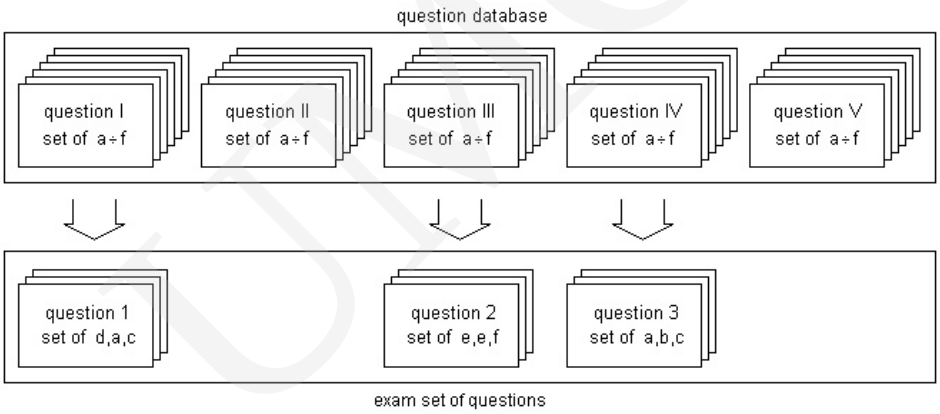


Fig.1. Random selection of the set of questions and subquestions

Another problem characteristic of a typical computer classroom was the issue of 'cribbing'. This problem can be greatly reduced by proper composition of the questions database and appropriate functioning of the program 'EXAMINATION'. Fig. 1 shows a scheme of the process of random selection of questions. The database consists of numbered sets of questions. Each set of questions includes 6 subquestions. The random selection of the examination set is conducted twice: first, the number of the set of questions is chosen; next, three subquestions are chosen from among this set. If the subquestions differ in an imperceptible manner, the correct answers may still be different in spite of the seeming compatibility of the shown question content. The fact that the examinees are informed about this forces them to concentrate their attention on their own sets of questions. An additional means of authenticating the answers was achieved by the fact that the program 'EXAMINATION' causes an xchange of the chosen subquestion for the next one whenever a faulty answer is corrected. This is not disadvantageous for the person taking the examination as it

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can be assumed that finding the mistake equals the knowledge of the problem to be solved.

Conducting an examination using the described set requires the installation of the program ‘BASE’ on the examiner’s computer and the program ‘EXAMINATION’ on the remaining computers in the examination room. Both programs copy the database necessary to conduct the examination to RAM memory. Organising the examination is reduced to verifying the identity of an examined person, choosing a random set of questions for this person, and delivering those questions on a diskette. The examinee should register in the program ‘EXAMINATION’, by means of the diskette, and commence the test. Having completed the test, the examinee should return the diskette to the examiner, who will assess the results with the program ‘BASE’. The necessary time which has to be devoted to each examined person does not exceed a dozen or so seconds – it is limited by the speed of the floppy disk drive and the process of its manual operation.

3. Graphic interface and the functioning of the program ‘BASE’.

Fig. 2 shows the graphic interface of the program ‘BASE’. The program graphic field has been divided into four thematic elements, designated with symbols F1, F2, F3, and F4. Five buttons are used to operate the program; they are divided into two groups, marked with symbols K1 and K2. In the lower part of the field, there is a status bar S, which indicates the name of the examination and the access path to the file with standard questions and answers.

F1 field, situated on the left side of the interface, is meant to show the list of people taking the examination. In each line of the F1 field there is a check box, a participant’s consecutive number, and his/her surname and name. Operations inside the field allow to indicate an examined person, mark the fact that the examination was handed out and returned, and also allow to cancel the above-mentioned commands.

F2 field, bearing the name ‘examination constants’ (‘stałe egzaminu’), is designed to define examination general parameters. By means of ‘UpDown’-type selectors, situated on the right side of textual boxes, the examiner can set a few parameters of an examination and adjust it to current requirements. It is possible to set the length of time of particular parts of an examination, the number of posed questions, and the percentage scale according to which the participants’ marks will be calculated. The choice field named ‘differential mode’ (‘tryb różnicowy’) allows to make the way of assessing the examination more lenient or strict. The possibility to choose ‘examination constants’ is available to the

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examiner during the first stage of the examination. After making the random choice of the first set of questions for an examined person, the field ‘examination constants’ is blocked – it is no longer possible to introduce any changes! Owing to that, all examined persons participate in the examination under the same, predefined conditions.

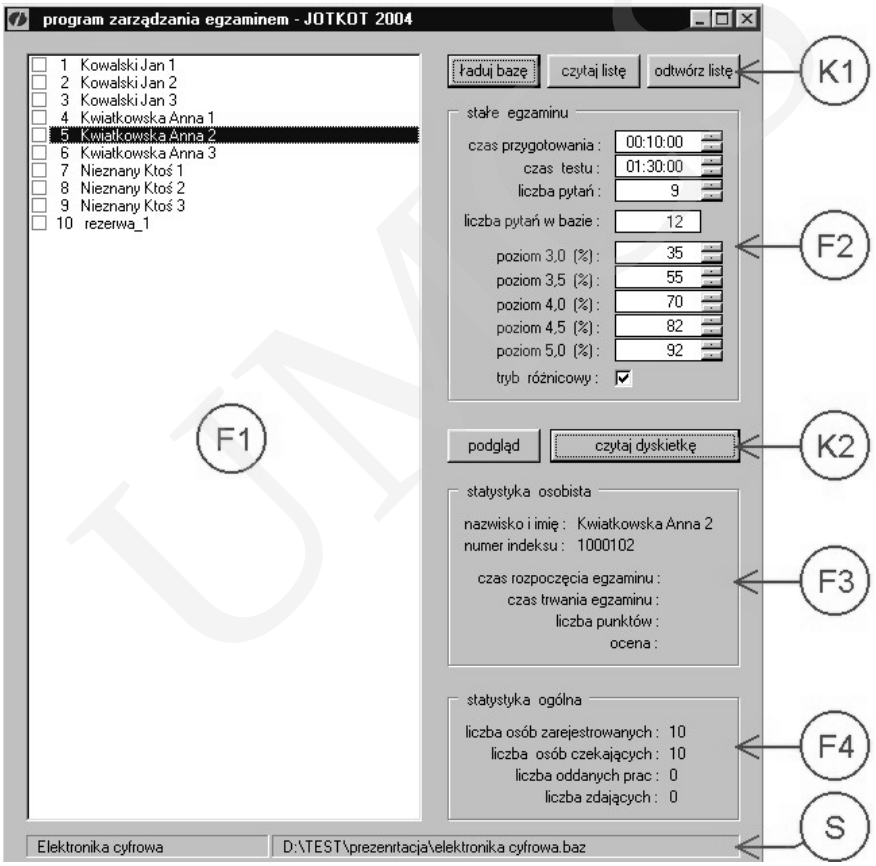


Fig. 2. The graphic interface of the program ‘BASE’

F3 field, called ‘personal statistics’ (‘statystyka osobista’), allows to investigate closely the status of an examined person. The F3 field contains all presently available data about the person which have been selected by means of the F1 field. Fig.3 shows what the F1 and F2 fields look like in various stages of the examination.

F4 field, named ‘general statistics’ (‘statystyka ogólna’), is designed to present the overall status of the examination, perceived as one event. The status of the F4 field is modified every time a commission has been handed out and after the student’s answers have been assessed.

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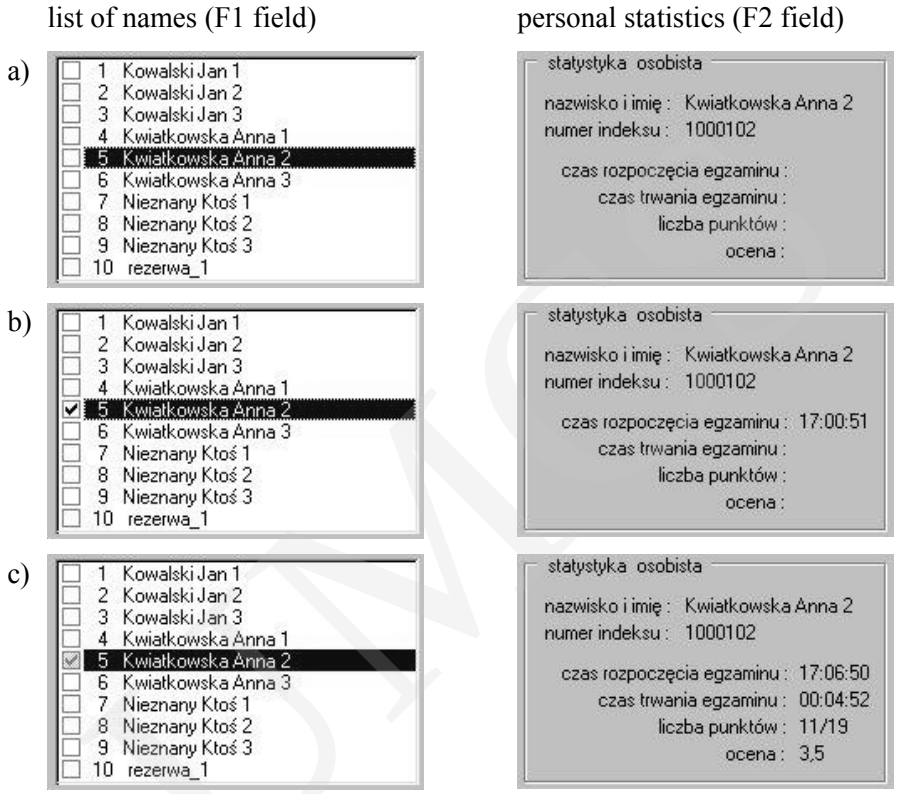


Fig. 3. F1 and F2 fields in respective stages of the examination: before the commission is handed out (a), after the commission has been handed out (b), and after the paper has been returned for assessment (c)

As mentioned above, five buttons, arranged in K1 and K2 groups, are used to operate the database program. The K1 group consists of three buttons and is active in the first operational stage of the 'BASE' program. After the program has been started, the examiner declares the subject of the examination by choosing the name of the question and answer database. The 'load the database' ('ładuj bazę') button serves this purpose. After pressing it, there appears a standard file download window, which allows access to any information storage device in the computer. After loading the questions database, it is possible to load the list of examination participants – also via a standard dialogue window. The list can be downloaded in two ways. After pressing the 'read a list' ('czytaj listę') button, a list of examination participants will be added to the program. When the button 'restore a list' ('odtwórz listę') is pressed, the program, apart from adding the list of examination participants,

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retrieves additional information about the previous examinations (if there has been one) from the archival file. This option is used to restore the scores of an examination after it has finished, or when there is a need for emergency examination restart.

K2 group of buttons consists of two elements named: 'read the disk' ('czytaj dyskietkę') and 'preview' ('podgląd'). The 'read the disk' button becomes active for a given examination participant, after s/he has been registered as a person taking the examination. The 'preview' button becomes active after the registration of an examined person's score. The 'preview' button allows to browse the results of returned papers. The preview has been given a similar graphic interface as that of the 'EXAMINATION' program, the only difference being that there is information available about the numbers of randomly selected questions and about their respective correct answers, as well as the way they are scored.

4. The graphic interface and the functioning of the program 'EXAMINATION'

Fig. 4 shows the graphic interface of the 'EXAMINATION' program. The program field has been divided into five elements, designated with the following symbols: F1, F2, F3, F4, and F5. Two buttons, situated in the F4 and F5 fields, are used to operate the program. The status bar situated in the lower part of the interface is designed to inform the person taking the examination about its present status.

F1 field, named 'question field – figure' ('pole pytań – grafika'), displays a question prepared in the form of a graphic file. Graphic files put in the F1 field should have a constant size (865x360 pixels).

F2 field, named 'question field – text' ('pole pytań – tekst'), displays a question prepared in the form of a text file. Text files may be of any length. If a file is put into the F2 field and it exceeds the size of this field, the access to the text hidden part is possible by means of a 'ScrollBar'-type element, situated in the right side of the field.

F3 field, named 'indication field' ('pole wskazań'), is meant for indicating a randomly selected question. The field allows to indicate one of 30 questions. Depending on the number of questions, previously declared in the 'BASE' program, the F3 field shows a suitable number of active choice fields – while the other choice fields remain blocked. After making the choice, fields F1 and F2 show the content of the indicated question.

F4 field, named 'answer field' ('pole deklaracji'), serves the purpose of indicating the correct answer or a group of correct answers. Explanations regarding the way they should be checked can be found in the fields F1 and F2.

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As various questions can differ regarding the number of available questions, some of the choice fields are blocked after a given question is chosen. Only the unblocked choice fields can be checked. Checking the correct answer has to be confirmed by means of an 'accept' ('akceptacja') button, situated in the F4 field. After confirmation, the choice fields are blocked whereas the button changes its name into 'correct' ('korekcja'). It allows to introduce changes in the answer field.

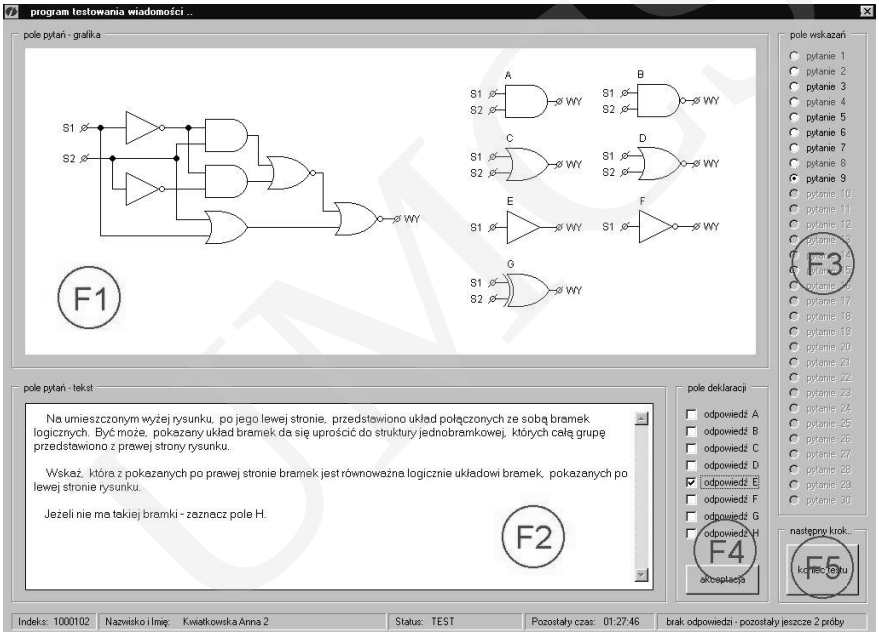


Fig. 4. Graphic interface of the 'EXAMINATION' program

F5 field, named 'next step' ('następny krok'), houses a button with a changing label. The successive labels: 'registration', 'test', and 'end test' inform the examined person what will happen after pressing the button. The examined person is required to press the button once at the moment of commencing the examination. This allows to register in the program the person's randomly selected set of questions and his/her personal data. The following examination phases proceed automatically according to time settings declared in the 'BASE' program. The examined person may independently shorten various stages of the examination by successive pressing the described button.

Summing up, managing the 'EXAMINATION' program is practically reduced to putting the diskette with the previously randomly selected set of questions in the floppy disk drive and registering it in the program. Further actions consist in indicating a question, checking its correct answer and registering the answer with the 'accept' button. The examined person may

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correct the answer twice in every question. When the running of the 'EXAMINATION' program has been finished, the diskette with examination results is to be delivered to the examiner so that the final score can be counted.

5. Graphic interface and the functioning of the 'CREATOR' program

As mentioned above, the 'CREATOR' program is an auxiliary tool designed to browse the questions database. The program allows to introduce minor corrections in the textual part of a chosen question. It gives access to every question (and subquestion) within the database and allows to select a subset of questions from the database to fit the needs of a given examination.

Fig. 5 shows the graphic interface of the 'CREATOR' program. The program field has been divided into five elements, marked with the symbols F1, F2, F3, F4, and F5. To operate the program, one uses buttons situated in the fields F3, F4, and F5. As in the 'EXAMINATION' program, the F1 and F2 fields house the question contents. The textual field F2 can be edited – one may freely correct a given question content.

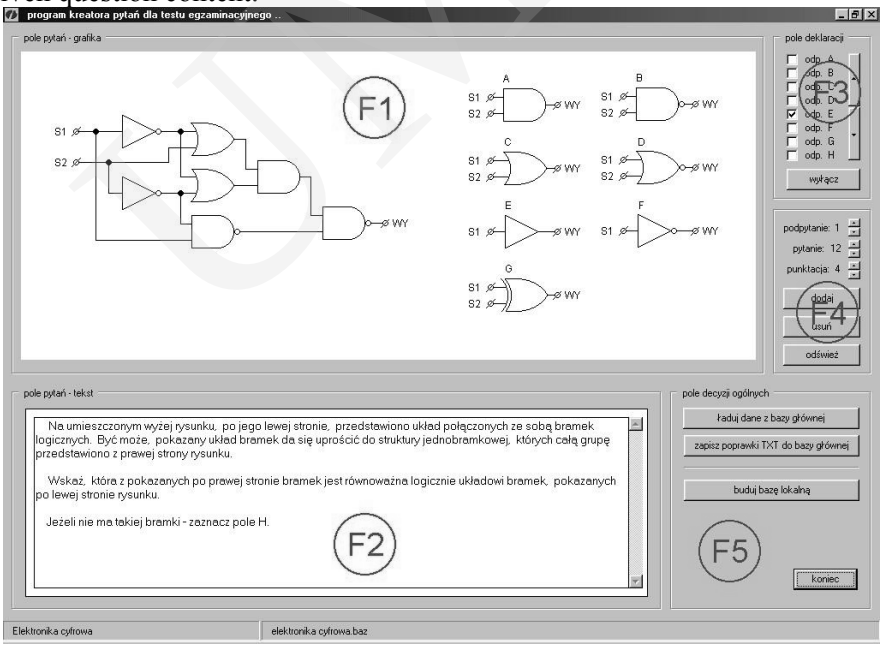


Fig. 5. Graphic interface of the 'CREATOR' program

F3 field, named 'answer field' ('pole deklaracji'), allows to introduce information about the correct solution to the question database. This refers both to new questions added to the database as well as those already existing in the database. The 'UpDown'-type button allows to limit the available number of active choice fields. The 'switch off' ('wyłącz') button allows to block the whole

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field – in that case no indications of correct answers are visible in spite of the fact that some were checked.

F4 field, allows to choose any question (and subquestion) from the database by means of 'UpDown'-type buttons and assign it proper scoring. Additional buttons allow to refresh the database status (e.g., after introducing changes) and to select those questions which are indispensable for conducting the examination. A new question database can be created from the set of selected questions by means of the 'build the local database' ('buduj bazę lokalną') button (button from the F5 field).

F5 field, named 'general decisions field' ('pole decyzji ogólnych'), allows, by means of its buttons, to indicate the location and name of the question database which will undergo the above-described adaptation processes.

6. Conclusions

The described set of programs has been tested under the conditions of a typical examination and has brilliantly confirmed the validity of its assumptions. The archival file, generated by the 'BASE' program, allows to retrieve a previous examination after it has finished and to view the papers of examined persons. In case there is a computer failure in the examination classroom, this file can help restart the examination.

The simple construction of the graphic interface of the set programs facilitated their trouble-free use both by persons taking the examination as well as those supervising it.

As mentioned above, the 'CREATOR' program allows access to every question (and subquestion) within the database. Owing to the possibility of blocking the F3 field, the indications of correct answers are rendered invisible. From then on, the program can be used as an auxiliary tool in an oral examination.

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