VISUAL ANALYSIS
OF QUESTIONNAIRY DATA

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Abstract. Nowadays surveys play an important role in modern society. They are needed in many fields of society: to inform the government, politicians, businessmen, scientists, media and citizens. A lot of information is collected in every survey which one later needs to process and give results of the research. A short review of questionnaire research, data presentation in a form of a diagram, widely usable data analysis software and data visualization with *Borland Delphi 7* component *Charts* are going to be presented in this paper. In order to create a visual analysis of questionnaires' results a user-friendly application was designed; also, more advanced steps of the task realization are described.

Introduction

Questionnaires are one of the most popular methods of public research. They enable to gather information from target population in a convenient way. There are two ways to complete a questionnaire. First, respondents could be asked to complete a questionnaire without researcher being present. This is a postal questionnaire. Second, respondents could be asked to complete a questionnaire verbally with the presence of the researcher. This variation is called as *structured interview*. All that process of collecting and analyzing data collecting is called questionnaire research. Every method has advantages and disadvantages which appear in certain situations of a research. It is not difficult to analyze Questionnaires and most statistical analysis software can process them easily.

Most popular statistical programs are: STATISTICA [1], STATGRAPHICS [2], SPSS [3], SAS [4]. Purpose and functions of these programs packages are similar. Using this statistical software, statistical results can be received in various forms. However, they require higher skills of using computers and basic knowledge of statistics. Therefore, it was decided to create a simple and user-friendly application designed for the visual analysis of a small-sized questionnaires' research, user manual is also created.

This work is aimed at processing and getting visual analysis

of small-sized questionnaires' research as they are carried out in schools, offices, etc.

1. Programming tools

The program is created on *Microsoft Windows XP* operating system using *Borland Delphi 7.0* programming environment with standard libraries [5]. Delphi component *TChart* was used for diagram charting. The program is compatible with any version of *Microsoft Windows*.

2. Program structure

Fig. 1 represents the structure of program. All of these operations are explained below.

2.1. The main window of the program

The main page of the program (Fig. 2) is built from operation zone (menu), chart of the results from questionnaires, status zone (at the bottom of the window) and the object *ListBox* which is invisible for the consumer. The main commands of the status zone are presented as follows:

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Fig. 1. The structure of program

i)   the description of the new questionnaire;
ii) the bootstrap of the questionnaire set which was created earlier (from the file);
iii) the saving in the file of the described questionnaire set;
iv) the review and drafting of the described questionnaire set;
v)   the emendation of the title of the questionnaire;
vi) the establishment of the information which was collected during the questionnaire by filling them;
vii) the bootstrap of the questionnaire results (from the file);
viii) the saving of the questionnaire results;
ix) the composition of diagram rates;
x)   the composition of chart rates;
xi) the instruction of programs' consumption.

The chart of the questionnaire results is built on the basis of the object *StringGrid*. It is filled in automatically. The columns of the chart are built according the user request: user must select the several numbered positions. Numbers are related to the answer variant and the lines of the chart are filled by the numbers of the questionnaire questions. The last column of the chart („Neatsakyta"/Unanswered) is filled with a number of unanswe-

red answers to a certain question.

The invisible object *ListBox* (in the program code the title is „laikinas"/temporary) is used as an array of *String* type element. While creating or loading a set to this program the questionnaire results are being written into it which is later used in a working process of the program.

2.2. The creation and the saving of the questionnaire

At the beginning of program's work, the function of the establishment of the questionnaire results is inactive. If one wants to activate it, the description of the questionnaire according to which the data will be established has to be written, one has to write a set – to indicate the title of the questionnaire, the formulation of each question, the variants of the elective answers and question to answer format (whether you can choose only one answer or more). In order to make this procedure the program gives a window of the establishment of a questionnaire set (Fig. 3) where the information mentioned above can be indicated.

Fig. 2. The main program window

Fig. 3. Window of the establishment of a questionnaire set

Fig. 4. An example of a questionnaire set saving file

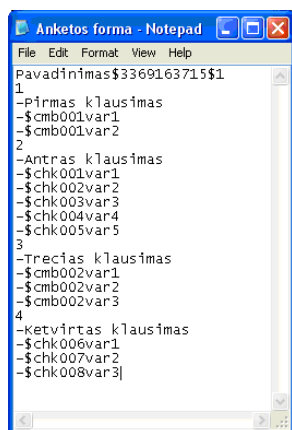Fig. 5. Reviewing and editing questionnaire set window

After that, the data which was written during the process of the description of the questionnaire set is being transferred to object ListBox and later it can be saved in the questionnaire set file which was indicated by the consumer with an extension „ank". There is a certain order for writing the data to a file or to the object List-Box which makes reading of the data easier. The example of a questionnaire set is represented in Fig. 4. The first line of the file is made from the title of the questionnaire, questionnaire set id and the mark of a possible edit ("0" – questionnaire set was not edited, "1" – questionnaire set was edited). The further content of the file is built up from blocks which describe each question of the questionnaire. Each block is made from the number of the question, formulation of the question and possible variants of the answers. Before the formulation of the question the symbol „–" is marked. Before each variant of the answer the combination of symbols „–$" is marked then the mark „cmb" is written which means that only one answer variant is possible, or the mark „chk" is written which means that there may be more than one answer variant. Then the line number of an object which will be created in the process of making questionnaire set review window is indicated. At the end of the line the answer variant formulation is written.

2.3. Review and edit of the questionnaire set

You can review your saved questionnaire set and edit it if it is needed: add a question, change the question formulation, eliminate unwanted questions or change the succession of the questions in the questionnaire. The button zone at the top of the questionnaire review window allows editing operation (Fig. 5).

It can be edited untill the first questionnaire is filled. After that, all the possibilities of questionnaire set editing are turned off.

2.4. Filling and data saving of the questionnaire

When the questionnaire set is properly prepared one can begin the establishment of the data collected during the questionnaire – fill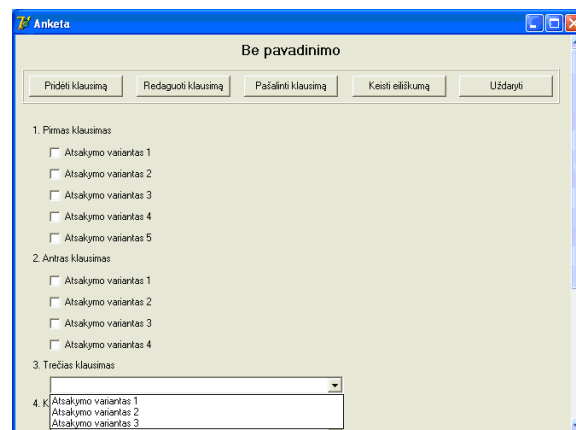ing of electronic questionnaires. The consumer is presented with a questionnaire review window (Fig. 5) only in this case the edit line is hidden and instead the button „Išsaugoti"/Save appears which has a function of saving the data and getting another questionnaire. Also a number of filled questionnaires is added to the questionnaire title. After filling the questionnaire the button of saving is pressed. The data is written to array and the questionnaire set is being prepared for the establishment of new data.

The answers of one questionnaire questions are saved in double matrix. The first element in each line is the number of a question and the other numbers are the numbers of the answers to the question. From all of the questionnaire data matrixes, the matrix array is made up (triple matrix). The whole triple matrix is saved in the file (*.ats) by a column down after printing all the double matrixes.

The saved data of the questionnaire can be loaded to the program repeatedly. While doing this command the data saving matrix is being filled by the data of a chosen file. Before loading the data the program checks if the identification numbers of the questionnaire set and chosen data file can be synchronized in order to avoid inconsistencies of data file and questionnaire set. If there is any inadequacy the consumer will be warned about the mistake. The data will not be loaded if the questionnaire set is closed.

3. Depiction of the results

The results of the questionnaire can be delivered visually – according to the data the diagrams are drawn (Fig. 6). The consumer can choose if the diagram will be drawn according to one question of the questionnaire or according to two – cross diagram of two questions. The consumer is offered to choose one of these diagram types: circle, column or linear diagram.

At the top of the window the main diagram parameters are shown (they are used when the diagram is drawn that is why they are used only after the drawing of repeated diagram): i) the question is chosen to which the diagram will be drawn; ii) the type of diagram is chosen; iii) the indication whether the diagram is for one question or for two is made; iv) the data aspect is chosen (unitary or percentage).
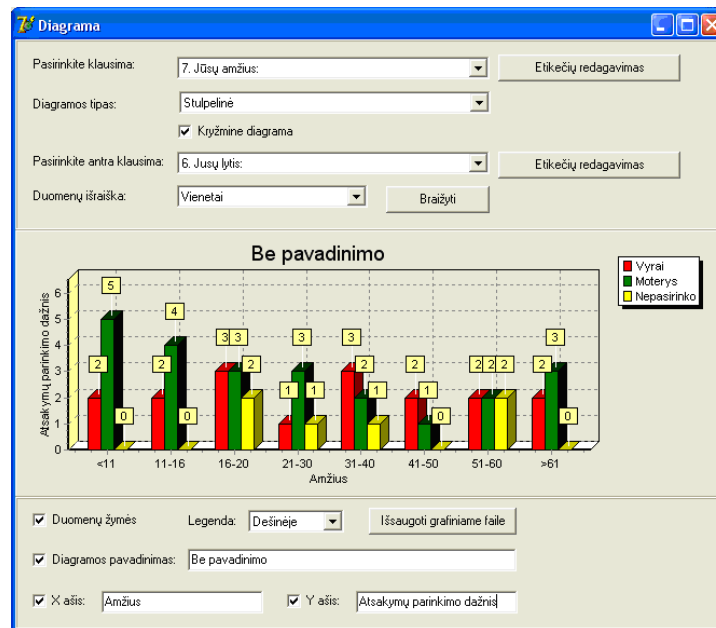
Fig. 6. Charting window

At the bottom of the window supplementary diagram settings are shown: i) it is chosen if data marks which are above diagram columns will be visible or not; ii) the legend place in the diagram window is chosen (on the right, on the left, at the top, at the bottom or invisible); iii) the title of the diagram is indicated; iv) the titles of horizontal and vertical diagram axles are indicated.

The created diagram can be saved in a graphic file (*.bmp) which the consumer indicates himself. The diagram is drawn by pressing a button „Braižyti/Draw". According to the button „Kryžminė diagrama/cross diagram" (whether it is on or off) the procedure of one question diagram drawing or cross diagram dra-wing is prosecuted. In both cases the diagram is drawn with the help of the *TChart* component.

Conclusions

User-friendly application was designed in order to make a visual analysis of questionnaires' results. Arrays of objects are convenient tools for creating data mining application when the amount of the data is undefined. *TChart* as the component of *Delphi* programming environment is a useful tool to chart the results of questionnaire research in various types of graphical presentations.

References

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