Automated Term Time-Table for Universities and its Application in the Intranet

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Abstract – **The automated term time-table is programmed in Borland Delphi v.5. My SQL and PHP are used for the application of the time-table in the Intranet. The students and professors can read the time-table and make some queries about the disciplines studied; professors' work load etc**

Keywords – **Automated Time-Table, Distance Education, Intranet Application**

I. Introduction

The last and final stage for the organization and carrying out of the study process in every school is the creation of the document "Time-table". It consists of the distributed lessons in each one of the disciplines studied according to the training plain. There are two kinds of time-tables according to the specificity of the educational process in every school:

- weekly (fixed) – when the lessons are planned for the same discipline on a definite day of week and at a definite hour for some study unit (group, class);

- term time-tables – when the time-table is daily for the particular groups and courses during the whole training period (term, semester, etc.).

The daily time-tables are unique and they are applied above all in the higher military schools, where the learning process is conformed to the military training.

When the learning process in the higher schools is being planned, it is possible to separate a block of the professors, as well as a block of the groups or classes of study and a block of the halls where the lessons are carried out. What the stage of the next details is depends on the tasks, which must be realized for a definite process and on the nature of the process itself.

II. Description of the Time-Table Programming

A review of publications [2] has been made about the approaches and methods used for solving the task of making the term time-table of the lessons in higher schools. Based on this review a conclusion has been reached that this task is multicriterial and multidimensional. For that reason the using of clear mathematical models is not appropriate, because the

receiving of the optimal solution of the task for compilation of the time-table cannot guaranteed

The right method to use for the task solution is the heuristic method. Practically the time-table is developed in two stages.

The first stage includes the solving of the following basic tasks:

- assignment of the necessary intensity of studying of the different disciplines during the term;

- assignment of the necessary order for carrying out the lessons within the frames of the different disciplines;

- making of the necessary links between the disciplines, and, in some cases, between the separate lessons for different disciplines,

- assigning priorities of the carrying out of lessons. The priorities are algorithmically computed weight coefficients, which determine the order of lessons' distribution in the respective disciplines. The priorities are changed dynamically in the process of lessons' distribution according to the temporary computed results.

In the second stage the whole distribution of the lessons is made by days and weeks within the frames of each week, according to the priorities determined. Here a change of the priorities and an estimation of the resulting variants of the time-table is made.

The task for creating of a term (weekly) time-table belongs to the class "Task for ordering". Meanwhile the task of time-table refers to the time-consuming and difficult to structure multicriterial optimization tasks. To solve it a calculation of many logical checks and work with dynamically changing coefficients and priorities is necessary. Therefore the programming is made in DELPHI [5], which is based on Object Pascal with the goal to increase the speed of the multiple calculations. Another positive characteristic of Delphi is the programming and working with databases. For these reasons a program product named "Automated term time-table" is developed in Delphi. In the process of creating of that product, it was made clear that the names and the codes, given to the professors, the kinds of lessons studied, the training halls and units (groups, subgroups, classes, streams of students) must be included in the local database and the access to it must be realized by an application program. Therefore a Dbase for Windows (local database) – included in Delphi - is used for creating and maintaining the file system. The access to the database is realized by means of BDE (Borland Database Engine), which is composed of libraries (*.DLL) and utilities. Program modules have been developed for maintaining

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the database in Object Pascal. These program modules convert the current database of DBF format in Pascal files of type record. These files are inputting for the program, realizing the term time-table. Other program modules are started after finishing the final variant for the lessons' distribution, which convert the files of type record into DBF format These programs are developed especially for using the output data from Delphi in the Intranet, based on Apache server in the University. Delphi, the program product "Automated term time-table and database are installed only on the computer in the department of "Planning of the training process".

To use information for the automated time-table in the Intranet in our University, it is necessary to export the output data from Delphi to the Apache server [7] with Linux operating system, MySQL [8] for operations with database and PHP [9] for creating applications for output queries and processing the data. Such software configuration is used not only in our Naval Academy, but in many Bulgarian Universities because of the free software for Linux, MySQL and PHP, which are downloaded from Internet [7-9].

III.   Application of the Term-Table in the Intranet

The process of loading the data for the time-table from Delphi in a relational database maintained under MySQL, passes the following stages:

1. Tables (*.dbf) in format Dbase 5.0 are created in Delphi. The tables contain the data of the time-table for the lessons, the names and codes of the disciplines studied, the data for the professors and the lessons, a calendar for the term's weeks. For this purpose program modules in Object Pascal are developed.

2. Data from the tables are converted in Text Files tab delimited, for filling the data directly in MySQL tables. In the text files the text must not be quoted and the data of type Date must be saved in format YYYY-MM-DD, by default in MySQL. The converting can be processed in MS EXCEL, MS ACCESS or by another program.

3. The structures of tables in MySQL are created on Apache server. These tables have a number of fields and type of data corresponding to the same fields and data types in Delphi. For that purpose it is convenient to use MySQL Control Center– a program product with Graphical User Interface (GUI) for working with MySQL. It can also be downloaded free from the site of MySQL [8].

4. Filling the data in the MySQL tables from the text files is made automatically by using the command mysqlimport, as the name of the text file must be identicall with the name of the table in the MySQL database.

The database created in this way can be used for making queries for reading of the time-table in the Intranet, where the professors' computers and computers in the training halls are connected. Each student, online in Intranet can make a query about his work load in the corresponding training period (week, term); about the place, where the lessons will
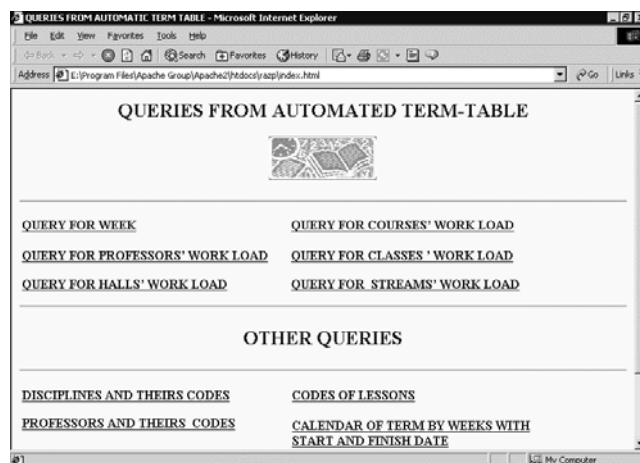

Fig. 1. First Web page of site for the time-table

be carried out (lecture hall, class hall, study room, laboratory), as well as about their form (lecture in a stream, lecture in a class, exercise, laboratory exercise, seminar, exam) and their duration. The professors can also receive information about the students' data (group codes streams, courses, disciplines), form and order of the lessons carried out, their duration, the hall where the lessons are carried out. The queries are summarized in a Web site, whose first page is visualized on Fig. 1.

After pressing on the hyperlink Query for week the Web page-form is opened for choice of week from the term, for which the user will want to read the time table. After choosing the week, a new Web page is started, which visualizes the time-table for the respective week. A time-table for the lessons is shown on Fig. 2, where the 5-th week of the term was chosen. The data are for the summer term of 2002 year.

Fig. 2. Time-table of lessons for a chosen week of the term

The information of the time-table, printed in the table on Fig. 2 includes:

- number of course – a number from 1 to 5;
- code of the discipline studied – a three digit number, with which each discipline is coded;

- consecutive number of the lesson – a two digit number, with which the consecutive number of the lesson is given according to the training program of the discipline studied in the corresponding specialty;
- code of the group, formed by the trainee students or cadets;
- code of lessons' form – a number, indicating the carrying out of the lecture, exercise, test etc.,
- duration of the lesson– a number, indicating the number of hours for carrying out the lesson;
- code of the professor – a four digit number, which identifies each professor in the University;
- a hall where the lesson will be carried out;
- code of a subgroup of the students – a number, indicating which half of the student's group (visualized in the fourth' column of the table on Fig.!2) will attend the lesson, when it is necessary to divide the group for the exercises;
- consecutive number of the week of the term, for which term-table is output;
- number of stream – a number, indicating the stream of students. The stream is a combination of groups, learning equal training material in separate disciplines;
- data of the lesson;
- starting hour of the lesson – a number from 1 to 10;
- ending hour of the lesson – a number from 1 to 10;

All that data, visualized on Fig. 2 are read on the database of the time-table, placed on the Apache server. The program language PHP [3,4,6] is used for their processing and visualization in the browser. The queries, described below are also output with .PHP files:

Query for professors' work load is started after choosing the respective hyperlink from the initial Web page. A form is opened in which the user has to choose the number of week (optional) and professor, about whose work load the information is demanded. The query includes the same data as shown at Fig. 1, but this time the data refers only to one professor in the chosen week. If no week is chosen, information about the whole term work load of the respective professor is visualized.

Query for halls' work load shows the number of the hall, the date, the starting and ending hour of the lessons in the hall. The user can also enter the number of week in which he chooses to find information about the halls' work load.

Query For Courses' Work Load, Query For Classes' Work Load and Query For Streams' Work Load are constructed in the same way. The first query visualizes the work load of the respective course, the user choosing the number of the course. The second query shows on the display the work load of the group, chosen by the user from the form. The query for the streams workload includes the data from the work load connected only with the respective stream, chosen by the user. The number of week the information is about can be chosen in all three queries.

The rest of the queries summon data from tables, including information about:

- codes and names of disciplines;
- codes of professors and their names;
- codes and kind of lessons;
- calendar of term by weeks with a beginning and ending date – a table including the number of week initial and final date of the week and the number of days, it consists of.

No corrections in the database is allowed in thus created Web site, although this is possible by means of PHP. The reason why this option is not included is that, once created by means of Delphi, the work load can be subject to small changes. They are connected with preplanning of lessons, because of holidays or accidental absence of some professor. Such changes can easily be realized in the MySQL Control Center by an employee in the lesson planning department. A second programming by means of Delphi of the preplanned work load for small changes is not advisable, because this can change the organization of the planning process, which can lead to a non-optimal variant of the time-table.

Presently the Web site is located on Intranet Web server, but its transfer to an Internet Web server is no problem. In this way the time-table information can be received by the home computer of the users. The software product does not demand particularly powerful computers for using. The presence of a browser (Internet Explorer, Netscape etc.) is sufficient.

All forms and the initial Web page have been programmed on HTML v. 4.0 [1]. All queries using information from the database can be programmed on PHP making use the functions it supports to work with database and MySQL [3,4,6].

IV. Conclusion

From the started above the following conclusions can be made:

- using Delphi to program lesson planning is appropriate because the time-consuming computations in the process of designing a term time-table and the presence in Delphi of opportunities to create and maintain databases, the process of their processing being carrying out on a high-level computer language – Object Pascal;
- the Web site created for getting information about the time-table in Intranet is convenient because the time for reading the time-table can be decreased compared to the paper-based information used so far;
- the queries realized assist professors and students in reading their work load;
- students and cadets find it easy to spot the professor by viewing his work load. This is particularly convenient for students, living outside Varna.

The access to the Web site in the Internet together with other sites used for distance learning in which there is a hyperlink for reading the lesson time-table is convenient for extra-mural students, travelling on ships all over the world.

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