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Research Article

THE RELEVANCE OF AUTOMATING THE SCHEDULE OF CLASSES IN HIGHER MILITARY EDUCATIONAL INSTITUTIONS

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ABSTRACT

In the modern world, much attention is paid to the development of information technologies in the XXI century. As the President of our country noted, the formation of a national informatization system and the mass introduction of modern information and communication technologies in all spheres of society requires future specialists to have special knowledge and skills in the field of computer technology. Therefore, algorithmization and programming is of particular importance in the formation of a national informatization system, especially for the prompt resolution of important military issues and their solutions. As already noted, the system of training, advanced training and retraining of military specialists in the field of programming is one of the main tasks today, as well as the development of local computer programs designed to solve military tasks, scheduling classes, automating the educational process as a whole and putting them into practice.

KEYWORDS

Technology, information, programming, component, algorithm, combinator, optimum, parameter, informatization, database, Internet, methodology, hybridization.

INTRODUCTION

In the process of compiling the table, scientific research began in the middle of the last century. Tables are available not only in the field of education but also in the fields of transportation, industry, public service and others. Currently, attempts are being made to

automate the process of creating a table using a programming language and Microsoft Excel. The introduction of fully automated information systems for creating a lesson schedule is suitable not only for one university but also for other higher military educational institutions. The purpose of this article is

to increase the effectiveness of the educational process by designing an automated information system for compiling programs in all higher military educational institutions. To achieve this goal, the following tasks must be solved:

1. review and study of theoretical aspects, as well as specific features of the process of creating programs in educational institutions;
2. analysis of existing software products that automate the process of creating programs;
3. study the process of creating an automated lesson schedule available in other educational institutions;
4. planning of automated information systems in educational institutions;
5. Evaluation of the effectiveness of the implementation of the planned automated information system [1].

A well-designed lesson schedule can be the basis for the realization of the scientific and pedagogical potential of the educational courses and the good assimilation of the materials by the students. It should be noted that in higher military educational institutions, however, a solution for creating an automated lesson schedule using programming languages has not yet been found. The task of creating tables is not as simple as it seems at first glance. Many attempts have been made to solve it. Unfortunately, today, no path is very versatile and does not meet the needs of all higher military educational institutions. The following components are required for the process of creating a schedule: educational streams (one or more groups, small groups), teachers (the main component of the system), discipline (the amount and type are determined by the curriculum), and audience. In many cases, the task of lesson planning is determined by considering all the options for all the initial information

of the planning process and is considered optimal according to the criteria of meeting the specified requirements and is characterized by a high level of complexity. The task of planning a training schedule is a task of combinator-type scheduling, which is characterized by the presence of many constraints of large size and complex form. Today, since the paper method of creating tables is almost obsolete, many educational institutions use Microsoft Excel tools to simplify the task. On the Internet, we can still find ready-made routines to do the work that needs to be automated manually, but these automated lesson plans have not yet been found to be suitable for our educational institutions, and in very few cases, educational institutions have ready-made software solutions[2]

The solution of the initial problem is formed sequentially in the decisions of educational institutions, therefore, I consider it necessary to automate the initial problem in the process of frequent solution. In general, constraints on the automation parameters will only lead to suboptimal solutions. The task of creating a timetable with the dimensions of the parameter vector for 300-500 variables is solved only with the help of algorithms, and algorithms should be used to further increase the size of the problem. Existing class scheduling tasks typically have more than 700 variables, so the use of mathematical algorithms is almost mandatory to solve such problems. A group of techniques called constraint propagation methods is a formalized subset of algorithms designed to solve the constraint search task. Such a task is usually formulated as three elements (A, B, C), where: A is several variables (parameters of the task), each of which can accept the final set of B-values; C - is many constraints that can be formally imagined, some forbidden values given for various variables from A - such tasks are called constraint propagation tasks.

Solving the problem of distribution of constraints - setting A-values for all variables, performing a set of constraints C - if we compare two tasks, the task of distributing constraints and the task of creating a lesson schedule, the first constraint A corresponds to the parameters of the vector of the second task [4].

This automated class schedule typically requires little computer staff time. Another advantage is the ability to evaluate all possible solutions to the problem in advance. If a solution is found, many solutions to the original problem will disappear. If a solution to the problem is not found, then the solution process can be repeated to change the set of constraints and see if it significantly reduces the number of possible solutions to the problem. Among the disadvantages of this approach, the acceptability of the accepted schedules may not be high in terms of predefined automation criteria. However, if we consider the constraint propagation method as an opportunity to evaluate many solutions to the problem and obtain some initial approaches, this method looks very promising [3].

In addition, there are mathematical and genetic algorithms in which method parameters are automatically selected in the process of solving a specific problem. The classification of methods described above is not complete but reflects the main groups of existing methods of creating a lesson schedule. When choosing this method, the following 4 important features should be taken into account.

1. One of the most important features of the combinatorial optimization method is its completeness.
2. Guarantees to solve the problem if the complete method is available.

3. If a solution is found at the very end of the search, it is unacceptable for practical reasons with the large dimensions of the problem to be found.
4. Complete methods include mathematical programming methods, branches and bounds methods, deep and wide column search methods, as well as methods based on flow theory in networks [5].

These methods have been used several times to solve the problems of creating a lesson schedule. At the same time, researchers who have used these methods to solve real problems of lesson planning note many features. When using integer programming, the genetic or mathematical algorithms used to write the constraints are necessary to successfully formulate the constraints present in the tasks. From the point of view of creating an automated system of creating an optimal training program, it is desirable to set constraints using the same vector of optimization parameters, otherwise, all constraints in the task must be reformulated. Most of the constraints in the task of creating an optimal lesson schedule can be formulated using some mathematical logical expression consisting of mathematical operations and logical operations on predicates. As an example, there is a hybrid algorithm.

This algorithm is based on a combination of the branches and bounds method and the local search method. The disadvantage is the complexity of choosing adjustment parameters to solve a specific problem. Another important feature of these optimization methods is the possibility of combining different mathematical algorithms. A hybrid algorithm is an algorithm that combines several approaches to solve the problem of creating an optimal lesson schedule [6].

The efficiency of the hybrid algorithm can be higher than the total efficiency of the individual algorithms included in it. It is possible if the individual algorithms that enter the hybrid are combined in such a way that the advantages of others are overcome. As examples of hybrid algorithms that have been successfully used to develop the best lesson programs, it is possible to note a mathematical algorithm that is a hybrid of genetic algorithms and a local search method, for which it is a special tool for many tasks of creating a lesson schedule according to the established optimality criteria. Provide optimal schedules than most of the existing genetic algorithms in use. In addition to the ability to hybridize solution algorithms, there are other ways to increase the efficiency of the algorithms used. To organize an interactive method, it is suggested to use the candidate criticism method to select the best solution option. The results of any algorithm can be improved by building a cooperative solver. Called a cooperative solver, it consists of several search agents that share information in the process of solving a problem. A search agent is a member of the population in genetic algorithms or a point and several points in the space of optimization parameters used in stochastic search methods. Information exchange between agents can be organized in different ways, for example, a special matrix is built that collects statistical information about positive and negative results obtained during the search process. Search agents use this information to find more solutions, and to get some new information about the search situation, write them in general for all search agents. Creating parallel solutions to solve the original problem in parallel can have a positive effect if the educational institution has computer classes connected to a local network. The advantage of the parallel solver is the ability to reduce the calculation time with the same quality results (compared to the traditional solver) or

to improve the quality of the results with the same calculation time [8].

The program should have a unique and powerful algorithm for building and automating the schedule. The table obtained as a result of the program almost does not require the distribution of manual cleaning, even in very complex and difficult conditions, all possible classes are automatically placed. If there are intractable conflicts in these 17 constraints, they can be detected and eliminated using a special analysis block. The software product provides the following: reduction of "cells" in the table; taking into account the necessary days/hours for study groups and teachers; it is acceptable to place classes in auditoriums, taking into account the capabilities of facilities, teachers, and auditoriums; the nature and wishes of permanent teachers and part-time employees. It is possible to analyze the initial data system. The following procedure for creating tables was adopted: the permissible table is created automatically, and if it is not done, it is possible to eliminate the errors detected by the source data analysis unit in interactive mode, or the possibility of manual work [7].

The definition of this program shows that the algorithm used is limited in the size of the solution tasks. The "University" program is designed to create lesson plans for traditional schools and schools with in-depth study of foreign languages. Taking into account the wishes of teachers, planning to work in 1-2 shifts, dividing classes into two or three groups. When working with the program, you can use two methods of creating a table: manual selection of tables, automatic selection of tables using an efficient search algorithm; and a combined method that combines manual and automatic selection. In all cases, the program automatically performs a control that excludes any crossing. Results of working with the

program: optimal schedule of lessons for groups; general schedule of all teachers; personal programs of teachers. In all modes of operation, manual, automatic, and interactive program acceptance is observed. The "Exchange" program is intended to create a schedule of classes in universities, gymnasiums, lyceums and other classes. The main feature of the "Schedule-Exchange" program is the ability to "adjust" the automatic schedule for almost any requirement. You can manually enter an initial schedule and edit an already created schedule, which allows you to take into account some considerations specific to a particular educational institution. This version automatically creates a table without "cells" of groups and is used to configure the function of automatic placement of lessons by teachers. The "Class Schedule" information system offers automatic placement of lessons, and then manual placement by the user. There are no optimality criteria, but there is an opportunity to take into account the distribution of the training load throughout the day using an integral hand. The application of this development is limited by not taking into account the personal preferences of teachers [9].

The usability of the program depends on the technology used, and each version of the tables is considered a separate project. Once we enter the source data, we can create and work on copies of the project in the future. The program created using the Python programming language allows you to make changes to the table and print it at any time, and it is easy and convenient to export the table to Excel for further editing and processing. The program supports two data management modes: manual and automatic. All restrictions given during the initial data entry phase are displayed in the program or on the screen or observed at runtime. Automatic mode: Since there are no fixed algorithms in the table, only automatic calculation options are offered in this mode. Once you

have an acceptable option, you can change it manually. If you need to further design the look of the table, you can export the results to Microsoft Excel. The possibility of genetic algorithms for the automatic creation of a lesson schedule depends very much on the choice of the mutation operator and the methods used for selection. Therefore, although this approach is flexible, the results of the genetic algorithm to solve problems allow optimization problems. For this, a hybrid of genetic algorithms and local search algorithms can provide a better solution than most of the known genetic algorithms. The program helps to ensure the following: setting the maximum number of lessons per day; dividing groups into students for five or six days; division of given subjects into two or more groups; dividing groups into groups on different topics; specifying the number of hours; teaching of two or more subjects by one teacher; there is a convenient tool for hourly monitoring of individual teachers' programs, as well as an interface for manual adjustment of the structured schedule. The approach proposed by the authors is called constraint distribution methods, which do not give the solver only optimization options, but allow to obtain solutions that are accepted as draft options of the program. At the same time, the dispatcher should try to reduce some restrictions in the adopted version of the decision that does not correspond to it. The advantage of this approach is interactivity and the ability to evaluate the manager of the adopted solutions [10].

One of the most important problems of quality organization of the educational process at the higher educational institution is the task of forming a quality schedule of training sessions. This task is the main activity of the methodological department. A qualitatively structured schedule should ensure the same loading of groups of students, cadets and teaching staff in the next semester. This work is aimed

at the design of an information system that allows to creation of a quality lesson schedule in a relatively short time. The following can be distinguished among the work results:

1. as a result of reviewing the characteristics of the schedule, the task of planning the training schedule is the task of creating a combinator-type schedule, the characteristic feature of which is the presence of many restrictions of a large size and complex form. In addition, it should be noted that today there are no universal methods of solving such problems.

2. In the process of reviewing the classification of planning process automation methods, the following groups of methods were distinguished: sequential methods, cluster methods, and method of distribution of constraints.

3. the work of the methodological department aimed at compiling the table compiled in other higher education institutions was analyzed. The table was found to be created manually, using Microsoft Excel as the time grid. 4. developed algorithmic methods for automating the creation of an optimal table, as well as developed a database storage system - a database table.

5. the purpose of this article is to increase the efficiency of the methodological department by designing an automated information system for compiling programs in educational institutions [11].

CONCLUSION

As a result of the work carried out in this article, the issue of developing an automated system of the lesson schedule of the educational institution was considered to apply to the educational process of the university. This system has a convenient user interface, which

makes it easier to work in the program, and if necessary, the flexibility of the software code allows it to meet the growing requirements for the system. Initially, the goal of automating the lesson schedule process was achieved. The developed automated system can be included in the unified information system of the university, which will undoubtedly have a positive effect on the analysis of the load structure of users, structural improvement and integration of existing curricula. The developed system increases the speed of information processing, shortens the period of creating reports and saves the user's time. The automation of the curriculum management process and the flexibility of the developed automated system, when used in the educational system, have the advantage of improving the performance of employees and at the same time increasing the quality of education provided by the university. The modular implementation of the automated scheduling system, developed in the structure of the general automated document circulation system, allows for the general use of databases and the introduction of a general policy on providing the system with information.

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