

An Optimization of the Weeks' Distribution of the Subjects' Horariums.

Mariya I. Eremieva¹

Abstract — The article discusses the optimum distribution of the subjects' horariums during each of the term weeks of the university. The paper suggests an algorithm for defining the schedule of dividing the horariums of each school subject by the weeks of the term. In order to create the schedule, it is necessary to have the following information: the school programs, the number and the different kind of the streams for each course as well as the limit of the possible weekly horarium.

Keywords - time table, exact methods, distribution, weeks' horariums of the study subjects.

I. INTRODUCTION.

In the beginning of the XXI century there are two fundamental trends that emerge clearly in the educational sphere:

1) The importance of the education continuously increases and becomes a dominating factor in the modern civilization. The system of traditional education is being replaced by the technologies of the innovated education which apart from being orientated towards modern material and information resources, are also directed towards the creation of abilities in the students to prognosticate and reorganize the development of the future.

2) The competition and the rivalry present in the global world are more and more taking place in the national educational programs as well. There is a new competition among the educational institutions to attract students by offering them higher quality educational services and better perspectives for realization.

II. OPTIMISATION OF THE STUDY PROCESS ORGANIZATION.

These two trends define the new challenge facing the development of the world's higher education. One of these trends is the introduction of degrees into the education. The approved, during the 29 session of the General conference of UNESCO in November 1997, International classification of the standards of the education, (ISCED) initiated multi-degree structure of the whole educational system [1].

In ISCED, the term education is interpreted as to include all intentional and systematic activities, which are supposed to cover the needs of knowledge. In some countries these needs are described as cultural activities and education. According to ISCED the education must be interpreted as organized and

continuous communication, intended to bring knowledge. In ISCED, an elaborate interpretation is made of the main categories in this definition:

1. The communication is a connection between two or more persons, involved in exchanging information (messages, ideas, knowledge, strategies and so on). The communication can be verbal and non-verbal, direct (face to face) or non-direct (remote). It can use large variety of channels and media.

2. Studying is every improvement in the behavior, information, knowledge, understanding, and way of thinking or skills.

3. The organized communication means that it is planned according to a sequence with explicit and implicit aims. It includes security agency (person or organization) which provides education and the methods of educating, through which the communication is realized

4. Continuous category means, that education has elements of infinity and continuity. There are no conditions for minimum duration, but this minimum is defined in operative documents. Under the conditions of mass education the scientific organization and the optimization of planning of the school process are of great importance. The main principles of planning are:

- Connection between theory and practice. The studied subjects must have the opportunity to be practiced.
- Harmonizing of the volume of the study information with the study time of the students.
- Taking into account the time order inter and inner subject connections.

Therefore, by these principles, decisions are taken about the developing of the structure-logical scheme (SLS) for every school subject. SLC shows the objectives of the subject and its connection to previous and next subjects in the school plan of the defined subject.

To form an optimal organization it is needed to be paid careful attention to the planning of the school process, which is connected with the creation a timetable of the school subjects. The quality of the timetable shows the level of the organization of the school process. Very important part of creating the timetable is the school plan. There are two kinds of school plans:

1. For every school year each subject gets a horarium, needed for its through study, which must be multiplied by the number of the school weeks in the term.

2. The horarium, needed for studying each subject is defined by required volume of the information in it.

Therefore, there are two ways of creating a timetable of the subjects. The first is by using "typical week", the timetable is created for the first, or for both: the first and the second week, from the term and after this, it is repeated for all the rest. In

¹ Mariya I. Eremieva is with the Naval Academy , 9000 Varna, Bulgaria, E-mail: eremievam@abv.bg

TABLE 1
INPUT DATA FOR THE SCHEDULE

subject	code of the spec.	Courses number	Kind of the class	continuance	Halls' code	Teachers' code	Kind of halls	Number of the week
Math. analysis	1	1	1	2	2501	-	Hall	1
Math. analysis	1	1	2	2	2501	-	Hall	1
Math. analysis	1	1	3	2	-	2507	classroom	1
Informat - DB	1	1	1	2	2505	-	Hall	1
Informat - DB	1	1	2	2		2506	laboratory	1
Sum data	1	1		10	6	4		1

the second way before creating a timetable, it is necessary to create a special document “schedule of dividing the horariums for subject” for the weeks of the term. It is necessary to keep the sequence of the classes according to the school plan for the subject and for the different studied subjects for the specified specialty. The advantage of the first way is the short technical work for creating the timetable for “typical” week and its duplication. Its disadvantages are:

1. the different subjects according to their defined time study, which is multiplied to the number of the weeks, are in inequality positions;
2. the defined for the “first” week sequence of lecturer and practice classes is not optimal for the remaining weeks of the term;
3. the connection among the classes of one subject and among the different subjects is damaged..

The second way – creating a time table for every week – escapes from these disadvantages, but it is a very continued process and it is needed high qualified work of plan-making specialists.

In the military academies taking into account the specificity of education, which is in accordance with the inclusion of study and outside study classes, requirements are formed, to which each time-table of the subjects should accord.

III. AN ALGORITHM FOR THE DISTRIBUTION THE HORAROU.

This paper suggests an algorithm for defining the schedule of dividing the horariums for each school subject by the weeks of the term. For creating the schedule it is necessary to have the following information: the school programs, suggested by the different departments, the distribution of courses and specialties, the number and the different kinds of streams for every course, the limit of the possible weekly horarium. For every school subject is known the horariums, kind of subjects, the sequence of their realization, the needed halls and suggested teachers. There is separate schedule created for each course and specialty.

Whether this schedule is with high quality is determined by analyzing the number of the characteristics of the school subjects: number of classes, exercises, total summary of the classes. The schedule is in TABLE 1. Following this information it is estimated:

1. the distribution of the week horarium of the subjects for the different kinds of classes: lectures, laboratories, exercises;
2. the connection between the subjects of the specified specialty;;
3. whether the weeks' horarium is regular or irregular for all the term.
4. whether the total summary of the classes for every specialty is in the previous defined limits – 30..40; These limits are defined by the academic council .for each university.

It is suggested to be assigned link codes between the subjects for improving the quality of the created schedules. If the studied material on one subject is a base for other subject, the first receives a priority 1, and the second – 2..

Till now in the most universities, specialists –plan – makers create the schedules. In this paper is suggested an algorithm, based only on “exact” methods for distributing the horarium for each subject of the term.

On Fig. 1 is shown the algorithm of creating the weeks' horariums. Because of the specificity of education in the military academies the start or the end of the term is at different time for each course and specialties. In the variable “*brw*” is used the maximum number of school weeks, which includes the period since the first date of the term till the last date of the term for all study units. If *i* – is the number of the course, *j* – the number of the specialty and *k* – the number of the school weeks of the term, then the count of the school days for all weeks for all courses and specialties is written and stored in the three-dimensional matrix *Week[i,j,k]*. The two-dimensional matrix *Studydays[i,j]* shows the total count of school days for the term for each course and specialty. From this total count are deduced the interruptions during the term, needed to get the real value only of the study days. In *Hor[i,j,l]* is entered the horarium for each subject for *i* course and *j* specialty. With Eq. 1 is decided the horarium for the “*k*” week of the term.

$$horweek[ijkl] = \frac{hor[ijl].week[ijk]}{studydays[ij]} \quad (1)$$

In two variables *cjalo* and *ost*, (Eq. 2 and Eq. 3) are stored the fractional and the whole part for each subject's horarium.

IV. CONCLUSIONS

$$cjal_o = \text{int eger}(\text{horweek}[ijkl]), \quad (2)$$

$$ost = \text{horweek}[ijkl] - cjal_o. \quad (3)$$

If the rest is less than 1, for this week, there is a week's horarium for this subject, which is equal to the variable *cjalo*. If the rest is bigger than 1, these actions are taking place:

$$\begin{aligned} horws &= horws + cjal_o, \\ osts &= osts + ost, \end{aligned} \quad (4)$$

In the *horws* (Eq. 4) are summed the weeks' horariums for each subject. Here is the difference between *limbeg* (the start possible value of the week's horarium for each course and speciality) and the equaled week's horarium *horws*. When *horws* is between *limbeg* and *limend*, the process of distribution for the week is finished.

With the suggested algorithm for defining the weeks' horarium for the subjects is achieved regular distribution of the total horarium for the subjects for the weeks, and this algorithm escapes from the possibility for overloading some subject or for non – distributed classes.

1. Creating the SLC of the preparation of the future specialists on the base of SLS of all studied subjects allows the school process contents to be optimized.
2. Coordinating the quantity of the studied information with the available time of the students gives the opportunity to be defined the optimal time, needed for studying each subject.
3. Realizing the principle of sequence and the connection between the school subjects finishes with the creating of a program and an optimal time table of the classes during the term
4. Defining the main principles of planning allows the defining of an optimal weekly horarium for every subject according to the school plan.
5. For defining the weeks' horariums of the subjects are used only "exact" methods.

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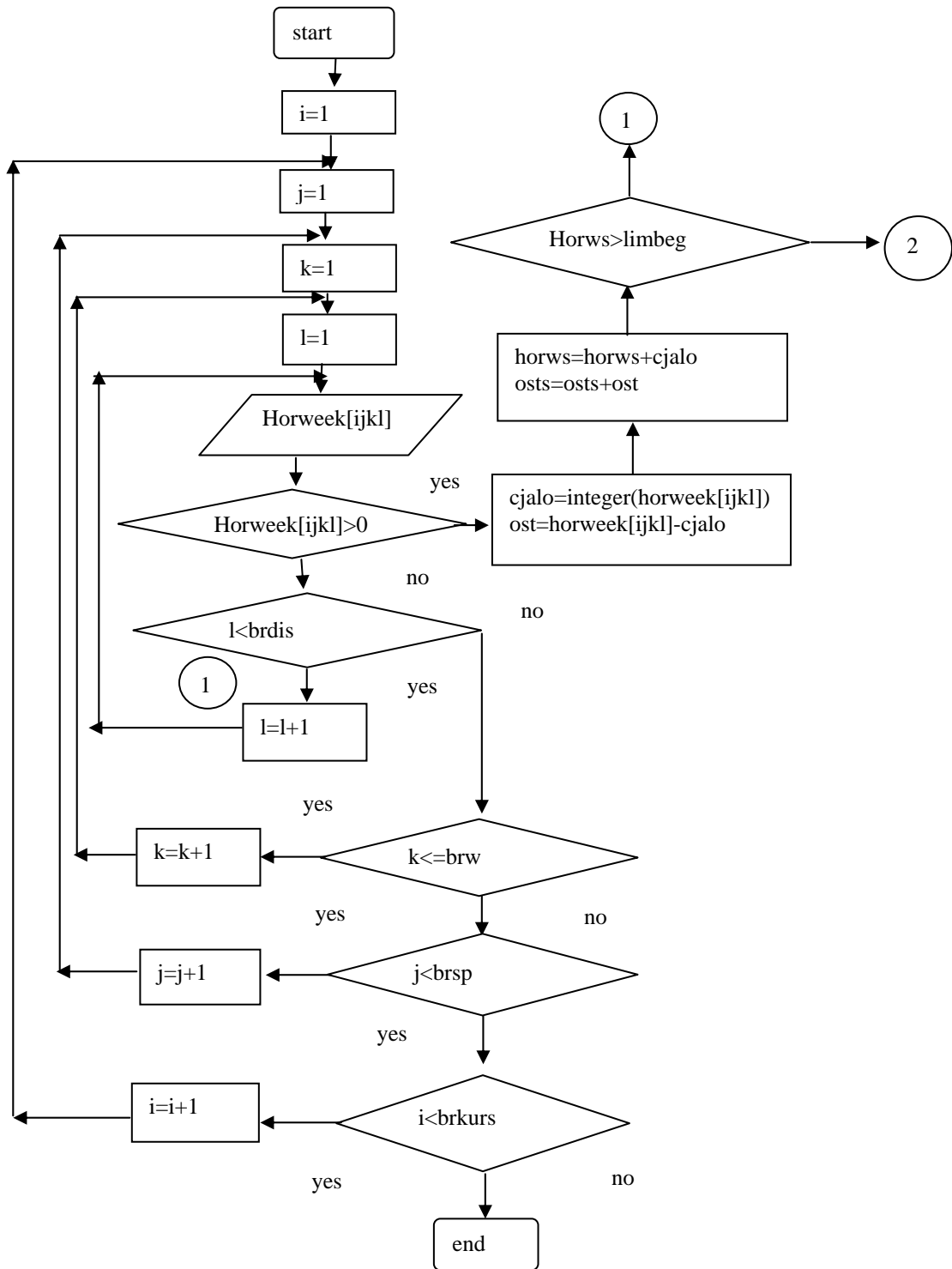


Fig. 1 An algorithm for defining the weeks' horariums for the all subjects