THE AUTOMATED SYSTEM OF THE RHYTHM ANALYSIS IN THE EDUCATIONAL PROCESS OF A HIGHER EDUCATIONAL INSTITUTION ON THE BASIS OF APRIORISTIC DATA

Nicolae PELIN
PhD, Associate Professor, Information Technology Department,
University of Applied Science of Moldova, Kishinev, Moldova

E-mail: pelin_nicolae@yahoo.com

Vladimir MIRONOV
PhD, Associate Professor, Tver Technical University, Russia

Abstract: *In this article we consider the problems of algorithm functioning development for the system of automated analysis of the educational process rhythm in a higher educational institution. Using devices of experimental planning in conducting the scientific researches, adapted methodologies, which were received by authors in their dissertations regarding the decision of similar problems for continuous and discrete mass productions, there are offered variants of constructing corresponding algorithms for the automated analysis of rhythm in a higher educational institution in conducting the educational process.*

Key words: *automated system; rhythm; educational process; quality*

1. Introduction

The preparation of experts with higher education in the CIS countries in the last 15 years is still accompanied by a decreasing interest in exact and engineering sciences and by an increasing demand for economic and legal specialties.

The planned number of students in educational groups of one specialty usually decreases, but for other specialties the number of groups and students in a group increase, which leads to the infringement of educational process rhythm, with all resulting consequences. First of all, it influences the quality of the educational process. Finding variants of the automated rhythm analysis of one educational process or another is the important and actual problem. Using planning techniques for the experiment, it is obviously possible to calculate the general dispersion of the rhythm factor. In the beginning, by means

of Kohren criterion, the performance of a hypothesis regarding the static uniformity of a selective dispersion is checked. The heterogeneity of each step is also established. Both the size of displacement, and the number of other operations are defined, while the picture of dispersion is also revealed. For a quantitative estimation of the rhythm factor we use the technique presented in [1,2][1]. In establishing the mathematical dependence between a rhythm parameter and the time we draw by analogy the sequence of actions applied in [3]. The moments of one-dimension numbers of the distribution [4], the mixed moments paid off, factors of correlation and the correlation attitude are calculated, in the end, the factors and direct regression equation, offered by P.L.Chebyshev [4] are defined. The received model can be used as a basis for the construction of the automated system of the analysis of rhythm in conducting the educational process by preparation of experts with higher education in modern conditions.

2. The analysis of rhythm of educational process

Let's assume, that there are rhythmical and spasmodic educational processes. Rhythmical processes are stable, the quantity of trained students and the quantity of let out experts in unit of time B_f basically corresponds to the in-advance established plan B_p, i.e. $B_f = B_p$. Graphically, rhythmical educational institutions can be presented in the form of some linear dependences (1) as shown in figure 1 and 2.

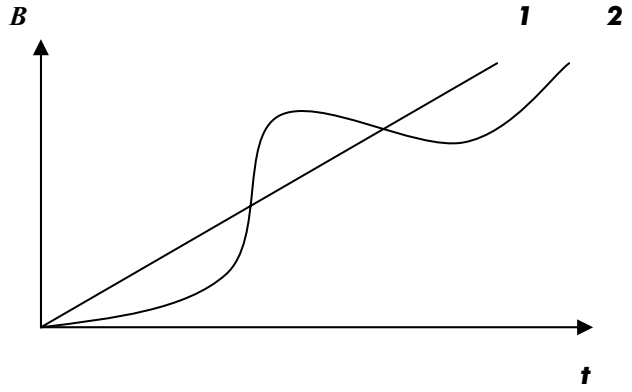

Figure 1. The schedule of dependence between the quantity of trained students and graduate experts from time at rhythmical (1) and spasmodic (2) educational process

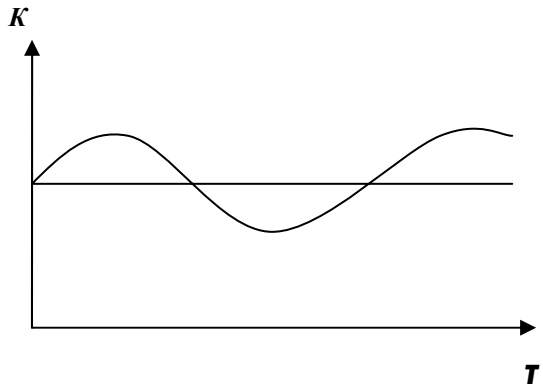

Figure 2. The dependence between the rhythm factor and time at rhythmical (1) and spasmodic (2) educational process

In spasmodic educational institutions the number of trained students and the quantity of graduate experts with higher education in current time changes under the casual law. For them deviations from planned targets, both in negative, and in the positive party are characteristic. Generally, they can be described in the form of some curves (2) presented on figure 1 and 2.

To quantitatively estimate both rhythmical, and spasmodic educational processes is possible by means of factor of rhythm. According to [1,2,5, etc.] it is possible to define factor of rhythm K_r a parity of the sum of actual release of experts and/or quantities of students simultaneously trained in the certain period of time B_f to the general scheduled volume of experts release B_p for the similar period of time:

$$K_r = \frac{\sum_{i=1}^{n} B_f}{\sum_{i=1}^{n} B_p} \qquad (1)$$

In view of both positive, and negative deviations of actual release of young experts and/or simultaneous training of students on corresponding specialization B_f from scheduled B_p, the rhythm factor suggests to count according to the following formula:

$$K_r = 1 - \frac{\sum_{i=1}^{n} \left| B_p - B_f \right|}{\sum_{i=1}^{n} B_p} = 1 - \frac{\sum_{i=1}^{n} a}{\sum_{i=1}^{n} B_p} \qquad (2)$$

where, $a = | B_p - B_f |$ - absolute (both positive, and negative) a deviation of scheduled and actual release of experts and/or quantities of students simultaneously trained during the certain period of time, n – number of the periods in which the rhythm of educational process (educational weeks, semester, educational years) is analyzed.

The rhythm factor expressed by means of formulas (1) and (2) is equal to unit at rhythmical work of an educational institution and less then one in all other cases.

Development-wise according to the present article, there is a necessity to consider possible fluctuations of educational process which can lower its quality considerably.

It is possible to consider these fluctuations as long as the corresponding algorithms in calculating the rhythm factor will be included. However, the formulas resulted in [4] regarding the rhythm factor definition are not so convenient for their account in corresponding algorithms because the inclusion in formulas (1) and (2) post value B_f in defining the rhythm factor which are not always convenient [3]. Positive results for calculating the rhythm factor on the basis of aprioristic data have been received in [3] but have not yet been published, while as object of research there were data about production of the enterprise with discrete mass character of manufacture. Therefore we were required additional researches for the acknowledgement of an opportunity of use received in [3], and for defining the rhythm factor on the basis of aprioristic data about a course of educational process in a higher educational institution.

For this purpose we used data about a number of students from one of the educational institutions at the beginning and the end of each educational semester, in an autumn and spring semester, a number of graduates in the period 1998-2002. Parameters B_f were compared, as well as in [3], with the plan B_p (a defined contingent of students accepted on the first rate) by means of the following formula

$$K^1 = \frac{B_f}{B_p}$$

The variable K^1, received in relative units, has appeared convenient for carrying out the corresponding researches with the purpose of defining the aprioristic rhythm factor of functioning of a higher educational institution. Values K^1 are accepted as initial for constructing trend components, describing the modification tendency in the quantity of graduates in time, i.e. rhythm of educational process on the basis of aprioristic data.

In defining the dispersion of trend components it is convenient to take advantage of the methods of dispersive analysis [4] which represent methods of processing the experimental data, allowing the check up a hypothesis about presence of effect, inserted by the investigated factor, by allocation and comparison of two dispersions: a dispersion defined by effect of level change in the investigated factor, and a dispersion describing distance, connected with a experimental mistake.

Considering that the planning and the control over an educational institution is conducted on results of each semester, academic year, on each release in a cut of each of educational groups, it would be logical to analyse a share of the dispersion at each stage in the general dispersion by means of the device of step planning experiment [4] about which we already made some remarks in the 1st section of this presentation.

3. Conclusions

Calculating the rhythm factor by time in an educational institution on the basis of aprioristic data, on quantity of trainees, on a contingent of graduates, and its use for constructing algorithms for the automated system of rhythm analysis during the preparation of experts, enables us to predict more accurately the behavior of a course of educational process during the subsequent periods of time, more precisely to count an academic load of teachers, allowing the reducing of financial losses of an educational institution, as well as the quality increase in the educational process as a whole.

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