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The Taguchi Method and Conditions for its Implementation in High Performance Athletic Training

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Abstract

The purpose of this research is to present the main features of the Taguchi method, a method used today mainly in the optimization of industrial processes and products. It allows identification of process parameters that may contribute to system optimization; in our case, it allows the selection of the most effective means of training aimed at optimizing processes. After having determined the relevant characteristics in athlete training, we developed a model based on the Taguchi method, adapting the characteristics of that training for implementation in high performance athletic training. We also checked the optimum conditions for the implementation of management techniques and for identifying responses to stimuli.

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1. Theoretical considerations

Rapid increase in the volume of experimental research has brought into focus the problem of increasing the efficiency of the experiment, the emergence of computers and software for such schemes has enabled experimentation to help increase yield sensitive research. It was in this context of the experiment and mathematical theory in its programming (organization) experiment. Box and Wilson have done schedule factors and optimum region described by polynomials (orthogonal programs). Experimental programming methods are used to study various phenomena which differ primarily by the nature of the processes taking place within them. Plays the role of those variables are called input variables (factors of the process), and the effect of role playing are called output variables. In solving optimization problems, to the researcher are two fundamentally different strategies:

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- classical strategy (Gauss-Seidel), characterized by the idea of "one factor at a time";
- Modern Strategy (Box-Wilson), characterized by the slogan "all factors in each moment."

Gauss-Seidel strategy reduces any experimental research in a research-factor, meaning that at some point adjust (change) one factor, the other factors at constant values are assigned more or less arbitrary, which can exert significant influence on the outcome.

Box-Wilson strategy, cited by Rotariu (1999) uses a factorial experiment, characterized by the fact that each test changes the value of all existing factors, therefore, the influence of each factor on the values of the objective function y is determined by All trials included in experimental research, experiment volume is so much lower and much higher certainty of results.

For the first stage of research, it is sufficient variation factors on two levels immediately resulting maximum volume of experimentation N = 2k. Full factorial experiment is called, if they are included all the possible combinations of the levels of the factors. Matrix spreadsheet program experimentation is performed on columns appearing factors and components of the software testing lines. Levels of factors are marked coded values (+1) and (- 1). Y objective function values have been determined experimentally.

2. Experiments plans (Taguchi method)

The whole philosophy of Taguchi method is based on minimizing disturbances to the system action by optimizing them. Classical alternative is based on eliminating disturbing factors, which involves high costs.

Usually when there is a dispersion or instability of the operating characteristics of a system, the causes are sought to be reduced or eliminated. These causes can be multiple, depending on the nature of the system (individual sport):

- External factors: social, opponents, referees, regulation, competitive system and so on;
- internal causes: health, greater physical and mental stress, relationship coach sports, physical condition, motivation, emotional state.

Taguchi strategy is to identify combinations of parameters that reduce the effects of causes, not that they are directly attacked (Sado & Sado, 1991).

Parameters on which one can act easily are called control factors. Finding good values to be attributed to factors controlled experiment is performed in order to optimize the system. Thus, with the lowest costs, find the optimized system: to disturbing factors (noise factors).

Attempts to improve an athlete's performance also concern the coach. This study identifies parameters for defining athlete preparation in order to achieve the proposed performance. If the aim is to improve the preparation process seeks to modify one or more parameters that pass through one or more values. Things start to get complicated so. Logical approach is to try changing the setting once. Each test new conclusions derived from previous test data. We can not know in advance how many tests will be required and the results will be as expected. It is possible to achieve optimal results with minimal costs using fractional factorial orthogonal planes of experience.

An experimental plan includes a series of trials held before to determine the minimum and maximum accurate test possible influences of different parameters to optimize performance of the system studied (athlete). One key Taguchi's experiences in implementing plans techniques, is that these plans very simplified experience and proposed a collection of standard plans allowing rapid adaptation to their real needs. Much of the statistical problems have been simplified or eliminated. Thus, implementation plans and usage experience is now available to all specialists and non-specialists.

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