ON AN ALGORITHM FOR SOLVING THE MULTICRITERION OPTIMIZATION PROBLEM IN SCHEDULING THEORY

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A standard problem of discrete optimization from scheduling problem theory is considered. There are n tasks to be executed on *m* processors at some restrictions and following conditions are satisfied:

$$\rho(S^*) = \min_S \rho(S) = \min_S \frac{1}{n}\sum_{i=1}^{n} \omega_i f_i(S)\,, \tag{1}$$

$$\min_S \rho(S^*) = \min_S [\max_{i \le i \le n} \{ f_i(S)\}]\,, \tag{2}$$

where S is the schedule of execution of tasks, S* is the optimal schedule, ω_i is execution price of i^{th} task and f_i is duration of execution of i^{th} task under schedule S.

The problem purpose consists in a finding of an optimal execution order for the tasks so that (1) and (2) conditions were carried out simultaneously if construction of such schedule is possible basically, and if construction of such schedule is impossible, then we search for the compromise decision:

$$\left|\frac{\rho_1(S)-\rho_1(S^*)}{\rho_1(S^*)}\right|^2 + \left|\frac{\rho_2(S)-\rho_2(S^*)}{\rho_2(S^*)}\right|^2 \to \min_S\,, \tag{3}$$

Where $\rho_1(S^*)$ is the optimal decision satisfying the criterion (1), and $\rho_2(S^*)$ the optimal decision satisfying the criterion (2). For the scheduling theory for two criteria, when weight functions are vector values and a multitude of additional resources is empty, an algorithm of a polinomial complexity for separate criteria is constructed. Taking into account the obtained solutions, the algorithm in a conversational mode proposes to the decision making person a system of possible compromise settlements deviating from the optimal solution with a desirable error.

The algorithm consists in the following: at first by means of constraints the domain area is created and the tree of acceptable alternatives is constructed. The vertices of the tree forms a matrix of alternatives from which the optimal solution it to be found. In the beginning we find the schedule for which the min under (1) is found. The value of $\rho_1(S^*)$ is calculated. Then, we find the optimal schedule for which the *min* under the formula (2) is reached. If these decisions coincide, we take it as the optimal decision for the multicriterion problem. Otherwise, we find the optimal schedule for which the *min* under the formula (3) is reached. After that in a dialogue mode acceptable alternatives are offered, with the help of which the decision making person can choose the desirable effect, and it is possible to improve the value of one of the functionals from (1) and (2), simultaneously making worse the value of another functional.

The considered method can be used for effective planning in economical, technical and constructional systems working in a given period of time under the restricted resources.