

Methods of Optimization of Multidimensional Networks

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Abstract - The questions of optimization of networks of FGN, the basic feature of which is multidimensionality, are examined. For such multidimensional networks it is suggested to use the methods of multicriterion synthesis. The basic methods of association of partial criteria and receipt of the generalized criterion are described that allows to carry out the global synthesis of multidimensional network taking into account partial criteria, necessary for providing of the set exactness of parameters of network.

Keywords - multidimensional networks, NGN, FGN, optimization, multicriterion synthesis.

Presently tasks come into question all more frequent, that linked with the prognoses of the future of informative communication networks (FGN). The analysis of the systems of principles of their construction grounds to assert that these will be multidimensional networks (MN). Moreover, if to present the differences of conception of FGN from NGN, it is possible to draw conclusion that to foresee architecture and even general principles of construction difficultly, but clearly, that a feature of networks of FGN is multidimensionality.

Therefore in the networks of FGN, that in the informative communication networks of the future will become possible due to the use of multidimensional network and much nuclear computing facilities in its knots to provide an exchange information and give various services users on an almost primitive on the face of it chart structure: Users – Multidimensional network – Users.

At such approach access, transport, service, support (synchronization, signaling, e.c.) – it is a domestic affair of the integrated network of FGN, multidimensional architecture of which gives possibility of general decision of tasks which are fixed on component networks in principle.

It is possible to provide for that for the difficult network of FGN the simplest decision, at which networks of access, transport, and different networks of support are in the own, only for them the taken measurings will not be the most effective decision [4].

In the network of FGN at a multidimensional structure it is possible it will be to use the shareable resources of network.

For MN the most adequate methods of multicriterion optimization.

MN adequately to the concept is a "large network". The last is characterized a few specific signs [2]. It, above all things, is multidimensionality of variety of structure; much linked elements (intercommunication of subnet at one level and between the different levels of hierarchy); heterogeneity of base of elements; recurrence of change of composition and

state (changeableness of structure, connections, and will make networks); multicriterion; multiplanning.

For every criterion of $Q_1(x)$, $Q_2(x)$, ..., $Q_s(x)$ must be found vector of $x=(x_1, x_2, \dots, x_n)$, that provides the minimum (maximal) value of criterion of optimum:

$$Q_i=Q_i(x_1, x_2, \dots, x_n), i=1, 2, \dots, m; \quad (1)$$

at the decision of the system of unequal

$$Q_i(x_1, x_2, \dots, x_n) \geq 0, i=1, 2, \dots, m, \quad (2)$$

$$x_j^- \leq x_j \leq x_j^+, j=1, 2, \dots, n. \quad (3)$$

Consequently, taken the decision task of optimization of MN to the decision of condition of optimization - expressions (1) - (3), that to determination of optimum value of x^* , that satisfies unequal (2), (3) and finding of minimum (maximal) value of criterion of optimum.

For determination of a minimum of vectorial criterion of $Q(x)$ it is necessary to pass from the task of vectorial optimization to the task of nonlinear optimization with the specially formulated objective function:

$$Q(x)=\Phi[Q_1(x), Q_2(x), \dots, Q_s(x)] \quad (4)$$

The process of search of scalar function (4), which is the generalized criterion for the task of multicriterion optimization, is named the association (rolling up) of vectorial criterion of optimum.

For realization of global synthesis of MN taking into account partial criteria necessary for providing of the set exactness of parameters of network the followings methods of association of partial criteria are offered for the receipt of the generalized criterion: association in number of compatible criteria, associations of criteria, for which certainly correlation of advantage after ponder ability.

Consequently future informative communication networks of FGN are multidimensional networks in which to foresee architecture and even general principles of construction difficultly enough, but it is possible to assert that a synthesis of MN must be vectorial, that executed taking into account the values of aggregate (vectors) of indexes of quality including and economic which are preliminary taken into account (forecast).

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