Programming model to determine the effect of input parameters variations on the network characteristics

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Abstract - **This work is devoted to the development of software models to estimate the sensitivity characteristics of the network on the variations of input parameters.**

Keywords - **network parameters, the variations of input parameters, sensitivity of the results of design.**

I. INTRODUCTION

Study of the influence of initial parameters variation on the results of design is one of the main tasks of network planning

In this paper we considered the relations between the input data, given constraints, optimization criteria and the result of telecommunications networks (TCN) optimization.

The effect of input parameters variations on the network design results was studied. Some results of the studding, obtained using a computer program, were presented.

II. INSTRUCTION FOR AUTHORS

One of the goals is to define the groups considered the network parameters, imposed limitations and optimization criterion.

The result of the application program under development is the determination of the impact of forecasting errors on the cost of the network. We considered the prediction error geographical distribution of users of infocommunication services, provided through the designed network (surface density of users); Error loading intensity (total load and load distribution among users); change in the cost of equipment, etc. Also enter information about the existing network, the restrictions on service quality, and so on.

Based on a set of input data and constraints, the program generates output data: number and location of network nodes, boundaries of the territory served, routing algorithms and the number of channels between nodes.

The considered network area is divided into segments (segment of the residential users, administrative, industrial segments, etc.). When determining the occurring load on the network $(Y_{\text{occ.}})$ are determined by the number of users of each segment $(N_{i.})$ and the unit load $(y_{i.})$, created by the corresponding group of users.

$$Y_{\text{occ}} = N_{rez.} \cdot y_{rez.} + N_{a.} \cdot y_{a.} + N_i \cdot y_i + ... \qquad (1)$$

Sensitivity of result (Zj) to input parameters variations (Xi) and restrictions (Ci) mathematically expressed using first partial derivatives $\frac{\partial Z_j}{\partial X_i}$ and $\frac{\partial Z_j}{\partial C_k}$.

Since quite difficult to analytically calculate these derivatives, calculation of network parameters through a computer program of optimization has been proposed. Analyzing the sensitivity of the railroad system costs to changes in the monetary value of the equipment, the initial cost of the network is expressed as,

$$Z = \sum_{i=1}^{n} X_i \qquad (2)$$

where X_i - components of value, percentages relations between which are specified in the simulation. The cost of switching units, subscriber lines, canals, etc. could be attributed to the components

The program consists of three program modules: optimization of the units location and border services, the formation of the matrix flow stress and optimize network channels.

Optimization module arrangement of units and boundaries used fully connected network and load distribution is proportional to the number of users connected to a specific site. We introduce the coefficients of variation of cost parameters.

Each module is designed so that it could be used separately to solve other problems of network planning.

III. CONCLUSION

The paper shows the results of studying the sensitivity of network planning to change some parameters, or prediction errors. To optimize the location of units and borders service in the most important was the accuracy of calculating the cost of equipment. Errors forecasting the users number, the value of incoming loads and coefficients of gravity influence is much smaller than is usually indicated. However, such results may be associated with the use of a linear function of the requirements for the development of the network.

In this connection it is necessary to perform similar studies using more sophisticated approximations of the variation in the users number in the network development. As anticipated cost factors switching equipment, access lines and channels were dominant in influencing the optimal configuration of the network.

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