FINDING SOLUTION OF THE VARIATIONAL PROBLEM IN THE FORM OF MINIMAL PATH ON SPECIAL GRAPH

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The communications are the fiber-optic cable, the roads, pipe-lines, etc. We mean fiber-optic cable. The construction of the communications is expensive. The goal is to reduce the cost of the communications construction on field surface. The problem of allocation of communication (a path across territory) to connect two points one to another on inhomogeneous territory is considered. Inhomogeneity is regarded as a variety of the communication construction cost at the various points of the territory. A continuous mathematical model of hilly territory have been formulated. The communication is allocated under the condition of the minimum of the construction cost. The problem is formulated as a variational problem. There are some reasons which do not permit to solve the problem by means of classical methods of calculus of variations [1].

A direct method to get approximate solution of the problem has been worked out. It is based on graph theory methods. The main concept of the worked out method is as following. First of all, the continuous mathematical model of territory is transformed to a digital locality model [2], which is converted in turn to special graph. The minimal cost path in graph to connect two given nodes of this graph is taken for the approximate solution of the problem under consideration. The graph is that. The exactness of approximation of lineal solution of variational problem may be made 8.2%, or 2.7%, or 1.3%, or 0.75%, …, or 0.12%, etc. It depends on the parameter of the graph which determines the local degree of the graph nodes. The local degree may be made 8, or 16, or 32, or 48, or 80, or 96, or 144, or 176, or 224 etc.

A minimum path on a graph is constructed by means of the adjusted Dijkstra algorithm [3].

[1] Эльсгольц Л.Э. Дифференциальные уравнения и вариационное исчисление – УРСС Москва, 1998.

[2] Лотарев Д.Т. Цифровая модель местности для задачи размещения коммуникаций // АиТ 1999.№ 12. С.41-49.

[3] Дейкстра Э. Дисциплина программирования. — М.: Мир, 1978.