

ON A WAVE APPROACH TO SOLVING OPTIMIZATION PROBLEMS OF LOGISTIC INFRASTRUCTURE¹

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The report shows two classical problems of infrastructural logistics: the problem of optimal location of service centres (a particular case of UFLP – uncapacitated facility location problem [1, 2]), with segmentation of service areas, and closely associated with it the problem of optimal organizing communications (for connecting logistical centres, e.g. utilities and manufactures) [3,4]. For these problems are given mathematical statements and described algorithms of approximating solution.

At first we examine the special case of Steiner problem with specific constraints in terms of infinitely dimensional optimization. Let a bounded region $D \subseteq R^2$ has m points $A_k(x_k, y_k)$, $k = \overline{1, m}$, and piecewise continuous function $\gamma \geq f(x, y) \geq 0$ defined in D . It's necessary define shortest tree (for example in terms of minimum cost), connected points A_k

$$T(\Gamma_{i,k}) = \min_{\Gamma_{i,k}} \int_{\Gamma_{i,k}} f(x, y) d\Gamma. \quad (1)$$

$$\sum_{i \in I, k \in K} T(\Gamma_{i,k}) \rightarrow \min, \quad (2)$$

where $\Gamma_{i,k} \in G_{i,k}$ – a continuous curve, connecting points A_i and A_k and giving a minimum of integral functional (1), $I \cup K = \{1, \dots, m\}$, $G_{i,k}$ – set of various curves connecting points A_i and A_k .

To solve this problem authors worked out new algorithms, based on the wave approach, which is defined in terms of geometrical optics (Huygens principle [5,6]) and finding of global extremum of integral functional. So let one has an optical inhomogeneous medium. From a source A is beamed light waves. Each point, that is reached the front of the light wave, is secondary light source. We draw a curve of these secondary sources. This curve is the front of light wave. Thus we find the border of wave propagating. Thereby define fronts of the light wave, we can draw the extremal (moved backward at time) as a curve between the light source A and the ultimate point B . Combining this approach with the Dijkstra algorithm we obtain the desired algorithm. Also results of computation are showed.

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