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THE OPTIMIZATION LOGISTICS MODEL FOR TRANSPORTATION GEOINFORMATION SYSTEM

The information system is a huge database of digital data, converted into digital format. They are detailed layers, united by geography sign and tied to a specific coordinate system. Any events can be successfully monitored in such database. In addition, it can be found almost anywhere in the world to track the movement of practically any object.

Geoinformation systems (GIS) are powerful tools for work and visual representation of information. GIS technologies provide new, more corresponding modernity, effective, comfortable and fast approach to analyze the problems and solve the tasks facing humanity both in whole and particular for an organization or a group of people. They are aimed to automate the analysis procedure and prognosis. Only few systems possessed the art of synthesis and analysis of geographic information and full analysis of geographic information before the application of GIS for the purpose of making optimal decisions to apply to modern approaches and vehicles.

GIS technology is not just a computer database. This is a great variety of opportunities for analysis, planning and regular information updating. GIS technologies are used today practically in all areas of life, and they really help to solve many problems effectively.

The development of models and methods of GIS design for transportation logistics, allowing optimization of transport routes and their effective monitoring are becoming of great importance at present. The aim of this work is the development and realization of optimization methods of logistic operations enterprise-carrier cargo and methods of monitoring the location of vehicles.

Clarke-Wright method is used to solve the optimization problem of transportation routes. This method is used because of great accuracy of calculations. The idea of the method is to design the optimum scheme for the delivery circular route step by step starting with the initial draft. I n order to achieve this, let us introduce a notion a kilometer gain. It is important to take into account that the more the items of cargo delivery, the more is the calculation time.Therefore, to simplify the calculations it is recommended expedient to cluster the item cargo delivery. It will also help to reduce the number of possible delivery routes.

The distance matrix D has to be calculated to applying the k-method. We form this using YandexMap data. It is performed to minimize objective function.

$$J = \sum_{i-1}^{n} \sum_{i=1}^{k} U_y^2 \left\| X_i - M_j \right\|^2 \qquad (1)$$

As a result of the following is obtained the derived cluster centers): - size matrix M and the preference matrix U (m - number of clusters; n - number of place; Uij - degree of preference the i-th place j-th cluster). The initial plan how to «download" vehicles cars is performed by the radial route considering the degree of cluster location preference.

The second step is a transition one that leads to the optimum scheme for the ring rout delivery The notion of kilometer gain is introduced here. In case of the radial transport routes in total the transport path equals:

$$L_A = d_{01} + d_{10} + d_{02} + d_{20} = 2d_{01} + 2d_{02} \qquad (2)$$

In the ring route path of a vehicle is:

$$L_b = d_{01} + d_{12} + d_{02} \qquad (3)$$

In general, the kilometer gain algorithm is expressed by:

$$S_{ij} = d_{0i} + d_{0j} + d_{ij} \qquad (4)$$

where
- Sij is the kilometer gain obtained in the association place i and j;
- d0i, d0j is the distance between wholesale basis points and i and j, respectively;
- dij is the distance between points i and j.

Clarke-Wright algorithm includes several of steps and allows analyzing the matrix kilometer gain for multitude of the sets of points. The focus (i *, j *) with the maximum value Smax is searched by means of this algorithm applying to the possible kilometer gain.

GIS prototype is implemented on the basis of the designed models. The project is developed using PHP language, MySQL database, Web Technologies Jquery, Ajax, Twittew Butstrap and Yandex map service. The system has a user-friendly interface; it is cross-platform compatible, client apps can be downloaded either from a PC or a mobile platform.
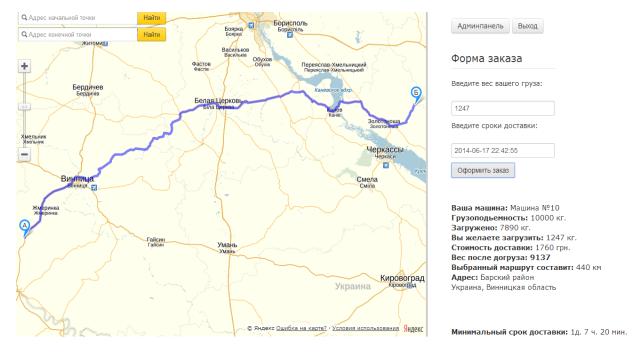
Fig. 1 General view of the system

The main features of the system are: the management vehicle transportation, finding the optimum way of traffic, the selection of the nearest to the starting point vehicle for transportation depending on criteria of search, the calculation of the route length, the transportation cost, the minimum delivery period and the review of the current information about cargo, which is in database. It is also possible to obtain the information about cargo for the definite periods of time and to add new vehicles as well.