Technical characteristics of MLIS and MNIS TO 1.6

The names of the proposed software products are: **Multilingual local instrumental system of transportation optimization**, version 1.6 (MLIS TO 1.6) and **Multilingual network instrumental system of transportation optimization**, version 1.6/upc (MNIS TO 1.6/upc).

1. General characteristics of the products

1.1. Business benefits

Allowing any interested users who are related to transportations in a city to promptly solve their tasks of finding optimal routes of moving a transport vehicle, which carries out such transportations.

1.2. Products positioning

Markets of software and network computing services to solve tasks of transportation optimization.

1.3. Information about users

Potential users of MLIS TO 1.6 and MNIS TO 1.6/upc are:

- transport companies engaged in transportation of cargoes;
- trading enterprises that transport goods to the addresses of customers which purchased them;
- emergency city services (emergency repair, ambulance, police).

2. Products overview

The programs **MLIS/MNIS TO 1.6** are designed to find optimal strategies of transportation in a city of cargo or people by *one* transport vehicle (**TV**) between specified target points (**TP**s). To solve such tasks are required appropriate databases of roads networks of (**DBRN**s), creation and import of which are provided in MLIS/MNIS. Such databases can be of the following three types:

- DBRN of ordinary type, where the information about houses is absent;
- DBRN of extended type, which contain such information;
- a client addition to DBRN of extended type, designed for remote users of MNIS TO 1.6/upc, when DBRN itself will be placed on a network server.

MLIS/MNIS TO 1.6 are multilingual programs. Alternative languages of their interfaces are stored in separate files, called *language shells*. These programs include two such shells: Russian and English, as well as a special program of version 1.0 called "**Генератор языковых оболочек (ГЯО 1.0)** (Generator of language shells (GLS 1.0))", that allows users themselves to create such shells for any languages in which they usually communicate.

MLIS TO 1.6 is an offline program, designed for a particular user (the lite version of this program is free).

MNIS TO 1.6/upc ensures the provision of network services to multiple users. This system consists of two parts: one remote module of optimization (MO), which is a part of the Universal processing center (UPC) 9 MNIS 1.0 (that is why the suffix "/upc" is indicated in the name of this MNIS), and numerous automated work places (AWPs) targeted at specific MNIS users. Each such AWP is designed to prepare by a separate user the input data of the tasks to be solved and to output the calculation results, and the synthesis of optimal strategies of transporting cargoes or people takes place in the MO. Information link between AWPs and MO can be carried out via the Internet, over the local network or even on the computer bus of a single user of AWPs. In the first and second cases MO is located on the network server, and in the third - on the computer of the indicated user. At that, there is ensured the operativeness and full automation of the AWPs interaction with this module.

MLIS/MNIS TO 1.6 are created on the basis of a new science-intensive information technology of automation of control of discrete technological and information processes (IT AC DTIP), having many uses, the founder of which is the author of these multilingual programs. A set of lite version of MLIS TO 1.6 can be downloaded from any of two websites of the author: "Promotion center of IT AC DTIP" (http://promo.dtip-optim.com/en) and "Implement. center of IT AC DTIP" (http://dtip-optim.com/en/main). There also the user can solve remotely up to 10 test tasks in MNIS TO 1.6/upc.

Areas of possible using MLIS/MNIS TO 1.6 are **transport, trade and sphere of emergency help**.
Year of release MLIS/MNIS TO 1.6 - 2018 (year of MNIS update to version 1.6/upc - the same). Place of development - Kiev (Ukraine).

3. Products functions

MLIS/MNIS TO 1.6 allow to solve various tasks of finding optimal strategies of transporting cargo or people by one vehicle at a given target points, which ensure minimum losses or maximum income from their service. There is provided a possible accounting of the following factors:

- refusals in serving TPs;
- a time factor when servicing TPs;
- holding capacity or cargo capacity of TV;
- return of TV to the initial TP for the remaining cargoes;
- specified order of passing some TPs by TV.

In the basis of solving these tasks lies the method of numerical optimization of discrete processes of service, as well as a unique scheme to optimize such processes developed by the creator of MLIS/MNIS TO 1.6. Each task is solved in two stages. On the first of them there are found the optimal routes of passing TV betweeng any possible pairs of TPs, and on the second - the optimal order of passage all TPs.

4. Restrictions

- maximum numbers of street types and streets themselves - **100** and **10000**;
- maximum number of directions of routing at the crossroads - **10**;
- maximum number of nodes in a roads network - **99999** (for lite version of the program MLIS TO 1.6 - **2500**);
- maximum number of transit sections in a roads network - **200000** (for lite version of MLIS - **10000**);
- for DBRN of extended type: maximum number of houses with addresses - **300000**;
- maximum number of target points - **18** (for lite version of MLIS - **10**);
- allowable number of phase states of an optimizable process - **2000000** (for lite version of MLIS - **30000**).

5. Practical application

MLIS/MNIS TO 1.6 were put into operation in April 2018 (MNIS was updated to version 1.6/upc in July of the same year). Now comes the stage of the search for potential dealers and users of these systems.

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