

ABSTRACT

Master Degree
on theme
«Transport logistics task solving with using decomposition procedures of genetic algorithms»
by
Oleksandr Sereda

The actuality

Today, transportation is one of the key industries of any state, the most important factor for effective economic development. Optimization of transportation is a key issue for many businesses, so the solution to the transport logistics problem (TLP), is actual for both small and large businesses. One of the key functions of decision support systems in the field of transport logistics is the ability to calculate and build effective cost-detour routes for different purposes on the transport network. The work is devoted to investigation of one of these problems, which consists in finding a route to visit a given set of addresses by certain number of units of vehicles with a mandatory return to the starting position after the end of the trip. There are several varieties of TLP with different conditions, allowing taking into consideration capacity of vehicles and other restrictions for a more complete view of reality. TLP is a generalization of the well-known traveling salesman problem (SP) in the case of constructing several closed routes passing through a common vertex, called the depot. TLP belongs to a class of discrete optimization problems and is in NP-problems class. There are no methods for finding exact solutions to verify the optimality and the approximate in polynomial time. Currently this domain is actively developing.

The purpose

Main diploma thesis object is to study the methods, approaches and algorithms for solving the TLP, using the decomposition of genetic algorithms (GA). Also, the goal is to obtain efficient algorithms for solving the TLP within one of its formulations.

Solved problems

As part of mentioned goal, next tasks were taken into consideration:

1. Investigation of the GA for using them in the TLP solving.
2. Research and development of parallel computing capabilities of the GA.
3. Design and experimental study of efficient algorithms for the the TLP resolving with considering the load-carrying ability of the vehicles and the production of "uniform routes".

Achieved results

Having resolved described tasks, the author defends:

- Modification of the GA crossover operation, which is a key element of the algorithm.
- The statistical approach used for establishing the parameters of the GA in solving the SP.
- The algorithm for finding uniform routes within the formulated TLP for finding routes for a given vehicles with considering their load-carrying ability. The resulting routes have to have as closest length as possible.

Scientific novelty of the work

Scientific novelty of the work can be described as next:

- The modification of the GA crossover operation was suggested, as the basic operation of the algorithm.
- Based on research conducted, using statistical data for solving TSP using GA suggestion was made.
- The problem of "uniform route" was formulated as one of the modifications of TLP.
- The modification of the method of approximate solutions of two-phase TLP with using GA in the first stage and subsequent clustering of points was suggested. This approach allows to solve the TLP in the light-duty vehicles used and the resulting solution to obtain a list of "uniform route."

The practical value of the work

The practical value of the work consists of next:

- The effectiveness of the proposed method mating GA was studied experimentally and proved.
- The software developed is suitable for use by end users for the practical calculation of effective routes in the area of transport logistics.

Conclusions

1. GA were analyzed in terms of applicability for the solution of SP, as well as in terms of parallelization. The suggestion to use statistical data to improve the quality and speed of decision was made.

2. Based on the analysis of the existing wording of the tasks of transport logistics and the needs of modern retailers, the new TLP was formulated for finding "uniform routes".
3. The main methods and algorithms for TLP were analyzed in terms of their efficiency, adaptability and applicability in practice. Based on the analyzed data the suggestion was made to use 2-phase approach to the TLP solving with fulfilment of clusterization of points on the second stage.
4. An algorithm for finding "the uniform route" within the TLP was proposed and implemented.
5. Implementataion of the extensible solutions for TLP solving was done. The solution provides an interface for input of initial data and obtain the calculated results in a visual form.

Diploma thesis contains 104 pages, 20 images, 5 tables, 38 references.

Keywords: GENETICAL ALGORITHM, SALESMAN, TRANSPORT LOGISTICS, OPTIMIZATION.