**EVOLUTIONARY ALGORITHMS IN SOLVING LOGISTICAL PROBLEMS**

**E.V. Skakalina,**

**Poltava National Technical Yuri Kondratyuk University,**

**Poltava, Ukraine**

**elenaskakalina2501@gmail.com**

*Рассматривается новый подход к решению логистических задач. Показана важность и актуальность решения подобного рода задач в современных условиях глобализации мировых рынков и необходимости повышения эффективности транспортных перевозок. Предложена авторская модификация гибридного генетического алгоритма с использованием аппарата нечетких множеств для регулирования размером популяции. Показаны результаты тестирования гибридного генетического алгоритма на тестовых задачах и реальных данных из нескольких предметных областей.*

**Keywords:** *hybrid genetic algorithm, logistics, optimization,* *fuzzy sets,* *testing*

The trends in the development of modern economy testify to the growing role of logistics, which, in the face of growing competition, reducing information barriers and globalization, is becoming one of the most important components of the strategic development of enterprises. Leading world companies emphasize their activities on strategic logistics in order to be able to cover suppliers, logistics intermediaries and consumers.

At present, logistics is one of the fastest growing areas of productive activity. This process is connected not only with the growing demand for logistics services, but also with the strengthening of the mutual integration of the business opportunities of logistics and the simultaneous infrastructural development of the respective territories. The most significant development of methods and algorithms for interaction between the subjects of logistical processes is due to the rapid development of information technologies, which entailed a wide spread of network organizational forms of business, on-line document circulation, transition to electronic payment systems, virtualization of logistics processes, etc.

On the basis of innovative transformations of the information infrastructure of logistics, a transition to a new level of intellectual management of processes is carried out, new logistics concepts of "Party Logistics" are being formed. One of the main trends in the development of the world market is the increase in the concentration of capital for core business. Subsidiaries can be created to perform non-core functions. However, at the present stage, these functions are increasingly being outsourced. This tendency is also fully observed in the sphere of logistics services. As an example, we can cite the United States, where the turnover of logistics services is about 40 billion dollars.

Currently, logistics is one of the fastest growing areas of activity. This is due not only to the growing demand for logistics services, but also to the development of the infrastructure capabilities of this business. The most significant changes in the ways and forms of interaction between logistics entities are due to the development of information technologies, which entailed the spread of network organizational forms of business, the virtualization of logistics processes, the dissemination of electronic document management, the use of electronic payment systems.

On the basis of innovative transformations of the logistics information infrastructure, management tools are developing, new logistics concepts are being developed, such as "Party Logistics"[1], which are based on determining the level of involvement of independent companies (logistics providers / operators) to solve business problems of the customer. Exact methods of solving logistical problems allow solving problems of only small dimension (for example, the number of destination points is not more than 50). To solve practical problems of large dimension, which reflect the existing economic realities, it is necessary to develop new approaches that are based on the use of innovative computer and information technologies. One of the most promising modern scientific trends is the use of integrated approaches that lie at the junction of various scientific directions. To solve complex multicriterial optimization problems, to a class of which logistical tasks belong, various methods are successfully used, including evolutionary algorithms, which include genetic algorithms.

The optimization tasks of transport logistics are not amenable to a quick and effective solution. Modern results of research on methods of solving the main problem of routing (VRP - Vehicle Routing problem) [2], include a variety of mechanisms for finding and improving an acceptable solution [3]. VRP belongs to the class NP - complex problems. For small dimensions, integer linear programming methods are used, for large dimensions - metaheuristics, which have become widely used in practice. Within the framework of the second direction, a hybrid genetic algorithm (GGA) is proposed, which differs from the classical genetic algorithm using the apparatus of the theory of fuzzy sets (FST) to regulate the size of the initial population.

The genetic algorithm is a heuristic search algorithm used to solve optimization problems using mechanisms that imitate biological evolution [4]. In this case, in the case of a genetic algorithm under evolution, we mean the evolution of a certain population of individuals (chromosomes) -solutions, the suitability of each of which is determined by the value of the target function that corresponds to this solution. In the simplest case of a canonical genetic algorithm, the simulation of such an evolution reduces to the simulation of the emergence of new individuals-descendants (new solutions) based on the intercourse of the parents-parents (old solutions), the simulation of the selection of the most adapted individuals (solutions with the best values ​​of the target function) and the simulation of random mutations (rare random changes to solutions).

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