

Development of Effective Algorithms for Assessment of Risks in Logistics

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Abstract—The main factors determining the development of transport are the introduction of dynamic, safe, flexible, modern technological systems and traffic flow monitoring systems [1]. One of the most pressing issues in the decision-making process of solving various complex problems that arise at different stages of this process is the selection of a rational option on the basis of the well-established mathematical model. In this work, decision-making algorithms are used to select of the rational option among transport alternatives on the basis of expert information, arising multi-criteria optimization problems in fuzzy formulation were investigated, and a methodology to construct the membership function was given. Decision-making algorithms have been developed in the case of equivalence and dominance of the importance of criteria for the evaluation of linguistic variables on the basis of qualitative expert information in the fuzzy formulation.

Keywords—multi-criteria optimization, fuzzy logic, dominance of criteria, risk assessment, decision-making algorithms.

The study of the logistics and transportation problems is always of great interest to to their great practical importance. Improving this process, which depends on various factors, requires serious scientific approach. Thus, it is principally important to choose a rational option from the possible alternatives that include different criteria for the strategies of operation of logistics centers [2].

The importance of registration of a large number of indicators when choosing a rational option from various alternatives in logistics and transport, the superior quality of indicators taken into account in the analysis and synthesis of the system, the significant interrelationship and interdependence of these indicators, the requirements for synthesis There are problems such as the difficulty of obtaining the original data [3].

These features make it practically impossible to apply traditional mathematical methods, including mathematical statistics, probability theory, as well as classical optimization methods, in solving the problem of application of analysis and synthesis for the selection of a rational option in logistics and transport.

The complexity of the decision-making process makes it possible, and sometimes important, to process quality expert information to select a rational option among the alternatives when the classical mathematical apparatus is ineffective. One of the most promising directions in the development of decision-making methods based on expert information is the theory of fuzzy sets and the linguistic approach in the linguistic database [4]. This article also explores decision-making algorithms when selecting a rational option among transport alternatives based on expert information. Thus, the issue of multi-criteria optimization in the fuzzy setting was investigated, and a methodology for constructing affiliation functions was given. In case of equality of importance of criteria for evaluation of linguistic terms on the basis of qualitative expert information, software was created in object-oriented programming language, method of using Matlab Fuzzy Toolbox package in case of dominance of criteria was presented.

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