

Studies in Fuzziness and Soft Computing

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Series editor

Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland
e-mail: kacprzyk@ibspan.waw.pl

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Alexander Vitalievich Bozhenyuk
Evgeniya Michailovna Gerasimenko
Janusz Kacprzyk
Igor Naymovich Rozenberg

Flows in Networks Under Fuzzy Conditions

 Springer

Alexander Vitalievich Bozhenyuk
Southern Federal University
Taganrog
Russia

Evgeniya Michailovna Gerasimenko
Southern Federal University
Taganrog
Russia

Janusz Kacprzyk
Systems Research Institute
Polish Academy of Sciences
Warsaw
Poland

Igor Naymovich Rozenberg
Public Corporation “Research
and Development Institute of Railway
Engineers”
Moscow
Russia

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Introduction

Urgency of the flow problems including the maximum flow finding, the minimum cost flow finding, the maximum dynamic flow finding, and the minimum cost dynamic flow finding lies in the fact that economic development of any country is caused by the presence of roads. Due to the process of urbanization, the number of vehicles has been increased and the quality of roads is poor; there is no an adequate policy regarding the construction of the new roads and repair existing ones. Important sphere of researches is the flow control. The expanding transport infrastructure leads to congestion, emergencies due to “traffic jams.”

Scientists develop and solve various optimization problems in transportation networks, in particular the tasks of identifying the congested roads on the map and finding the routes of the minimum cost. Dynamic networks are important subject of research, as they allow solving flow problems, taking into account the time factor, thereby one can find the optimal routes of the cargo transmission considering the time factor, to find the maximum cargo traffic between selected points on the road map within a specified time period.

The complexity of the factors influencing the network parameters, in particular their inherent uncertainty, is not taken into account in the flows literature. In fact, the flow bounds, the values of flows passing along the arcs, and transmission costs cannot be accurately measured according to their nature. The weather conditions, traffic jams, and repairs influence flow bounds. Variations in petrol prices can influence transmission costs. Therefore, the flow tasks in static and dynamic networks will be proposed in the conditions of incomplete and inaccurate information.

The present book deals with the problems of finding the flows in static and dynamic networks in terms of fuzziness and partial uncertainty. The solution of these problems is based on the concepts of fuzzy logic presented by the authors Bellman and Zadeh [1], Zimmermann [2], Berstein and Korovin [3], Borisov [4], Dubois and Prade [5], and others.

Methods for solving flow problems in transportation networks were considered by Ford and Fulkerson [6], Minieka [7], Busacker and Gowen [8], Christofides [9], and others. In the fuzzy conditions, these problems were considered by the authors S. Chanas and W. Kolodziejczyk [10], Fonoberova and Lozovanu [11] and others.

However, these studies do not take into account the existence of nonzero lower arc flow bounds, reflecting the transportation profitability degree and dependence of the fuzzy network parameters from the departure time.

The methods of the maximum and the minimum cost flow finding with fuzzy nonzero lower, upper flow bounds and transmission costs; the maximum and the minimum cost dynamic flow finding with fuzzy transit parameters, such as nonzero lower, upper flow bounds and transmission costs, are proposed in the present book.

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