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Pages	203
Figures	44
Tables	15
References	224
Supplements	0
Appendixes	2

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Multimodal public transit forms a key element of the transportation system in large agglomerations enabling their inhabitants to move around efficiently. It is also one of the most important tools for city authorities to counter the negative effects of congestion, particularly for cities going through an intense growth phase. In modern, large public transportation systems ensuring a good transport offer requires basing the transit network on a set of strong, high-frequency lines and multimodal transfer hubs. These hubs should minimize the time required for transfers, as well as reduce passenger discomfort during the change from one means of transportation to another. Ensuring an optimal organisation of the public transit network requires the consideration of the quality and location of the transfer hubs, which affect both the passenger comfort, as well as the cost efficiency of the whole system.

Within the scope of this dissertation the author has performed a detailed review of the scientific literature on the subjects of models and organisation methods for public transit systems and multimodal transfer hubs. This has enabled the author to determine an existing research gap, which concerns the issue of the organisation of multimodal public transit systems based on transfer hubs.

The objective of this thesis is therefore the development of a method for the optimal organisation of a public transit system with multimodal transfer hubs. In order to achieve this goal a decision model has been created, considering the decision variables, constraints and solution quality evaluation indicators. This has enabled the author to develop a new algorithm to solve the problem of the optimal organisation of a public transit system. This algorithm has been implemented as a computer application, which was then used to perform the tests of the efficiency of the proposed solution using the data from the multimodal transit network of the city of Warsaw as a case study. These tests have shown that the research thesis analysed within the scope of this dissertation regarding the possibility of optimising the organisation of public transit systems using metaheuristics is in fact true.

The research performed within the scope of this dissertation has shown that metaheuristics can be used effectively to solve problems related to optimal public transport organisation. As indicated in the conclusions of this thesis, incorporating multimodal transfer hubs into the decision model and algorithm of optimal transport organisation has enabled enhanced realism as well as better transportation system adjustment towards passengers' needs. Implementing the algorithm in the form of a computer application based on the universally used GTFS public transport file format allows the verification of initial solutions of the transit network design problem for real world public transportation systems.