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Mirosław Dusza

### **The study of track gauge influence on lateral stability of 4-axle rail vehicle model**

Analysis of lateral stability of rail vehicle model is the subject of present paper. The method used by the author is based on bifurcation diagrams creation and analysis. The continued study of stability of vehicle model in straight track and curved track and form of the results presentation are original features of the method. Results for the straight track and wide range of radii of the curved track are presented jointly on the combined bifurcation diagrams in this paper. Multibody dynamics software VI-Rail was used for numerical analysis. Passenger vehicle model and track models were created. Analysis of track gauge influence on vehicle model stability is main aim of this paper. But analysis of possibility to adopt the method worked out earlier to the newly used numerical code and model of 4-axle vehicle is the aim either.

Petro Horbachov, Stanislav Svichynskyi

### **Dependence of trip length frequency distribution on characteristics of route network elements**

The up-to-date methods of the demand modelling for municipal public transport (MPT) services are not perfect and they require an objective estimation, enhancement and improvement. These refinements are to take into account the functions of population allocation in modern cities. The possibility of the definition of population allocation functions on the basis of characteristics of public transport stops allocation, the regularities of distances between adjacent stops and distances between a pair of stops are investigated.

Marianna Jacyna, Jerzy Merkisz

### **Proecological approach to modelling traffic organization in national transport system**

The paper presents a general approach to modelling traffic organization within the network of national transport system and with taking into account environmental aspects. General description of the model and necessary data for modelling are presented. The exact mathematical formulation of constraints and criteria functions assessing quality of traffic organization and taking into account level of emission of harmful compounds of exhaust gases are provided. The assessment of traffic organization in transport network is made in aspect of programming transport system development in ecological terms. Particular attention was paid to technical and ecological features of infrastructure and means of transport. What is important, model uses emission indexes set in real traffic conditions. The example of multi-variant distribution of freight traffic into the transport network is provided. Example was

prepared with regard to environmental factors in simulation modelling tool EMITRANSYS developed in PTV VISUM.

Marek Karkula

### **Selected aspects of simulation modelling of internal transport processes performed at logistics facilities**

The transport is an important part of logistic systems. Improper management of transport operations may contribute to the low level of the usage of vehicles and to high transport costs, as well as to the formation of unnecessary high inventory at each location of storage, as well as prolonged time of order realization and not full use of company capacity. It is therefore important the appropriate dimensioning, planning of the transport system and performed transport operations so as to allow the supply of certain goods at the right time and the amount to the appropriate points of the system. The article presents the methods of transport operations modelling, taking into account different criteria based on discrete event simulation. In the article the case study of modelling transport operations in the small cross-docking centre is also presented.

Rafał Kucharski, Guido Gentile

### **Direct observation of rerouting phenomena in traffic networks**

In this paper we propose how available dataset can be used to estimate rerouting phenomena in traffic networks. We show how to look at set of paths observed during unexpected events to understand the rerouting phenomena. We use the information comply model [1] and propose its estimation method. We propose the likelihood formula and show how the theoretical and observed rerouting probabilities can be obtained. We conclude with illustrative example showing how a single observed path can be processes and what information it provides. Contrary to parallel paper [2] where rerouting phenomena is estimated using real traffic flow measures from Warsaw, here we use only synthetic data. The paper is organized as follows. First we elaborate on rerouting phenomena and define the traffic network, then we summarize the literature behind rerouting phenomena. We follow with a synthetic definition of dynamic traffic assignment needed to introduce ICM model in subsequent section. Based on that introduction we define the observations and propose estimation method based on them followed by illustrative example. Paper is summarized with conclusions and pointing of future directions.

Michał Maciejewski

### **Benchmarking minimum passenger waiting time in online taxi dispatching with exact offline optimization methods**

This paper analyses the use of exact offline optimization methods for benchmarking online taxi dispatching strategies where the objective is to minimize the total passenger waiting time. First, a general framework for simulating dynamic transport services in MATSim (Multi-Agent Transport Simulation) is described. Next, the model of online taxi dispatching is defined, followed by a formulation of the offline problem as a mixed integer programming problem. Three benchmarks based on the offline problem are presented and compared to two simple heuristic strategies and a hypothetical simulation with teleportation of idle taxis. The benchmarks are evaluated and compared using the simulation scenario of taxi services in the city of Mielec. The obtained (approximate) lower and upper bounds for the minimum total passenger waiting time indicate directions for further research.

Yuri Palagin, Alexander Mochalov, Alexey Timonin

### **Mathematical modelling and parameters calculations in multimodal freight terminal networks**

There are presented the mathematical models, routing algorithms and calculation algorithms for cargo flows in transport-terminal road-air-railways networks of multimodal transport operators.