

Abstract of doctoral thesis
„Synchronization of intervals in public urban transport”

Author: Jakub Oziomek, MSc., Eng

Supervisor: Andrzej Rogowski, PhD, DSc

The aim of the dissertation was to develop an algorithm of synchronization of intervals in urban public transport ensuring regular running of vehicles moving to the same direction also in the case of different number of communication bundles and different intervals of communication lines and thus, the improvement of time availability in public urban transport.

In this dissertation, the following assumptions were made:

- all sizes are of deterministic type,
- the set of communication lines is given,
- on each communication line a lot of different route variants can be defined,
- the set of running periods is given, among which peak hours and pre-peak hours are specified,
- the earliest possible departure times from start stops are known,
- the travel times between stops in each running period are known,
- the intervals of communication lines in each running period are known,
- the travel times between stops and the intervals of communication lines can prove changeable in particular running periods,
- set theory as well as computer simulation methods will be used,

An implementation of the aim of the dissertation was made in a lot of stages. First mathematical models for the bus urban network, the communication line and the communication bundle were built and then, all characteristic parameters for the lines and the bundles were defined. Next step was to stipulate the conditions regarding the existence of synchronization of trips in the bundles, which allowed to build an objective function for the problem of synchronization of intervals. To solve this problem, it was necessary to develop three algorithms, namely: brute force, random search and beam search. Each of

13.04.2018



them was implemented in *Lazarus* development environment, which finally allowed to verify the model and the algorithms for the real urban transport network in Ostrowiec Świętokrzyski.

The dissertation consists of seven chapters and three appendices. The first three chapters include a short introduction to the problem of synchronization of intervals, an analysis of knowledge and the purpose and the scientific thesis of the dissertation. The fourth chapter contains the description of the urban transport network and its components. The fifth chapter consist of characteristic of the communication line and the communication bundle. In the sixth chapter, an approach to the problem of synchronization of intervals was discussed. In the seventh chapter, the algorithms finding solution to the problem of synchronization of intervals were developed. In the eight chapter, the verification results of the mathematical model and the algorithms were presented. The last chapter contains the conclusions, further research and a proof of the dissertation thesis, namely: ***synchronization of communication lines for different number of communication bundles and different intervals, which provides a regular running of public transport vehicles is possible.***

13.04.2013

A handwritten signature in blue ink, appearing to read 'Jan Ojeda'.