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Public transport traffic management systems simulation in Craiova city

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Abstract

Urban transport is a comprehensive and dynamic mechanism. Therefore, all the problems for improving and reorganization of the system can be examined only in the light of a systemic approach. Currently, public passenger transport is one of the most important branches of the urban development in cities and metropolis. Public passenger transport activity and all the steps taken to improve that activity are considered to be of great social importance. In the current stage of city development, one of the main tasks is to create a public passenger transportation system that is safe, affordable, economical, reliable and environmentally friendly. The important role of passenger transport in the city's economy and achieving important social services to the population, dictates the need to introduce measures in the system that are harmonious, balanced and effective. This can only be done, in the context of current development, only after the system as a whole is tested extensively through special traffic and management software.

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1. Introduction

The population mobility that is traveling in public urban transport can be considered as the number of trips by public transport in relation to city residents during the year [1], according to the relationship:

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$$M\_tr = Q/N\_pop \quad (1)$$

where:

- Q - is the number of passengers transported during one year, in thousand passengers;
- N_{pop} - urban population, thousand persons;

The formula offers the possibility (taking as input No. of trips / passenger / year) to determine the opportunity to modernize the public transport with minimum inconvenience [2]. It is extremely difficult to take into account a whole city: transport, freight vehicle, personal vehicles, traffic behaviour, traffic lights, road surface quality, the geometry of streets and intersections, angles of vision, pedestrians, etc [2, 3]. We can put the problem in the following way: if you change a bus stop after an intersection according to the theory of complex systems my nonlinear dynamic system will present a instability phenomenon called the sensitivity to initial conditions, so that relatively long-term repercussions (although complying with deterministic laws) is unpredictable.

An important aid in order to achieve an optimization of public transport at an entire city as well at an intersection (which will take into account multiple factors which belong at the city level) are modelling and simulation software's for road transport [4].

2. Context

2.1. Simulation and modelling of the public transport in Craiova

Since the trend in Europe and worldwide is to discourage individual road transport in favour of public transport, the necessary measures to increase the attractiveness of the latter needs to be much more obvious, especially effective in this regard (increase comfort, traffic safety, insurance transmission capacity while ensuring an appropriate degree of regularity etc.).

In light of these problems the objectives of this paper are the following [5]:

- Create a virtual model of the main arteries of Craiova
- Modelling the current situation of the public transport in the Craiova city's main arteries
- Green light for public transport in areas where street network allows

2.2. Virtual model

Critical-lane analysis compares actual demand flows in a single lane with the saturation flow rate and capacity of that lane. Critical-lane group analysis compares actual flow with the saturation flow rate and capacity. Where several lanes operate in equilibrium the lane group is treated as a single entity [1, 3]. Whether individual lanes or lane groups are used, the mathematic model ensures that the ratio of v to c based on an individual lane is equal to the ratio of v to c of the entire lane group.

To realize a virtual transport network for the city of Craiova we used a simulation and modelling program called Aimsun. Based on current research on public transport in Craiova was concluded that modelling the entire city is not required, since most activity transport routes of the city is developed (by intersecting and overlapping) on the main roads [6]. Due to this thing we modelled in Aimsun only the city's main transport networks (which confound with the main arteries) so virtual system consisting of 85 km long section, 139 km long lane, 762 sections, 269 junctions, 55 centroids, 103 stations for public transport (Figure 1).