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# Analysis of the intersection throughput at changes in the traffic flow structure

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**Abstract**

The paper addresses the throughput of an urban signalized intersection when the traffic flow structure varies widely. In the course of the study, data were collected from a street CCTV camera tracking traffic flows at a single intersection. At the preliminary step during the analysis of the dynamics of vehicles passing the intersection when leaving the queue that formed in front of the red light, it was found that it significantly changes for different types of vehicles. Therefore, the next step was to develop a statistically significant mathematical model of the intersection throughput as a multiple regression equation including all vehicle types under consideration. This model gave us various predictive estimates with the traffic flow structure varied. To obtain a visual representation of the results, we tested a model of category-based traffic flow at the intersection, built on the basis of fuzzy logic methods. This model allowed us to estimate the intersection throughput depending on some uncertain traffic flow factors in a graphic 3D view. The study was oriented towards the development of an algorithm to analyze the time required for a heterogeneous queue of vehicles to pass the intersection in real time. The algorithm can be used in intelligent transportation systems, in particular, in problems related to uninterrupted traffic of unmanned vehicles. The models considered may serve as a good basis for justified decisions on improving the vehicle-to-infrastructure communication (V2I).



*Keywords:* signalized intersection; vehicle categories; intersection passing time; mathematical modeling of the traffic flow; fuzzy logic methods.

## 1. Introduction

Analysis of traffic flows is essential for urban planning and road transport infrastructure management. Prediction of the traffic flow state is a key component of intelligent transportation systems (ITSs), which has attracted large

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