

*UNIWERSYTET TECHNOLOGICZNO – HUMANISTYCZNY*

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*WYDZIAŁ TRANSPORTU I ELEKTROTECHNIKI*

## **ROZPRAWA DOKTORSKA**

# Metoda wyznaczania drogi dla przejazdu pojazdu uprzywilejowanego

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## **The method of determining the way for the passage of the privileged vehicle**

### **Abstract**

In the doctoral dissertation a method of appointing 'a green line' is presented for the passage of the privileged vehicle through the sequence of controlled by the traffic lights crossings based on the signal determining its position, appointed by the GPS system.

The first chapter presents current state of knowledge in domestic and foreign literature concerning road traffic control. Motivation and predicted effects were also described as well as the purpose, the scientific thesis and assumptions.

In the second chapter the aim of applying traffic lights, their kinds are presented but also priorities in road traffic for the means of public transport. It describes the Intelligent Transport System in Poland that takes advantage of the state of signal precedence which may be used for the passage of privileged vehicles. The properties of chosen algorithms used for the control of the traffic lights and the disintegration of the traffic on the tested road crossroad and its influence on the transport network in the city are described.

The third chapter presents the way of using satellite navigation system to locate the privileged vehicle driving through the crowded urban agglomeration, the cooperation of the GPS system and PLC drives controlling traffic lights for the purpose of their synchronization and providing information on the position of the oncoming privileged vehicle.

The fourth chapter carries out the review of PLC drives used to control road crossroads in Poland. It describes the structure, the rules of operation, the ways of programming and the average errors of PLC drives.

In the fifth chapter the analysis of a few chosen probability distributions is made, the verifications of their parameters to choose distribution for further research are carried out, the frequency distribution of events in the passage of a privileged vehicle on the tested road unit on the basis of Poisson schedule is presented, the value of expectations is calculated, the graph for the step function of the passage is appointed, the density of the passage on the certain route is determined, the chosen characteristics of a random variable are depicted.

The sixth chapter shows the Cars' Bridge designed on the basis of the safe author's algorithm for appointing 'green line' in the passage of a privileged vehicle based on the signals received from GPS system. The results of measurements in the real passage of a privileged vehicle on the tested road unit are depicted. It determines and presents a temporal computational complexity of the author's algorithm, its noise resistance and errors of modelling.

The seventh chapter presents constructed on the basis of PLC drives test stand that controls 'green-yellow-red' signals on the intersections used for the verification of the stimulus tests. It describes the author's program for a drive that enables to apply master signal for the passage of a privileged vehicle based on the received information concerning the position of the privileged vehicle. This chapter also presents stimulus verification of the adopted algorithm in the VISSM environment as well as the simulation of road parameters for the priority in transport.

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