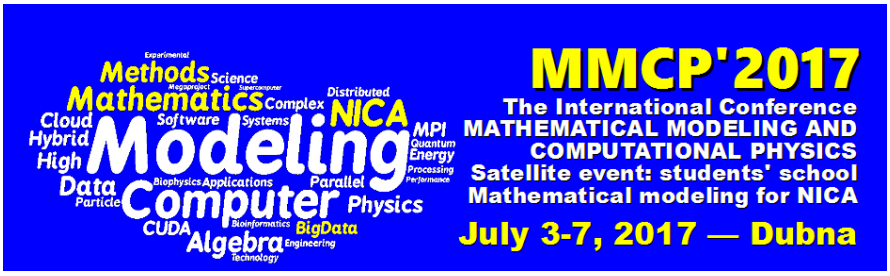

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Multilane traffic flow modelling using cellular automata theory

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The paper deals with mathematical modelling of traffic flows on urban road networks. The presented model relates to microscopic approach, i. e. each car is considered separately and is described by its own set of parameters.
The model is based on cellular automata theory and presents generalization of Nagel-Schreckenberg model [1] to a multilane case [2]. The computational domain is a 2D lattice, where two directions correspond to road length and width. A number of cells in the transverse direction corresponds to a number of lanes. Each cell of the lattice can be either empty or occupied by one vehicle. This approach allows vehicles to change lanes and to overtake one another. The algorithm of cell state update is formed by two components: lane change (if it is necessary and possible), movement along the road by the rules of Nagel-Schreckenberg model.
Numerical realization of the model is represented in a form of the program package CAM-2D, that consists of two modules: User Interface and Visualization module (for setting initial conditions and modelling parameters and calculations visual representation) and Computation module (for calculations).
Computations are carried out for each element of the road (i. e. T or X type intersection, strait road fragment) separately and in parallel, that allows performing calculations on various complex road networks.
Computations show that CAM-2D can be used to set up optimal traffic lights regimes on complex road fragments. Besides that, the program package allows to predict the consequences of various decisions regarding road infrastructure changes, such as: number of lanes increasing/decreasing, putting new traffic lights into operation, building new roads, entrances/exits, road junctions.

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REFERENCES:
[1] [1] K. Nagel, M. Schreckenberg, A Cellular Automation Model for Freeway Traffic. J. Phys. I France, Vol.2, p. 2221 (1992)
[2] Antonina Chechina, Natalia Churbanova and Marina Trapeznikova, Different Approaches to the Multilane Traffic Simulation // Traffic and Granular Flow '13, M. Chraibi et al. (Eds.), Springer, pp. 361-368 (2015)

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