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ABSTRACT SUBMISSION

Title: Quantitative analysis of interaction range in vehicular flows

Abstract No. 0873

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Objectives Generally, traffic systems represent granular ensembles whose intelligent agents interact with a certain set of their neighbors. Is, as supposed in most recent traffic models, such an interaction short-ranged? Or, on contrary, a chosen agent interact with more his neighboring agents. The main objective of our topic is to decide (by means of mathematical theory of the statistical rigidity) of how many closest cars influence the decision making procedure of a driver.

References:

- M. Krbálek and D. Helbing, Determination of interaction potentials in freeway traffic from steady-state statistics, *Physica A* 333 (2004), 370
- M. Krbálek and P. Šeba, Spectral rigidity of vehicular streams (Random Matrix Theory approach), *J. Phys. A: Math. Theor.* 42 (2009), 345001
- M. Krbálek, Theoretical predictions for vehicular headways and their clusters, *J. Phys. A: Math. Theor.* 46 (2013), 4451011
- M. Krbálek and J. Šleis, Vehicular headways on signalized intersections, *J. Phys. A: Math. Theor.* 48 (2015), 015101

Data and methodology We will introduce mathematical methodology for deciding how many succeeding cars influence the driver. The method is based on an analysis of the statistical rigidity in empirical traffic data and on a numerical scheme using one-dimensional non-equilibrium thermodynamics introduced in the previous papers of the speaker. Individual (vehicle-by-vehicle) data has been provided by the Road and Motorway Directorate of the Czech Republic.

Expected results We expect to demonstrate the sophisticated method analyzing the level of mutual interactions among two vehicles which are not neighboring. Correctness of our approaches will be supported by the mathematical analysis of the quantity called the spectral rigidity (see References above). Agreement between the model and traffic reality will be also a part of our presentation.

Approval Confirm

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Categories C. Traffic Management, Operations and Control

Session track C1: Traffic Theory and Modelling

Keyword1 mutual interactions in vehicular flows

Keyword2 statistical rigidity of particle ensembles

Keyword3 non-equilibrium thermodynamical modelling

Presentation Oral

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Registration Confirm