

Nov 2016 Complexity Community Sharing Session

8 Nov 2016 (Tue) 11:00am-01:00pm

Seminar Room 102

(opposite Learning Hub), Blk 1 Innovation Centre, Level 1
16 Nanyang Drive, Singapore 637722

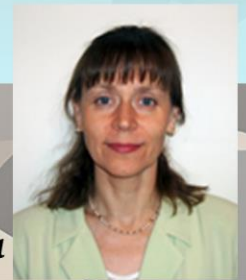


Dr. Valentin Melnikov

*MATSim scenario for Amsterdam:
data, approaches and simulation of the
massive power outage effect in
transportation*

Cities as complex systems can be severely affected by the critical events such as natural disasters or electricity failures. Transportation system of a city is one which cannot be managed manually in case of emergency and thus should be designed in a sustainable way to remain efficient in conditions of critical event. Traffic flow sensors in the Netherlands captured traffic flow characteristics during massive power outage in Amsterdam, which occurred on 27 March 2015 and lasted for more than 3 hours. Such data is a unique source of information able to reveal the impact of blackout on transportation systems. Combining analysis of this data and a full-scale agent-based traffic flow model of Amsterdam (600+ thousand agents), an approach of modeling of critical events impact on transportation systems has been proposed. I will describe the multiple data sources used in research, the travel demand model for Amsterdam urban area, results of Amsterdam traffic flows simulation in MATSim and their validation in normal and critical situations. Finally I will discuss possible future developments of traffic flows model as well as of blackout simulation approach, and formulate a framework for analysis of transportation systems in different scenarios.

Biography: Valentin Melnikov is now joining Complexity Institute as research associate in Cooler Calmer Singapore project. His Engineer degree from ITMO University, Russia (2009) is in Information Systems and Technologies, has a strong experience in web-based applications development. Obtained Masters in joint program of University of Amsterdam and ITMO University in Computational Science in 2016. His main sphere of scientific interests is interdisciplinary research and modeling and simulation of urban systems driven by big data.



Dr. Valeria V. Krzhizhanovskaya

*UrbanFlood flood early warning system:
data-driven modelling and anomaly detection by
machine learning methods*

I will present the flood early warning system developed within the UrbanFlood pan-European project [1]. The system monitors sensor networks installed in flood defenses (dikes, dams, embankments, etc.), detects sensor signal anomalies, calculates dike failure probability, and simulates possible scenarios of dike breaching and flood propagation. All the relevant information and simulation results are fed into an interactive decision support system that helps dike managers and city authorities to make informed decisions in case of emergency and in routine dike quality assessment. The focus of my talk will be on the anomaly detection methods for failure prediction [2] and on modelling levee stability and city inundation. For advanced research into dike stability and failure mechanisms, we developed the Virtual Dike finite-element computational module, which was also used for training the artificial intelligence module on signal parameters induced by dike instabilities [5]. The combination of finite element modelling with advanced data analysis of sensor measurements successfully predicted levee instability [3] and failure [4] a few days before the collapse – early enough for the maintenance services to reinforce the embankment slope.

Biography: Dr. Valeria V. Krzhizhanovskaya is an Associate Professor at ITMO University, Russia and a Senior Researcher at the University of Amsterdam (UvA), the Netherlands. Valeria holds a Ph.D. degree in Computational Science from UvA and M.Sc. in Applied Mathematics and Physics from St. Petersburg Polytechnic University. Valeria has been teaching university courses on Modeling and Simulation, Scientific Computing, Complex System Simulation, Scientific Data Processing, The Finite Element Method, and other courses in the field of computational science. She is an expert in simulation of multiscale complex systems, data-driven modelling, machine learning and artificial intelligence, decision support and early warning systems, high performance parallel and distributed computing on Grids and Clouds, problem solving environments and ICT. Valeria is an author of over 150 scientific publications, associate editor of the Elsevier Journal of Computational Science; organizer of the annual International Conference on Computational Science, Workshop on Multiscale Modelling and Simulation and ASME IDETC/CIE Symposia on Computational Multiphysics Applications; invited speaker in over 10 international conferences; co-organizer, program committee member and reviewer in over 30 conferences and 15 international journals; participated in over 60 conferences, coordinated work in 23 national and international projects and worked in over 30 projects.

Publication list in Google Scholar: <http://goo.gl/6DqYR>

Profile at the University of Amsterdam: <http://www.uva.nl/en/contact/staff/item/o.krzhizhanovskaya.html?#Krzhizhanovskaya>

Profile at ITMO University: <http://en.jpcc.ifmo.ru/staff/26/dr-valeria-v-krzhizhanovskaya>