You are invited to the 47th edition of the PRAGUE COMPUTER SCIENCE SEMINAR

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From nano to mega: Coordinating swarms of objects at extreme dimensions

The lecture will be followed by a discussion

February 27, 2020
4:15pm

Auditorium S5, MFF UK
Malostranské nám. 25,
Praha 1

ABSTRACT

Coordinating and reconfiguring arrangements of objects poses important questions at various dimensions, ranging from tiny particles all the way to far-away satellite swarms. Ironically, systems of these very small and very large distances share a fundamental property: It becomes difficult to use "external" computation, in which a powerful central computing device is provided with input about the system, and output is fed back into the system. Instead, it becomes important to consider "internal" computation, in which algorithms and execution remain within the system itself, even if that comes at the expense of processing power. Additional challenges arise from coordinating the parallel motion of larger and larger sets of objects in a globally efficient manner.

This talk will describe a variety of algorithmic approaches to coordination and reconfiguration. These are based on the work of our group and include: (1) Algorithmic aspects of "programmable matter", i.e., algorithmic methods for controlling structures that can change their physical properties (shape, density, moduli, conductivity, optical properties, etc.) in a programmable fashion. (2) Optimization methods for coordinated motion planning, in which a large swarm of objects needs to be reorganized in a minimum amount of time. (3) Distributed approaches for coordinating the downlink activities of satellite swarms with more than 1000 spacecraft.

Despite the practical motivations and applications, the talk will contain a fair amount of theory, in part controlled by feedback from the audience.

ABOUT THE PRAGUE COMPUTER SCIENCE SEMINAR

The seminar takes place once a month on Thursdays at 4:15pm (except June to September, and December) alternately in the buildings of Faculty of Electrical Engineering, Czech Technical University in Prague, Karlovo nám. 13, Praha 2 and Faculty of Mathematics and Physics, Charles University, Malostranské nám. 25, Praha 1. Its program typically consists of a one-hour lecture followed by a discussion. The lecture is based on an (internationally) exceptional or remarkable achievement of the lecturer, presented in a way which is comprehensible and interesting to a broad computer science community. The lectures are in English.

Sándor Fekete holds the chair for Algorithmics at the Department of Computer Science, Braunschweig University of Technology in Germany. From 2011-2019 he was also director of the interdisciplinary Research Center for Informatics, Information Technologies and Digitalization (TUBS.digital). Having received his Ph.D. in mathematics from the University of Waterloo in Canada, he has held positions at the University of Cologne, SUNY Stony Brook and TU Berlin. His research interests range all the way from theoretical foundations of algorithms and optimization (with a focus on geometric and distributed methods) to application areas such as practical computer science, electrical engineering, economics, biology and physics, leading to about 250 peer-reviewed publications with about 250 different coauthors.

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