

Colloquium: Modeling Traffic on Networks as Complex Dynamical System

Abstract

Complex structure of networks may affect the dynamic processes on them in different ways, depending on the topological elements. On the other hand, the dynamical interactions between agents in different environments may be mapped onto networks, whose structure is varying in time. In both cases, numerical modeling offers a way to unravel structure-dynamics interdependences, specifically how the dynamical rules working at local level lead to emergent global behaviors.

In this talk we present a numerical model of traffic of information packets, which includes minimal rules with search and queuing, and show a number of simulation results with the emphasis on the collective dynamical phenomena. We also demonstrate how the modified microscopic rules of this model can be used to study queuing and jamming effects in city traffic and identify dynamically distinct subgraphs. Using similar methodology we analyzed data-driven networks from Blogs.

Monday, November 9th 2009
4 pm, presentation-room
B4 .1.114, Lakeside Labs.



Biography

Prof. Dr.
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Education:

Diploma in Physics, 1974, Belgrade University, Belgrade/Serbia (Hons.)

M.Sci. Degree in Physics, 1977, Belgrade University, Belgrade/Serbia (Hons.)

One year: Laboratoire de Physique des Solides, Universite Paris Sud, Orsay/France

One year: Institute for Theoretical Physics, Eotvos University, Budapest/Hungary

Ph.D. in Physics, 1980, Belgrade University, Belgrade/Serbia (Hons.), Thesis title: Phase Transitions in Disordered Magnetic Systems and Spin Glasses

Employment:

Research assistant, Institute of Physics, Beograd: 1975-80

Postdoctoral research associate, Universitaet des Saarlandes, Saarbruecken: 1981-82

Research scientist at Associate professor rank, Institute of Physics, Beograd: 1982-86 and Jožef Stefan Institute, Ljubljana: 1987-88

Visiting scientist, Jožef Stefan Institute, Ljubljana: 1984-85

Research scientist, Technische Universitaet Muenchen, Garching: 1985-86

Research scientist at associate professor rank, Jozef Stefan Institute, Ljubljana: 1988-1998 and Institute of Physics, Beograd: 1991-92

Research scientist at full professor rank, Jozef Stefan Institute, Ljubljana: 1999-present

Current Research Interests:

Numerical Modeling of Gene Expression and Regulatory Networks; Transport Processes on Complex Graphs; Statistical Physics of the World-Wide Web and Other Complex Networks; Cellular Automata Models, Anomalous Diffusion & Coupled Chaotic Maps; Dynamic Phase Transitions; Self-Organization & Emergent Properties in Nanostructures; Driven Disordered Systems: Barkhausen Noise in Ferroelectrics, Ferromagnets and Nano-Materials

Publications:

Over 90 publications in international journals such as Physical Review Letters, Physical Review A, B and E, European Physical Journal B, Physica A, Fractals, International Journal of Bifurcation and Chaos, New Journal of Physics, Journal of Statistical Physics Theory and Experiment; Two review articles and Book chapters by invitation; Publications cover various topics in modern Statistical Physics from Renormalization group theory of Critical Phenomena, Classical and Quantum Spin-Glasses, to numerical simulations of Driven Disordered Systems, Cellular Automata, Transport Processes on Complex Networks, Theoretical and Data-driven Network Modeling.