AKSOE 11 Social, Information and Production Networks II

Zeit: Dienstag 14:00–16:00 Raum: TU P-N203

AKSOE 11.1 Di 14:00 TU P-N203

Complete decomposition of communication patterns social networks: an approach based on complex Hermitian adjacency matrices — •Bettina Hoser and Andreas Geyer-Schulz — Lehrstuhl f. Informationsdienste u. elektronische Märkte, Universität Karlsruhe (TH), Zirkel 2, 76131 Karlsruhe

In this paper the method of eigensystem analysis of complex Hermitian adjacency matrices is used to describe asymmetric communication patterns in social networks. As an example a well known data set (EIES data set) is analyzed.

The eigensystem of the complex Hermitian adjacency matrix is such, that it offers a decomposition of the original matrix into all detectable patterns and groups. The eigenvalues represent the relative amount of traffic volume being communicated in a pattern, while the sign of the eigenvalue helps to identify patterns that exist within a subgroup and as well as between this subgroup and the rest of the network. The distribution of eigenvalues yields information about the overall structure of communication.

The absolute value of the eigenvector components give information about the relevance of different network members within any of the detected patterns. The phase information of the eigenvector component gives the additional information about directional preference of communication in that pattern.

Also an outlook on other applications will be given. Preliminary results show that forecasting markets, like political stock markets, can be analyzed in structure as well as prognostic quality by this method.

AKSOE 11.2 Di 14:30 TU P-N203

Selfish vs. Unselfish Optimization of Network Creation — •Johannes J. Schneider[1] and Scott Kirkpatrick[2] — [1]Institute of Physics, Johannes Gutenberg University of Mainz, Staudinger Weg 7, 55099 Mainz, Germany — [2]School of Engineering and Computer Science, The Hebrew University of Jerusalem, Givat Ram, Jerusalem 91904, Israel

In the last few years, many properties of the Internet have been detected which are not found in simple random networks. The question arises which basic mechanisms lead to this structure of the Internet. In fact, the Internet appears to be a "game", in which many independent agents manage its components to suit their own needs, e.g., by buying and selling links. In the "network creation" model [1], agents have to buy links in order to establish a network for sending messages to each other. Buying each link costs a constant amount, α, sending a message costs the minimum number of hops between sender and receiver. Depending on the value of α and on the allowed behaviors of the agents, we get to different types of networks created with this model [2].

[1] A. Fabrikant, A. Luthra, E. Maneva, C. H. Papadimitriou, and S. Shenker, *On a Network Creation Game*, PODC Proceedings, 2003, 347-351.

[2] J. J. Schneider and S. Kirkpatrick, *Selfish vs. Unselfish Optimization of Network Creation*, submitted to J. Stat. Mech.

AKSOE 11.3 Di 15:00 TU P-N203

Analysis of self organized scale-free networks in presence of merge and split processes — •Roman Faber, Klaus Dragosits, and Stefan Turnher — Complex Systems Research Group, HNO, Meduniwien, Währingerstr. 18-20, A-1090 Wien

Merging of nodes within networks is one of the most interesting alternatives to obtain scale-free networks in growth models. An analysis of this issue was recently published by Trusina et al. We used this work as starting point to analyze the impact of node splitting on the properties op these networks.

The process of merging selects at chosen intervals of points in time one random node and merges this node either with one of its neighbors or with another random node. At separately chosen time intervals nodes with highest degree are split into uniformly or randomly distributed parts thereby balancing system size by compensating the loss of nodes in merging.

We analyze the effects of the rate of splits on the power-law behavior of the degree distribution. Overall, we observe an eventual breakdown of the scale-free behavior.

AKSOE 11.4 Di 15:30 TU P-N203

Multi-Goal Control in Supply and Production Networks — •Stefan Lämmer — University of Technology Dresden, A.-Schubert-Str. 23, 01062 Dresden, Germany

Supply networks consist of many manufacturing and distribution organizations, interconnected by the flow of information, money and goods. Each organization has a number of functions, specializing in the flow of typically more than one kind of product. A low inventory of one product may call for an increase in the production rate, but the warehouse for another product, which is generated at the same time, may be already full. Recent supply network models indicate that the network of material flow can itself be a source of instability, and oscillatory variations are an inherent feature of decentralized adjustment processes. We conjecture that multi-goal control of production networks may imply additional sources of dynamical instabilities and that some of the problems may be solved by price adjustments, which can influence the consumption rates.