AKSOE 4 Social-, Information-, and Production Networks I

Time: Monday 16:00–18:00 Room: BAR 205

AKSOE 4.1 Mon 16:00 BAR 205

Does human knowledge live in a small world? — •Dirk Graudenz — Hagenau 61, 22089 Hamburg

I study the link structure of the online encyclopedia Wikipedia, i.e. the network consisting of Wikipedia articles as vertices and references between articles as network links. The analysis has two parts: (a) a study of the statistical and topological properties of the network, in order to gain insights into whether the network is a small world, and (b) an exploration of the community structure of the network with the goal of defining a taxonomy of human knowledge through an automated process.

AKSOE 4.2 Mon 16:30 BAR 205

Credit Chains and Bankruptcies Avalanches in Production Networks — •Stefano Battiston[1], Domenico Delli Gatti[2], Mauro Gallegati[3], Bruce Greenwald[4], and Joseph E. Stiglitz[4] — [1]Chair of Systems Design, ETH Zurich, CH-8092 Zurich, Switzerland — [2]Univ. Cattolica, Milan, Italy — [3]Univ. Polit. d.le Marche, Ancona, Italy — [4]Columbia University, New York, USA

We present a simple model of failure propagation on a network of firms linked by supply-customer relationships and trade credit relationships. Our aim is to identify the minimal ingredients to simultaneously produce on one hand the main facts of firm demography (like broad distribution of firm size) and, on the other hand, some occasional spontaneous avalanches of defaults accompanied by sudden drops of the total output of the economy. As opposed to previous models in which there is no firm-firm interaction and avalanches result from a global coupling through interest rate and alike, here avalanches are due to the dependence of the output of each firm on delivery from suppliers and payments from customers. In the simplest version of the model, the network has a regular and static structure, but we also investigate which structures are more robust against domino effects and which ones emerge spontaneously in a network evolution. We also discuss under which conditions the system is susceptible to self-organize in a critical state in which small perturbations trigger re-adjustments of trade credit relationships on a long range.

AKSOE 4.3 Mon 17:00 BAR 205

Self-Assembling of Information in Networks — •Martin Rosvall[1,2] and Kim Sneppen[2] — [1]Department of Theoretical Physics, Umeå University, 901 87 Umeå, Sweden — [2]Niels Bohr Institute, Blegdamsvej 17, Dk 2100, Copenhagen, Denmark

Communication is essential in systems ranging from human society to mobile telephone- and computer networks. It enables parts of a system to build a global perception, and thereby makes it possible for these parts to overcome the information horizon set by their immediate neighbors. We mimic real-world situations to investigate what limits the local generation of this global perception of the network from multiple communication events. Our approach is to let agents chat in a model system to self-organize distant communication path-ways, and thereby make use of the typical small-world properties of networks. We demonstrate that simple local rules allow agents to build a perception of the system that is robust to dynamical changes and mistakes. In this minimalistic model, we find that messages are most effectively forwarded in the presence of hubs with funnelling, like in scale-free networks, while transmission in hub-free networks is more robust against misinformation and failures.

AKSOE 4.4 Mon 17:30 BAR 205

The Democracy-Ochlocracy-Dictatorship Transition in the Sznajd Model — •Johannes J. Schneider[1] and Christian Hirtreiter[2] — [1]Institute of Physics, Johannes Gutenberg University of Mainz, Staudinger Weg 7, 55099 Mainz, Germany — [2]Institute of Organic Chemistry, University of Regensburg, Universitätsstr. 31, 93053 Regensburg, Germany

Since its introduction in 2000, the Sznajd model has been assumed to simulate a democratic community with two parties [1]. The main flaw in this model is that a Sznajd system freezes in the long term in a non-democratic state, which can be either a dictatorship or a stalemate configuration. Here we show that the Sznajd model has better to be considered as a transition model, transferring a democratic system already at the beginning of a simulation via an ochlocratic scenario, i.e., a regime in which several mobs rule, to a dictatorship [2], thus reproducing the corresponding Aristotelian theory [3].

[1] K. Sznajd-Weron and J. Sznajd, Int. J. Mod. Phys. C **11**, 1157 (2000).
[2] J. J. Schneider and Ch. Hirtreiter, Physica A **353**, 539 (2005).
[3] Aristoteles, Politica.