AKSOE 4: Dynamics of Groups and Organizations II

Time: Monday 14:00–16:00 Location: EW 203

AKSOE 4.1 Mon 14:00 EW 203

Two case studies of the Hirsch index and some of its variants — •Michael Schreiber — Institut für Physik, Technische Universität Chemnitz

The h-index was introduced by Hirsch to quantify the impact of the publications of a scientist by measuring the number of citations. I present an analysis of two data sets, one for 8 famous physicists and another [1,2] for 26 not-so-prominent colleagues. Difficulties with the determination of the index and its interpretation are discussed. In addition the influence of self-citations is analyzed. Some variants of the index are investigated. A new modification is suggested in order to take the number of co-authors appropriately into account. By means of this new m-index it is possible to attribute the fame for multi-authored manuscripts in a fair way.

[1] M. Schreiber, EPL 78 (2007) 30002
[2] M. Schreiber, Ann. Phys. (Leipzig) 16 (2007) 640

AKSOE 4.2 Mon 14:30 EW 203

Slower-is-faster: Enforcing consensus formation by heterogeneous inertia to change opinion — Hans-Ulrich Stark, Claudio Juan Tessone, and •Frank Schweitzer — Chair of Systems Design,ETH Zurich, Switzerland

In this paper, we investigate the role of a certain heterogeneity in an extension of the voter model. In our model, voters are equipped with an individual inertia to change opinion which depends on the persistence time of a voter's current opinion. We focus on the simplest scenario, where there are only two different inertia values present in the system: zero if a voter just adopted its current opinion and ν otherwise. In this way, voters change their individual behavior over time and the system builds up heterogeneity. The unexpected outcome of this dynamics is a non-monotonous development of average consensus times T_κ on the value ν. Up to a value ν_c, T_κ decreases systematically with increasing ν, i.e. systems with higher average inertia reach the final attractor state faster. For inertia values larger than ν_c, consensus times increase and can exceed the reference time of the voter model. These results are obtained only by considering a heterogeneity of voters that evolves through the described ageing of the voters, as we find monotonously increasing consensus times in a control setting of homogeneous inertia values. In the paper, we present the dynamical equations for the mean-field case, that give insight into the complex dynamics leading to the observed slower-is-faster effect.

AKSOE 4.3 Mon 15:00 EW 203

Surrounding of clusters in a one-dimensional system — •Julian Sienkiewicz and Janusz Holyst — Faculty of Physics, Warsaw University of Technology, Poland

We investigate evolution of a system consisting of randomly added two-state objects e.g. spins or group members having one of the two opinions. Our numercial and analytical calculations show that even a simple one-dimensional model (a chain of N nodes) provides interesting results. The system's dynamics is described as follows: in each time step we add a spin with opposite value at a random, not occupied node in the chain until there is no space left in the chain. If after the addition of a new spin, there is a cluster (n consecutive spins with the same sign) surrounded by two spins of the opposite sign - the spins in the cluster are turned inactive. Those nodes no longer interact with the rest of the chain. In the investigated system the critical density - the moment at which the first blocked spin appears vanishes in the termodynamical limit (N goes to infinity). The rescaled number of the blocked nodes Z/N increases with the rescaled time t/N as $(Z/N) \sim (t/N)^\gamma$ with γ exponent close to 3. We believe that the future generalization on other structures (2D, 3D and arbitrary complex network) can be used to model the process of one community being surrounded by another one.

AKSOE 4.4 Mon 15:30 EW 203

Parameter Estimation for Stochastic Models of Interacting Agents: An Approximate ML Approach — •Thomas Lux — University of Kiel

Simple models of interacting agents can be formulated as jump Markov processes via suitably specified transition probabilities. Their aggregate dynamics might then be analyzed by the Master equation for the change of the probability distribution over time, or the Fokker-Planck equation that is obtained by a power series expansion and governs the probability distribution for fluctuations around an equilibrium. With such information on the transient density of the process, maximum likelihood estimation of its parameters becomes feasible. Even if the Fokker-Planck equation can not be solved explicitly, one can resort to numerical approximations like the Crank-Nicolson method for approximate ML estimation. We explain this algorithm with a simple model of interacting agents and show that the approximate ML procedure works well and has desirable accuracy even in the case of bimodal limiting distributions. We illustrate possible applications by estimating the parameters of this model for a popular business climate index for the German economy showing that the pronounced ups and downs of the survey expectations can be explained to a large extent by social interactions.