AGSOE 14: Poster Session

Time: Wednesday 18:00–20:00 Location: P1B

Note: Posters can and should be on display all day.

AGSOE 14.1 Wed 18:10 P1B

Extinction time of three-strategy cyclic coevolution in finite populations — •Markus Schütt[1] and Jens Christian Claussen[2,1] — [1]Theor. Phys. & Astrophys., CAU Kiel — [2]Neuro- und Bioinformatik, U zu Lübeck

In the limit of large populations, coevolutionary dynamics of interacting species (in biology) or strategies (of social individuals) is commonly described by the replicator equations of evolutionary game theory. In finite populations the microscopic dynamics however is a discrete stochastic process, based on such, fixation and extinction times of strategies can be calculated, see [1] for an introduction and overview. In finite populations, the $1/N$ corrections can be conveniently described by a Fokker-Planck equation which can lead to counterintuitive effects as a stability reversal ("drift reversal") in games between two populations [2]. In [3] we have shown analytically that such a drift reversal also is observed for a Rock-Papers-Scissors (RPS) game within one population, provided that the game is no longer zero-sum: *if the bank looses in the play, biodiversity of strategies is stabilized even in a well-mixed (nonspatial) population.* Here we investigate the extinction time for the non zero-sum RPS game. Its scaling with N changes between exponential (positive-sum RPS) and polynomial (zero-sum and negative-sum RPS) scaling, and is consistent with the results from the drift reversal picture.

[1] Martin Nowak, Evolutionary Dynamics, Harvard (2007).
[2] A Traulsen JC Claussen C Hauert, PRL 95, 238701 (2005)
[3] JC Claussen A Traulsen PRL 100, 058104 (2008)

AGSOE 14.2 Wed 18:10 P1B

Three-site cluster approximation for the evolution of adoption rules in Prisoner's Dilemma games — •Jeromos Vukov, Attila Szolnoki, and György Szabó — Research Institute for Technical Physics and Materials Science, P.O. Box 49, H-1525 Budapest, Hungary

We study spatial Prisoner's Dilemma games where the distribution of both the strategies and strategy adoption rules can evolve depending on the payoff differences between neighboring players. Players are located on the sites of a kagome lattice where the overlapping triangles support the spreading of cooperation. Choosing between unconditional cooperation and defection, the players gain their payoff from games with their neighbors. Each individual strategy adoption rule is characterized by a single (temperature-like) parameter describing how strongly the adoptions depend on the payoff-difference. If we start the system from a random strategy distribution with many adoption rules, the co-evolution of strategies and adoption rules drives the system to a final state where only one adoption rule remains. This adoption rule is in good agreement with the parameter value associated to the highest cooperativity in the region where cooperators and defectors coexist. The predictions of the three-site approximation agree very well with the results of Monte Carlo simulations. In this poster, we give a thorough overview about the method of this type of approximation.

AGSOE 14.3 Wed 18:10 P1B

Dynamics of supply chains under mixed production strategies — •Reik Donner[1], Kathrin Padberg[1], Johannes Höfener[2], and Dirk Helbing[3] — [1]TU Dresden, Andreas-Schubert-Str. 23, 01062 Dresden, Germany — [2]MPI-PKS, Nöthnitzer Str. 38, 01187 Dresden — [3]ETH Zürich, Universitätstr. 41, CH-8092 Zürich

We study the dynamics of material flows in supply chains under pull, push and mixed production strategies. For this purpose, a mathematical input-output model of commodity flows is generalized and analyzed in some detail for the case of linear supply chains. In particular, it is investigated under which conditions the effect of instabilities like the Bullwhip effect can be minimized. The presented results allow some new insight into the dynamics of manufacturing systems, which will be of importance for the development of new approaches for production planning and control.

AGSOE 14.4 Wed 18:10 P1B

Time series processing via independent component analysis and financial asset allocation — •Sergio Rojas — Physics Department, Universidad Simón Bolívar, Valle de Sartenejas, Edo. Miranda, Venezuela

A fundamental problem in time series analysis is to find suitable representation of the signals in terms of basis that could help in extracting useful information from the data and/or to provide a better appropriate representation of the observed signals for further analysis. Linear methods widely used for this purpose include the Fourier, Haar, and cosine transformations. In this work we will examine the implementation of the relatively new technique known as Independent Component Analysis, which is intended to find non gaussian statistically independent representations of time series. By means of synthetic data that reflect some of the structural features of financial time series (like stock prices) we will show the robustness and appropriateness of the aforementioned technique for analyzing noise, incomplete and irregularly sampled time series. After that, we will address the suitability of the technique to building diversified investment financial portfolios and its applications to risk management tasks.

AGSOE 14.5 Wed 18:10 P1B

Time Symmetric Monetary Systems — •Braun Dieter — Systems Biophysics, LMU München, Germany

With the current credit crisis, the problems of bank money creation is back in focus. We discuss criteria towards establishing monetary systems without money creation which still allow creditary dynamics. The ultimate aim is to develop a monetary system with an inherent mechanism of defining units of account.

The guiding principles will be the Noether theorem, linking the quantity of money with the time symmetry of monetary transactions, based on a physically inspired mapping between space-time and bookkeeping [1][2].

We propose a symmetric approach of balancing assets/liabilities of credits and assets/liabilities of deposits with a floating exchange rate. We show that under random transfer between agents, this system is stable and converges to a two-sided exponential distribution.

References:
[1] Physica A, 369, 714-722 (2006)
[2] Physica A 324, 266-271 (2003)

AGSOE 14.6 Wed 18:10 P1B

Car park management and train position monitoring based on magnetic imaging of vehicles — •Haibin Gao[1], Stefan Voit[2], and Uwe Hartmann[1] — [1]Physics Department, Saarland University, Campus, 66123 Saarbruecken, Germany — [2]Votronic GmbH, Saarbruecker Str. 8, 66386 St. Ingbert, Germany

Increasing traffic volume needs optimized traffic management for both economy and safety reasons. A car park guiding system is based on providing the real-time occupation of each parking lot. Efficient railway marshalling requires the actual train positions. Magnetic field detectors can be employed for vehicle position monitoring by means of magnetic profile measurement. Magnetoresistive sensors utilize the earth*s magnetic field as a bias field for detecting the presence of ferromagnetic objects, i.e., components of a vehicle. The passive method of sensing requires no energy to be emitted, thus minimizing both energy consumption and risk of electromagnetic interference. Furthermore, the compact size of the magnetoresistive sensors allows for versatile placement options. A car park employed with more than 100 magnetic detectors in each parking lot is used to demonstrate the application of magnetic detectors. Customers can obtain the unoccupied lots* positions via a large LED display. Other information like local news, time and commercial information can be presented simultaneously. Detectors were used to detect the actual train positions during railway marshalling process. They were buried underneath tracks to obtain magnetic profiles of passing locomotive and carriages. The results shows magnetic detectors can be applied in this field as well.

AGSOE 14.7 Wed 18:10 P1B

Synchronization in material flow networks with biologically inspired self-organized control — •Reik Donner[1], Stefan Lämmer[1], and Dirk Helbing[2] — [1]TU Dresden, Andreas-Schubert-Str. 23, 01062 Dresden, Germany — [2]ETH Zürich, Universitätstr. 41, CH-8092 Zürich

The efficient operation of material flows in traffic or production net-

works is a subject of broad economic interest. Traditional centralized as well as decentralized approaches to operating material flow networks are known to have severe disadvantages. As an alternative approach that may help to overcome these problems, we propose a simple self-organization mechanism of conflicting flows that is inspired by oscillatory phenomena of pedestrian or animal counter-flows at bottlenecks. As a result, one may observe a synchronization of the switching dynamics at different intersections in the network. For regular grid topologies, we find different synchronization regimes depending on the inertia of the switching from one service state to the next one.

In order to test the robustness of our corresponding observations, we study how the detailed properties of the network as well as dynamic feedbacks between the relevant state variables affect the degree of achievable synchronization and the resulting performance of the network. Our results yield an improved understanding of the conditions that have to be present for efficiently operating material flow networks by a decentralized control, which is of paramount importance for future implementations in real-world traffic or production systems.

AGSOE 14.8 Wed 18:10 P1B

Spontaneous ordering against external mass media in social systems — •Juan Carlos Gonzalez-Avella[1], Mario G. Cosenza[2], Victor M. Eguiluz[1], and Maxi San Miguel[1] — [1]IFISC (CSIC-UIB), Instituto de Física Interdisciplinar y Sistemas Complejos, Campus Universitat Illes Balears, E-07122 Palma de Mallorca, Spain. — [2]Centro de Física Fundamental, Universidad de Los Andes, Mérida, Mérida 5251, Venezuela.

We study the collective behavior of nonequilibrium systems subject to an external field modeled as mass media or propaganda with a dynamics characterized by the existence of non-interacting states. Aiming at exploring the generality of the results, we consider two types of models according to the nature of their state variables: (i) a vector model, where interactions are proportional to the overlap between the states, and (ii) a scalar model, where interaction depends on the distance between states. In both cases the system displays three phases: two ordered phases, one parallel to the field, and another orthogonal to the field; and a disordered phase. The phase space is numerically characterized for each model in a fully connected network. By placing the particles on a small-world network, we show that, while a regular lattice favors the alignment with the field, the presence of long-range interactions promotes the formation of the ordered phase orthogonal to the field.

AGSOE 14.9 Wed 18:10 P1B

Dominance in cooperation networks — •Marcus John[1], Miloš Jovanović[1,2], and Stefan Reschke[1] — [1]Fraunhofer Institut für Naturwissenschaftlich-Technische Trendanalysen, Euskirchen — [2]Heinrich-Heine-Universität, Düsseldorf

Cooperation between various partners (e.g. scientists, institutes or countries) is an important and characteristic attribute of the scientific community. It can be viewed in terms of a weighted network. In such a network some partners may be more dominant than others either due to their cooperation activity, scientific output, excellence or because of political and/or social processes. In this contribution we utilise a cooperation matrix C, where each element C_{ij} is the number of cooperation between two distinct partners i and j, for representing this network. The matrix is constructed by means of a bibliometric approach by analysing the publications of a set of partners. We derive and discuss various quantities, which we call *dominance factors*, for measuring the dominance within such a cooperation network. We further give some real world applications as examples and demonstrate that an appropriately chosen dominance factor is indeed able to mirror e.g. social or political processes, which affect a cooperation network and the dominance of its members.

AGSOE 14.10 Wed 18:10 P1B

Investigation of opinion poll data and election results in Germany and Great Britain — •Johannes Josef Schneider[1] and Christian Hirtreiter[2] — [1]Department of Physics, Mathematics, and Computer Science, Johannes Gutenberg University of Mainz, Staudinger Weg 7, 55099 Mainz, Germany — [2]Faculty of Physics, University of Regensburg, Universitätsstr. 31, 93053 Regensburg, Germany

Since many years, the Allensbach institute in Germany and a related institute in Great Britain performs an opinion poll each week, asking at least 1000 people the question "Which party would you vote for if there was an election next Sunday?"

We investigate these opinion poll data by means of time series analysis. The most prominent results for the German data are fat tails in the return distributions of the time series. Furthermore, we find that the election results for the Green party cannot be predicted at all by opinion polls. For the conservative and the social democratic party, we find that the opinion poll data agree the more with the election results, the closer the date of the opinion poll is to the election date [1]. Thus, the question arises whether an opinion poll long before an election provides any useful information at all. In this talk, we compare the results we found in Germany with corresponding data from Great Britain and focus on similarities with the time developments of price changes of assets traded at financial markets.

[1] J.J. Schneider and Ch. Hirtreiter, Int. J. Mod. Phys. C **19**, 441, 2008.

AGSOE 14.11 Wed 18:10 P1B

Distributing students optimally to universities — •Christian Hirtreiter[1], Johannes Josef Schneider[2], and Ingo Morgenstern[1] — [1]Faculty of Physics, University of Regensburg, Universitätsstr. 31, 93053 Regensburg, Germany — [2]Department of Physics, Mathematics, and Computer Science, Johannes Gutenberg University of Mainz, Staudinger Weg 7, 55099 Mainz, Germany

Since many years, the problem of how to distribute students to the various universities in Germany according to the preferences of the students remains unsolved. In a nowadays widely used approach, students apply for a place at various universities. The best students get then several acceptances, whereas some worse students fail everywhere. In the next step, the best students choose a place at their preferred university, such that places suddenly become free for students, who received a rejection in the first step and who now get an acceptance. This scheme is iterated several times, each time takes some weeks. Then the semester has already started before some students get the acceptance letter. But for some subjects, like medical science, students can lose a whole year by this way. The former way of distributing students was to apply for a place at some preferred universities at a central agency called ZVS (Zentralstelle für die Vergabe von Studienplätzen). However, due to a strange rule set, many students ended up at universities which were not in their preference list. In this talk, we show how the rules for distributing students could be changed easily in order to increase the fraction of satisfied students.

AGSOE 14.12 Wed 18:10 P1B

Epidemic dynamics on spatio-temporal networks: The Dengue fever host-vector bipartite network model — •Alejandro Mora[1,2], Jose Daniel Munoz[2], Fabio Correa[2], and Harish Padmanabha[3] — [1]Max-Planck Institute for the Physics of Complex Systems, Nöthnitzer Straße 38, 01187 Dresden Germany — [2]Simulation of Physical Systems Group, Departamento de Física, Universidad Nacional de Colombia, Cra 30 45-03, Ed. 404, Of. 348, Bogotá D.C., Colombia — [3]Florida Medical Entomology Laboratory, University of Florida, Florida, USA

Dengue Fever is a human arboviral disease which is transmitted by the domestic mosquito *Aedes aegypti* and constitutes one of the most widespread tropical diseases around the globe. The only way dengue fever virus can spread is the transmission from human to human via the mosquito. We present a *host-vector bipartite network* model for the spreading of the Dengue fever epidemics in urban areas. The simulated spatiotemporal system reveals rich dynamical behavior with epidemic thresholds, classes of phase transitions, and synchronization properties. The model is extended to include disease control/immunization strategies and analyzed within the adaptive networks conceptual framework. Validation of the model with field epidemiological data is discussed.