SOE 7: Poster

Time: Monday 18:00–20:00   Location: Poster B1

SOE 7.1 Mon 18:00 Poster B1

A Geonomic Reflection (Globalistics/Geonomics/Energetics) — •Stephen I. Ternyik — POB. 201 82043 Munich

A human social economy is, in historical and empirical terms, an evolving energy transduction system, i.e. there exists physically a cybernetic circuit of natural input—economic conversion—social output—financial transaction. Since 1989, we can observe a rapidly growing world exchange of natural resources and economic values in the global monetary economy. According to the geonomic calculation model, the following formula is used in the scientific discourse (Production/minus/Rent=Wages/plus/Interest; P-R=W+I); the (neo)classical model reads P=R+W+I. The geo-economic point of view is marked by the physical fact (Land Value) that the access to natural resources (e.g.energy)decides about the production/distribution of wealth, income and assets, i.e. the land monopoly on natural resources is reinforced by the monetary monopoly of private commercial banking (the inter-changeability of unlimited fiat money with limited natural resources of the earth; taxation remains focused on W and I, not on R). These artificial imbalances in economic book-keeping/accounting of human-nature-interaction have lead to globally unsustainable economic practices of production and exchange, i.e. the total costs of these accounting models are outnumbering the real global benefits, in terms of socio-economic and eco-logical consequences. An economic course correction can be achieved via the application of geonomic thought.

SOE 7.2 Mon 18:00 Poster B1

Influence of triadic motifs on the dynamics of epidemic networks — •Ilja Rausch, Marco Winkler, and Haye Hinrichsen — Institute for Theoretical Physics, University of Würzburg, Am Hubland, 97074 Würzburg, Germany

Networks have become an important tool for the analysis of a variety of dynamic systems such as financial markets, coupled oscillators or epidemics. Looking at structure properties such as clustering or overrepresentation of certain motifs can lead to new insights on how networks evolve in time. In our research we want to investigate how the occurrence of specific types of triadic motifs can influence the dynamics of disease spreading on Steiner Triple Systems. In order to model the infection spreading, we consider the *SIR model* where susceptibles (S) interact with the infected (I) at rate β and are removed (R) due to recovery or death at rate γ. We use numerical simulations and recently developed techniques such as Node Specific Pattern Mining (NoSPaM) and Z-core analysis to investigate the effect of overrepresented triadic motifs on the clustering coefficient and network output for different values of β and γ.

SOE 7.3 Mon 18:00 Poster B1

A co-evolutionary conceptual model of global pre-industrial societies — •Jan Nitzbon[1,2] and Jobst Heitzig[1] — [1]Potsdam Institut für Klimafolgenforschung — [2]Georg-August-Universität Göttingen

The evolution of the earth system cannot be described without the "human factor" anymore. Co-evolutionary modeling approaches thus aim at incorporating socio-economic dynamics of the society into the description of natural systems in order to obtain a more holistic picture of the world-earth system.

We present a conceptual, low-dimensional, deterministic model which describes the co-evolution of globally aggregated key observables of the earth system. These include natural variables such as atmospheric, oceanic and land carbon stocks, as well as socio-economic quantities such as population, economic output or wellbeing. The goal of the model study is to identify the dominant feedbacks in the coupled dynamics of the "ecosphere" and the "anthroposhere" and to get deeper insights into the underlying topology of these spaces.

In particular we investigated a simplified model scenario which describes pre-industrial societies. Most of the model parameters can roughly be estimated on the basis of available global data. Those associated with a high uncertainty have been varied during bifurcation analyses. The results reveal a partition of the parameter space into several regimes which are characterized by qualitatively different transient and asymptotic behaviors of the system, ranging from ending up surely on an unpopulated hot desert planet to uninterrupted oscillations.

SOE 7.4 Mon 18:00 Poster B1

Price response in correlated financial markets: empirical results — •Shanshan Wang, Rudi Schäfer, and Thomas Guhr — Fakultät für Physik, Universität Duisburg-Essen, Duisburg, Germany

Previous studies of the stock price response to individual trades focused on single stocks. We empirically investigate the price response of one stock to the trades of other stocks. How large is the impact of one stock on others and vice versa? – This impact of trades on the price change across stocks appears to be transient instead of permanent. Performing different averages, we distinguish active and passive responses. The two average responses show different characteristic dependences on the time lag. The passive response exhibits a shorter response period with sizeable volatilities, and the active response a longer period. We also study the response for a given stock with respect to different sectors and to the whole market. Furthermore, we compare the self-response with the various cross-responses. The correlation of the trade signs is a short-memory process for a pair of stocks, but it turns into a long-memory process when averaged over different pairs of stocks.

SOE 7.5 Mon 18:00 Poster B1

Effects of Microscopic Limit Order Book Structure on Price Formation — •Martin Vogt and Stephan Eule — Max-Planck-Institut für Dynamik und Selbstorganisation, Am Faßberg, 37077 Göttingen

Most modern financial markets employ an electronic limit order book to temporarily store supply and demand in form of unexecuted buy and sell limit orders. In a high frequency setting, the central economic question of price formation is governed by the static and dynamic properties of the order book in a continuous double auction market system. Prior analyses of high frequency, high resolution order book data have mainly focused on three different issues:

(i) Static statistics of price determining quantities such as spread size and price jump distributions,

(ii) how the flow of incoming limit and market orders and their cancellations influence those statistics,

(iii) and the effect of the order book's state itself on the dynamics of the order flow.

While these issues govern price formation on short scales, past analyses have shown that dynamic properties of order books such as price relaxation and order book resilience are important factors when trading frequently. Consequently, these dynamic properties are important determinants of optimal execution strategies. We investigate the dynamic properties in a zero intelligence setting and compare them to the assumptions of previous optimal execution models as well as real market data from the Deutsche Börse.

SOE 7.6 Mon 18:00 Poster B1

Structural Organization in King Penguin Colonies — •Richard Gerum[1], Ben Fabry[1], Claus Metzner[1], Céline Le Bohec[2,3], Francesco Bonadonna[4], Anna Nesterova[2], and Daniel Zitterbart[1,5] — [1]University of Erlangen-Nürnberg, Germany — [2]CNRS/UdS, Strasbourg, France — [3]CSM LIA-647 BioSensib, Monaco — [4]CEFE-CNRS, Montpellier, France — [5]AWI, Bremerhaven, Germany

King penguins (*Aptenodytes patagonicus*) that show territorial behaviour during breeding, incubate their single egg on their feet. Thus they can adjust their positions to avoid the proximity of other penguins, while retaining a compact colony structure. A preliminary analysis of aerial imagery reveals that the resulting structure shows a spatial periodicity in density, thus resembling locally the structure of hexagonally arranged crystals. Every penguin keeps its neighbours at least 1.1m away, except couples which have an average distance of 0.45m. Distances and angles to neighbours differ for couples in comparison to solitary penguins, but these differences vanish when couples are treated as a single unit, thus implying that couples don't disturb the colony structure. Couples tend to cluster, as more couples are found next to other couples than solitary penguins, which could be caused by synchronisation in breeding behaviour of nearby penguins. These results can help to answer questions regarding formation and structure of breeding colonies.

1

SOE 7.7　Mon 18:00　Poster B1

Measurability and Characteristics of Structural Metrics and Business Scores for HR development — •Jan Moritz Joseph[1] and Matthias Hudeček[2] — [1]joseph@iti.uni-luebeck.de — [2]m.hudecek@systemische-potentiale.de

Here we analyze structural metrics that are measured for business evaluation and leadership decisions in the field of HR development. We focus on results of feedbacks and data based on questionnaires to evaluate the measurability of the metrics in order to demonstrate their significance and determine their relevance. Both characteristics are major issues for organization of companies since policy makers orient key business parameters and human resources development toward the results of measures and the value of metrics. This is an especially relevant topic as multiple business parameters are unified into scores to accelerate changes in orientation. We argue that profound statistical understanding is crucial to interpret data from questionnaires correctly.

SOE 7.8　Mon 18:00　Poster B1

Correlations of Value Added Growth in the World Trade Network — Julian Maluck[1,2] and •Reik V. Donner[1] — [1]Potsdam Institute for Climate Impact Research, Potsdam, Germany — [2]Tokyo Institute of Technology, Tokyo, Japan

International trade has grown considerably during the process of globalization. Complex supply chains for the production of goods have resulted in an increasingly connected International Trade Network [1]. Here, we investigate empirically to what extent the topological properties of the ITN provide information about the correlations in the production of two industry sectors. We observe that although direct trade relations between industries serve as important indicators for correlations in the industries' value added, opportunities of substitution for required production inputs as well as second-order trade relations cannot be neglected. Our results contribute to a better understanding of the relation between trade and economic productivity. They serve as a basis for more accurate modeling techniques and better interpretation of the impacts of a node's failure due to economic crises.

[1] J. Maluck, R.V. Donner: A Network of Networks Perspective on Global Trade. PLoS ONE 10(7), e0133310 (2015)

SOE 7.9　Mon 18:00　Poster B1

Oscillating hysteresis in the q-neighbor Ising model — •Arkadiusz Jedrzejewski, Anna Chmiel, and Katarzyna Sznajd-Weron — Department of Theoretical Physics, Wroclaw University of Technology, Wroclaw, Poland

We modify the kinetic Ising model with Metropolis dynamics, allowing each spin to interact only with q spins randomly chosen from the whole system, which corresponds to the topology of a complete graph. We show that the model with $q \geqslant 3$ exhibits a phase transition between ferromagnetic and paramagnetic phases at temperature T^*, which linearly increases with q. Moreover, we show that for $q = 3$ the phase transition is continuous and that it is discontinuous for larger values of q. For $q > 3$, the hysteresis exhibits oscillatory behavior - expanding for even values of q and shrinking for odd values of q. Due to the mean-field-like nature of the model, we are able to derive the analytical form of transition probabilities and, therefore, calculate not only the probability density function of the order parameter but also precisely determine the hysteresis and the effective potential showing stable, unstable, and metastable steady states. Our results show that a seemingly small modification of the kinetic Ising model leads not only to the switch from a continuous to a discontinuous phase transition, but also to an unexpected oscillating behavior of the hysteresis and a puzzling phenomenon for $q = 5$, which might be taken as evidence for the so-called mixed-order phase transition.

SOE 7.10　Mon 18:00　Poster B1

Agent based modelling of the diffusion of innovations —

•Florian Senger — Fraunhofer ISI, Breslauer Str. 38, 76139 Karlsruhe

The work presented here is part of a PhD thesis, where methods from physics of social systems were combined with methods from evolutionary economics to develop an agent-based model to mimic the dynamics of regime changes in socio-technical systems. Therefore the demand side was modelled as consumer agents according to a distribution of endowments and needs, connected to each other in a social network, influencing each other in a voter-model-like manner and the supply side as explicit company agents consisting of genes in an evolutionary sense, producing a technology in a quality depending on their particular fitness, taking influence on particular areas of the consumer network via marketing and changing the alleles of their genes by a process of imitating and stochastically innovating, getting feedback on their fitness by the degree of success with the consumers. In this presentation results will be shown for different time scales and different geographical distributions of consumer agents and it will be shown how the model is applied to the case of forms of regional mobility based on empirical data.

SOE 7.11　Mon 18:00　Poster B1

Evolutionary stability of mixed strategies on graphs — Yan Li[1], •Jens Christian Claussen[2], and Xinsheng Liu[1] — [1]Nanjing University of Aeronautics and Astronautics, Nanjing 210016, China — [2]Computational Systems Biology, Jacobs University Bremen, Germany

Up to the present, the study of evolutionary dynamics mostly focused on pure strategy games in finite discrete strategy space, either in well-mixed or structured populations. In this paper, we study mixed strategy games in continuous strategy space on graphs of degree k. Each player is arranged on a vertex of the graph. The edges denote the interaction between two individuals. In the limit of weak selection, we first derive the payoff functions of two mixed strategies under three different updating rules, named birth-death, death-birth and imitation. Then we obtain the conditions for a strategy being continuously stable strategy (CSS), we also confirm that the equilibrium distribution corresponding to the CSS is neighborhood attracting and strongly uninvadable. Finally we apply our theory to the Prisoner's Dilemma and the snowdrift game to obtain possible CSS. Simulations are performed for the two special games and the results are well consistent with the conclusions.

SOE 7.12　Mon 18:00　Poster B1

Optimal cervical cancer preventing strategies. Model for Moldova — •Andrzej Jarynowski[1,2] and Ghennadii Gubceac[1] — [1]Moldova State University, Kishinev, Moldova — [2]Jagiellonian University, Cracow, Poland

We built the model, that aggregated the most important paths of infection (HPV virus), cancer development and prevention scenarios (more than 100 equations and 200 parameters). We observe both behavioral change (sexuality increase) and demographical change (population ageing). We have run computer simulation to prepare cost/benefit analysis for different vaccination strategies, various screening programs and preventive programs (using condoms) for Moldova, based on its own demography and sexual behavior. In our setup, obligatory vaccination seems to not be so crucial (for none of realistic scenarios increase of cancer cases is possible) for public health, as in most countries in European Union. However, national screening practice must be verified in terms of efficiency. We propose more optimal screening guidelines (with prevention cost 5-12k EUR per QALY), which could provide saving perspective in 10-15 year in range 150-300k EUR yearly. Targeted vaccination could be also consider, because population effect are similar to high frequencies screening schema with 1-1.5M EUR savings yearly.