SOE 3: Focus Session: Swarm Intelligence - Contributed Talks

Time: Monday 12:00–12:30 Location: GÖR 226

SOE 3.1 Mon 12:00 GÖR 226

Emergence of coherent motion in flocks of deterministics walkers: a coupled maps evolving network perspective — •Garcia Cantu Ros Anselmo[1], Antonopoulos Chris[2], and Basios Vasileos[2] — [1]Potstdam Institute for Climate Impact Research PIK, Potsdam, Germany — [2]Free University of Brussels ULB, Brussels, Belgium

The emergence of coherence in collective motion described by a system of interacting motiles is analyzed. By means of a nonlinear adaptive coupling, the system elements are able to swing along the route to chaos. Thereby, each motile can display different types of behavior, i.e. from ordered to fully erratic motion, accordingly with its surrounding conditions. The appearance of patterns of collective motion is shown to be related to the emergence of interparticle synchronization and the degree of coherence of motion is quantified by means of a network representation. It is shown that the highest degree of coherence of motion is attained when the system self-drives towards the border between order and chaos. The effect of both particles' density and of considering different weights for the interparticle distances is explored.

SOE 3.2 Mon 12:15 GÖR 226

Complex dynamics of our economic life on different scales: insights from search engine query data — •Tobias Preis[1,2,3], Daniel Reith[3], and H. Eugene Stanley[1] — [1]Center for Polymer Studies, Department of Physics, 590 Commonwealth Avenue, Boston, MA 02215, USA — [2]Artemis Capital Asset Management GmbH, Gartenstrasse 14, 65558 Holzheim, Germany — [3]Institute of Physics, Johannes Gutenberg University Mainz, Staudingerweg 7, 55128 Mainz, Germany

Search engine query data deliver insight into the behaviour of individuals who are the smallest possible scale of our economic life. Individuals are submitting several hundred million search engine queries around the world each day. We study weekly search volume data for various search terms from 2004 to 2010 that are offered by the search engine Google for scientific use, providing information about our economic life on an aggregated collective level. We ask the question whether there is a link between search volume data and financial market fluctuations on a weekly time scale. Both collective swarm intelligence of Internet users and the group of financial market participants can be regarded as a complex system of many interacting subunits that react quickly to external changes. We find clear evidence that weekly transaction volumes of S&P 500 companies are correlated with weekly search volume of corresponding company names. Furthermore, we apply a recently introduced method for quantifying complex correlations in time series with which we find a clear tendency that search volume time series and transaction volume time series show recurring patterns.