Grupo Interdisciplinar de Sistemas Complejos

IX Workshop

Facultad de CC.Económicas y Empresariales (UAM)
February 3rd, 2012.

Address: C/ Francisco Tomás y Valiente 5, 28049 Cantoblanco, Madrid
Room: Sala de conferencias (módulo B).

Program

10:00	A. Sánchez	There is no such thing as network reciprocity when human subjects play a Prisoner's Dilemma.
11:00	L. Dinís	Fluctuation-dissipation for a noisy active oscillator: the hair-bundle of inner ear.
11:30	Coffee break	
12:00	A. Gambassi	The universal force of critical fluctuations: Casimir, wetting, colloids and all that.
13:00	J. Munárriz	Spin filtering with graphene-based heterostructures.
13:30	Lunch *	
15:30	L. Martínez	Ecosystem assembly for responsive strategies.
16:00	D. Vilone	Effects of mixed dynamics in spin systems with conserved magnetization.
16:30	Coffee break	
17:00	C. Glez.-Santander	Excitonic Aharonov-Bohm effect in a two-dimensional quantum ring.
17:30	C. Gaul	Stability of (super) Bloch oscillations in the presence of time-dependent nonlinearities.
18:00	Conclusion	

* 6.70€ menu.

Abstracts

There is no such thing as network reciprocity when human subjects play a Prisoner's Dilemma

Anxo Sánchez (UC3M)

I will present theoretical and experimental results on the way people interact with each other when they have to deal with a social dilemma in a group context. I will begin by discussing experiments on small groups (2 through 5 people) and comparing them with a theoretical approach previously developed (presented in the 2011 Workshop, "Replicator dynamics for the iterated prisoner's dilemma with three types of players", by Jelena Grujić). Then I will discuss the relation of these results to our previous experiment on social dilemmas on lattices (presented in the 2010 Workshop, "Prisoner's dilemma experiment", by Jelena Grujić) and obtain predictions for other types of networks by means of a mean-field theory. Finally, I will compare this prediction with the largest experiments ever on lattices and heterogeneous networks, carried out with over 1200 volunteers last December in Zaragoza. On the basis of all this work, we conclude that networks do not play any effect in the level of cooperation of humans playing a Prisoner's Dilemma.

Fluctuation-dissipation for a noisy active oscillator: the hair-bundle of inner ear

Luis Dinís (UCM)

The fluctuation-dissipation theorem (FDT) is a cornerstone of linear response theory. It connects the response of a system to an external perturbation that slightly displaces it away from equilibrium to the correlations of equilibrium fluctuations. However, many interesting systems are arbitrarily far from equilibrium and do not obey the theorem. Active noisy oscillators like the hair-bundles of hair-cells provide an example of strong violation of the FDT. The generalized fluctuation dissipation theorem (GFDT) of Prost et al. (2009) applies to Markovian systems perturbed from a non-equilibrium steady state. We'll show that a proper choice of variables restores a fluctuation response theorem, which is similar to the equilibrium fluctuation-dissipation theorem.

The universal force of critical fluctuations: Casimir, wetting, colloids and all that

Andrea Gambassi (Invited)

In 1948, Hendrik Casimir predicted that two uncharged conducting surfaces in vacuum attract each other due to the quantum fluctuations of the electromagnetic field which are spatially confined by these surfaces. The classical analogue of this effect originates from the confinement of thermal fluctuations in fluids near continuous phase transitions, such as the demixing of a mixture of two liquids or the normal-superfluid transition in 4He. Early indirect experimental evidence of the force of these fluctuations - the so-called critical Casimir force - were provided by detailed

studies of complete wetting films. Thirty years after its first theoretical investigation by Michael Fisher and Pierre-Gilles de Gennes in 1978, the critical Casimir force has now been measured directly at the sub-micrometer scale by monitoring the Brownian motion of a colloidal particle close to a surface, both immersed in a near-critical liquid mixture.
I will present recent advances in the theoretical and experimental study of the universal properties of this novel fluctuation-induced force, discussing possible relevant applications for manipulating soft matter systems.

Spin filtering with graphene-based heterostructures
Javier Munárriz (UCM)
We investigate theoretically the effect of insulating ferromagnetic stripes placed on top of graphene nanoribbons, forming heterostructures. Spin filtering and spin-dependent Negative Differential Resistance can be obtained by a suitable choice of the system geometry.

Ecosystem assembly for responsive strategies
Luis Martínez (UC3M)
The aim of this work is to perform a systematic study of the emergence of responsive strategies in iterative games, as a result of successive invasions of resident strategies by new ones, which are incorporated to the game at a very low rate. We focus on memory-one strategies, whose probability to play a given action depends on the actions of both players in the previous time step. By this method we are able to study the whole space of symmetric $2\times$ 2 games, characterizing the most probable results of evolution for the different classes of games. We confirm earlier results for some different games. However, the formation of new mixed states have an important influence in the ecosystem, and some non-expected strategies arise as well.

Effects of mixed dynamics in spin systems with conserved magnetization
Daniele Vilone (UC3M)
We consider a system of N agents, each one with only two possible states. They interact asynchronously by means of the voter model (VM) dynamics with probability q, and by means of a totally symmetric coordination game (CG) with probability $1 - q$. Both dynamics share some important features - they conserve the average magnetization and admit two absorbing configurations (when all the agents have the same spin) - but they show also remarkable differences (for instance, CG dynamics allows the existence of many disordered frozen configurations as well). Such mix of the VM and CG dynamics triggers not trivial effects; tuning the value of the parameter q, and depending on the topology, we see interesting crossovers and transitions in the dynamical behaviour and the final configurations of the system.

Excitonic Aharonov-Bohm effect in a two-dimensional quantum ring
Clara González-Santander (UCM)
We study theoretically the optical properties of an exciton in a two-dimensional

ring threaded by a magnetic flux. We model the quantum ring by a confining potential that can be continuously tuned from strictly one-dimensional to truly two-dimensional with finite radius-to-width ratio. We present an analytic solution of the problem when the electron-hole interaction is short ranged. The oscillatory dependence of the oscillator strength as a function of the magnetic flux is attributed to the Aharonov-Bohm effect. The amplitude of the oscillations changes upon increasing the width of the quantum ring. We find that the Aharonov-Bohm oscillations of the ground state of the exciton decrease with increasing the width, but, remarkably, the amplitude remains finite down to radius-to-width ratios less than unity. We attribute this resilience of the excitonic oscillations to the nonsimple connectedness of our chosen confinement potential with its centrifugal core at the origin.

Stability of (super) Bloch oscillations in the presence of time-dependent nonlinearities

Christopher Gaul (UCM)

Many fundamental problems of condensed-matter physics, like e.g. Bloch oscillations (BOs), can be modeled by ultracold atoms trapped in optical lattices. Beyond that, completely new experimental possibilities open up: (i) with the help of Feshbach resonances, the s-wave scattering length can be arbitrarily modulated, and (ii) by optical means potentials can be manipulated at will, in particular, a lattice potential can be accelerated back and forth. Such a shaking, together with the free BO leads to so-called super-BOs (SBOs), with large amplitudes in real space. Here, we consider BOs and SBOs in the presence of a time-modulated s-wave scattering length. Generically, such a nonlinearity leads to dephasing and decay of the wave packet. However, we present a time-reversal argument that allows us to identify an infinite family of modulations of the nonlinearity, which leave the periodic time evolution of the wave packet intact. Refs. Gaul et al. PRL 102, 255303 (2009), PRA 84, 053627 (2011).

Dinner

Restaurante Domine Cabra
(`www.restaurantedominecabra.com/`)
C/ Huertas, 54 (click for google maps)
Menu: 18.99 € + drinks