

CICADA ONE-DAY ISSB SYMPOSIUM

15 JULY 2011

ABSTRACTS

Professor Alan Champneys (University of Bristol)

Spatially discrete and homogenised bio-mechanical models hearing (in insects and mammals)

Dr John Realpe Gomez (School of Physics & Astronomy)

Statistical physics approach to graphical games: local and global

In a graphical game agents play with their neighbours on a graph to achieve an appropriate state of equilibrium. Here relevant problems are characterising the equilibrium set and discovering efficient algorithms to find such an equilibrium. We consider a representation of games that extends over graphical games to deal conveniently with both local and global interactions, and use the cavity method of statistical physics to study the geometrical structure of the equilibria space. The method also provides a distributive and local algorithm to find an equilibrium. For simplicity we consider only pure Nash equilibria but the methods can as well be extended to deal with (approximated) mixed Nash equilibria.

Ref. Ramezanpour et al. arxiv.org/abs/1104.1929 to appear in Eur. Phys. J. B.

Mr James Hook (CICADA)

The moving average transformation

We present a novel, systematic procedure for smoothing non-smooth dynamical systems. In particular we introduce the Moving Average Transformation which can be thought of as a change of variables which transforms discontinuous systems into dynamically equivalent continuous systems and continuous but non-differentiable systems into dynamically equivalent differentiable systems. This smoothing gives us a new way to compute the stability properties of a non-smooth systems and provides a new theoretical link between smooth and non-smooth systems. The dynamics and algebraic structure of systems obtained by transforming typical non-smooth systems are investigated.

Dr Dan Tang (CICADA)

How to use abstract interpretation to simulate complex physical systems

Dr Gareth Jones (CICADA)

Pfaffian functions and o-minimality

O-minimal structures provide a framework for tame real geometry, and Pfaffian functions lead to important examples of o-minimal structures. I'll give a survey of the area and then say something about connections with hybrid systems.

Professor Paul Glendinning (CICADA)

Multistability near grazing bifurcations in three-dimensional systems

Switched systems (differential equations whose defining vector field is discontinuous across some surface called the switching surface) arise naturally in models of friction and control. I will derive a return map on the sliding surface of a three-dimensional switched system in normal form in the case that a periodic orbit of one system grazes the switching surface. This return map can be analyzed to show the existence of multistability for the first time. Other bifurcation structures can also be analyzed using the return map. This work is joint with Piotr Kowalczyk and Arne Nordmark.