Vendredi 24 avril 2009 à 14 h 00

Amphi Concorde, Bâtiment U4, campus UPS

A l'occasion de la

Chaire d'Excellence Pierre de Fermat

de la Région Midi-Pyrénées

attribuée au prof. J.A.S. KELSO

Brain, Behavior, and Beyond:

A seminar on

Coordination Dynamics

Programme

14h00 : Ouverture par les représentants de l'Université Paul Sabatier et de la Région Midi-Pyrénées
14h15 : J. A. Scott Kelso – A brief history of coordination
15h15 : Julien Lagarde – The human laws of attraction: How social interaction can spontaneously take over postural dynamics
16h00 : Olivier Oullier – Social neuroeconomics and the informational body
16h45 : Viktor Jirsa – Dynamic mechanisms underlying the emergence of function from neural network interactions

Participants

J.A. Scott Kelso : Professor, Center for Complex Systems and Brain Sciences, Florida Atlantic University - Chaire d'Excellence Pierre de Fermat

Julien Lagarde : Maître de Conférences, Laboratoire Efficience et Déficience Motrice EA 2991, Université de Montpellier 1

Olivier Oullier : Maître de Conférences, Laboratoire de Neurobiologie Humaine UMR 6149, CNRS - Université de Provence, Marseille

Viktor Jirsa : Directeur de Recherche, Mouvement et Perception UMR 6559, CNRS - Université de la Méditerranée, Marseille

Contributions

14:15: J.A. Scott Kelso – A brief history of coordination

Abstract: This talk will trace, in a somewhat personal and informal fashion, the origins of Coordination Dynamics and its evolution as a scientific approach to the deep problem of coordination in complex, living things. From rather humble beginnings, Coordination Dynamics has taken some unexpected turns and now figures quite prominently in a number of fields, both basic and applied. Some new directions will be discussed and their broader implications considered.

15:15 : Julien Lagarde – The human laws of attraction: How social interaction can spontaneously take over postural dynamics

Abstract: When interacting with others, coordination phenomena emerge, the dynamics of which are reminiscent of those found within individuals. The same dynamical law described by the HKB model apply to social coordination, another proof of the informational nature of brain and behavior functioning. However this also means that, to date, few if any new behavioral phenomena have been found in the investigation of social coordination dynamics. Here we studied how individual's coordination dynamics are influenced by the coordinated movements of another person. We extended a parametric postural dynamics paradigm to address the effects of visual inter-individual coupling. Comparing conditions with and without visual social interaction we found that social factors can override known determiners of postural dynamics. Complementary to previous approaches of interpersonal dynamics, postural coordination provides new insights into basic social behavior.

16:00 : Olivier Oullier – Social neuroeconomics and the informational body

Abstract: Over the past decade cognitive neuroscientists interested in the neural foundations of the states-of-mind at stake in social interactions have taken note of and used the strong body of results coming from well controlled empirical paradigms that experimental economics has been offering. Combining the concept and methods of neuroscience and game theory has therefore provided original insights that could lead to a better understanding of the processes underlying social interactions such a as competition, cooperation, reciprocity as well as preferences and economic exchanges between two (or more) individuals. This new transdisciplinary field of research is often referred to as social neuroeconomics. However, to date, the experiments have essentially been restricted to situations in which the individuals are not influenced by the physical presence of their partners or competitors. In such contexts, the interaction therefore remains at a "mental" level, bodily signals being left out of the picture. We will discuss experiments in which the social coordination dynamics paradigm is crossed with game theory to connect bodily and cognitive levels of analysis and investigate economic decisions in a more realistic fashion.

16:45 : Viktor Jirsa – Dynamic mechanisms underlying the emergence of function from neural network interactions

Abstract: How high-dimensional networks give rise to functionally meaningful low-dimensional dynamics is not known. The main difficulty thereby lies in the richness of the global network dynamics and the involvement of single neurons, ensembles and areas in a variety of different functions. Understanding the emergence of low-dimensional behavior and its collective variables from neural interactions would establish a link between function (cognition, perception, action) and its neural basis and through such dramatically improve our understanding of brain function. Despite a plethora of high-level models for human behavior and cognition on one side and more low-level models of neural network dynamics on the other there have been only a few instances where the two have been linked together. To date, however, there is no framework that systematically relates brain function as it is expressed in human behavior and cognition to its representation in the brain in terms of neural network dynamics. Furthermore such an endeavor is complicated by its intimate connection to the relation between structure and dynamics in neural networks which is still far from being understood. We have proposed a set of generic network equations described by Structured Flows on Manifolds (SFM), which are intrinsically low-dimensional, systematically controllable dynamic systems exhibiting a wealth of behaviors. As such SFM's are excellent candidates for the quantitative description of cognitive architectures. Furthermore, using first principles such as symmetry and tools from nonlinear dynamics we discuss the various conditions of how SFM's can be coded in neural networks. Multiple possible network representations of the same SFM and thus brain function exist for a given neural network model.