Laboratoire Jacques-Louis Lions
UMR 7598 CNRS
Université Pierre et Marie Curie Paris VI
et Université Paris Diderot Paris 7

Leçons Jacques-Louis Lions 2016
13-17 juin 2016

Données par **Eitan Tadmor** (Université du Maryland) du 13 au 17 juin 2016, les Leçons Jacques-Louis Lions 2016 comprendront :

– un **mini cours**
Collective dynamics: flocking, emergence of patterns and social hydrodynamics
3 séances, **lundi 13, mardi 14 et mercredi 15 juin 2016, de 11h30 à 13h**
salle du séminaire du Laboratoire Jacques-Louis Lions
barre 15-16, 3ème étage, salle 09 (15-16-309)
Université Pierre et Marie Curie, Campus Jussieu, 4 place Jussieu, Paris 5ème

– un **colloquium**
Computation of entropy measure-valued solutions for Euler equations
vendredi 17 juin 2016 de 14h à 15h
Université Pierre et Marie Curie, Campus Jussieu, 4 place Jussieu, Paris 5ème
LIEU EXACT A PRECISER

Abstract of the mini-course
Collective dynamics: flocking, emergence of patterns and social hydrodynamics

This mini-course is focused on the dynamics of systems driven by the social engagement of agents with their neighbors. Prototype models based on environmental averaging are found in opinion and crowd dynamics of human networks, flocking, self-organization of biological organisms, and rendezvous of mobile systems.

We begin with a survey of several classical models of agent-based systems. We then follow with two natural questions that arise in the context of such systems: what is their large time behavior and what is the effective dynamics when the number of their agents tends to infinity.

The underlying issue of the first question is the emergence over time of large-scale patterns, and in particular, how different rules of engagement influence the formation of clusters e.g., the emergence of consensus. We propose an alternative paradigm based on the tendency of agents to move ahead which leads to the formation of trails and emergence of leaders.

The second question is concerned with different descriptions of collective dynamics which arise with large crowds of agents, and in particular, the formation of Dirac masses at the kinetic level of description, and the study of critical thresholds for macroscopic regularity at the level of social hydrodynamics.

Abstract of the colloquium
Computation of entropy measure-valued solutions for Euler equations

Entropy stability plays an important role in the dynamics of nonlinear hyperbolic systems of conservation laws. But there are serious obstacles, most notably in multidimensional problems, where the persistence of oscillations at finer and finer scales prevents compactness. Indeed, these oscillations are an indication, consistent with recent theoretical results, of the possible lack of existence/uniqueness of entropy solutions within the standard framework of integrable functions. It is in this context that entropy measure-valued solutions offer the more general solution paradigm. Solutions are interpreted in an average sense as part of an ensemble average in configuration space.

We revisit the general framework of numerical entropy stability. Our approach is based on comparing numerical viscosities with entropy conservative schemes. We demonstrate this approach with entropy conservative fluxes which serve as the building block for a class of non-oscillatory entropy stable schemes of arbitrarily high-order of accuracy, so-called TeCNO schemes.

We then outline a viable numerical algorithm to compute entropy measure-valued solutions, based on realization of approximate measures as laws of Monte Carlo sampled random fields. Numerical experiments, including recent TeCNO-based computation of entropy measure-valued solutions, provide a convincing evidence for the viability of the new paradigm.

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