Complex Patterns for Strongly Interacting Dynamical Systems

Fact Sheet

Project Information

COMPAT
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Status
Closed project
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1 February 2014
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31 January 2019

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FP7-IDEAS-ERC
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€ 1 346 145
EU contribution
€ 1 346 145

Hosted by
UNIVERSITA DEGLI STUDI DI TORINO
Italy

Objective

This project focuses on nontrivial solutions of systems of differential equations characterized by strongly nonlinear interactions. We are interested in the effect of the nonlinearities on the emergence of non trivial self-organized structures. Such patterns correspond to selected solutions of the differential system possessing special symmetries or shadowing particular shapes. We want to understand, from the mathematical point of view, what are the main mechanisms involved in the aggregation process in terms of the global variational structure of the problem. Following this common thread, we deal with both with the classical N-body problem of Celestial Mechanics, where interactions feature attractive singularities, and competition-diffusion systems, where pattern formation is driven by strongly repulsive forces. More precisely, we are interested in periodic and bounded solutions, parabolic trajectories with the final intent to build complex motions and possibly obtain the symbolic
dynamics for the general N–body problem. On the other hand, we deal with elliptic, parabolic and hyperbolic systems of differential equations with strongly competing interaction terms, modeling both the dynamics of competing populations (Lotka-Volterra systems) and other interesting physical phenomena, among which the phase segregation of solitary waves of Gross-Pitaevskii systems arising in the study of multicomponent Bose-Einstein condensates. In particular, we will study existence, multiplicity and asymptotic expansions of solutions when the competition parameter tends to infinity. We shall be concerned with optimal partition problems related to linear and nonlinear eigenvalues

Field of science

/natural sciences/mathematics/applied mathematics
/natural sciences/physical sciences/astronomy/planetary science/celestial mechanics

Field of science

/natural sciences/mathematics/pure mathematics/mathematical analysis/differential equations
/natural sciences/physical sciences/condensed matter physics/bose-einstein condensates
/natural sciences/physical sciences/condensed matter physics/quantum gases

Programme(s)

Topic(s)

Call for proposal

ERC-2013-ADG

Funding Scheme

ERC-AG - ERC Advanced Grant

Host institution

UNIVERSITA DEGLI STUDI DI TORINO

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Activity type
Higher or Secondary Education Establishments

EU contribution
€ 1 346 145

Website
Contact the organisation

Principal investigator
Administrative Contact
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