Sparse Stabilization of dynamical systems driven by attraction and avoidance forces

Mattia Bongini, Technische Universität München.

In this talk we address dynamical systems of agents driven by attraction and repulsion forces, modelling cohesion and collision avoidance. When the total energy, which is composed of a kinetic part and a geometrical part describing the balance between attraction and repulsion forces, is below a certain threshold, then it is known that the agents will converge to a dynamics where mutual space confinement is guaranteed. In this paper we question the construction of a stabilization strategy, which requires the minimal amount of external intervention for nevertheless inducing space confinement, also when the initial energy threshold is violated. Our main result establishes that if the initial energy exceeds the threshold mainly because of its kinetic component, then a sparse control instantaneously applied with enough strength on the most rowdy agent, i.e., the one with maximal speed, will be able to steer in finite time the system to an energy level under the threshold.