Consensus, network & control in self-organizing systems

Figure 1: “Psychohistory is the mathematical study of the reactions of human conglomerates in response to economic and social stimuli”. – Isaac Asimov, Foundation, 1951.

Self-organization in social interactions is a fascinating mechanism, which has inspired the development of new areas of applied mathematics and physics, in order to describe multi-agent dynamics towards formation of coherent global behaviors. The mathematical modelling of these phenomena roused a large variety of applications: in biology (cell aggregation and motility, coordinated animal motion,…); in socio-economics (opinion formation or wealth distribution,…); in engineering, (cooperative robots, traffic management,…).

The main question we will address will be “Under which conditions self-organization can be obtained, and in which way we can promote/control it?”. To answer we will focus on consensus-type dynamics where agents try to align their behavior according to interactions ruled by a dynamical communication network. Further, we will try to understand in which way these systems can be influenced by control strategies. Direct applications of our findings will be the modelling of opinion dynamics on social network.

The methods of study will be non-linear ODEs systems, Markov processes and optimal control. Theoretical and modeling concepts will be complemented by numerical methods and simulations.

Course presentation and schedule confirmation
October 2nd, 15:30-16:30 room M, Ca’ Vignal 2.
Schedule (TBC)

1. 2/10. 15:30-16:30 room M. Presentation.
2. 3/10. 12:30-14:30 room G.
3. 6/10. 11:30-13:30 room M.
4. 9/10. 15:30-16:30 room M.
5. 10/10. 12:30-14:30 room G.

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