Research Proposal

Optimal Influencers in Social Networks

Supervisors: **Paolo Frasca (CNRS)**
E-mail: **Paolo.Frasca@gipsa-lab.grenoble-inp.fr**
Team: NeCS (http://necs.inrialpes.fr)
Duration: 6 months

Topic description:
This research originates from the growing interest in the mathematical theory of social relations and on in its implications for the management of large online social networks. In this internship, we shall focus on the following prototypical mathematical description [ACFO14]. A network is given, where the nodes represent individuals that have opinions on a certain issue and the links represent their interactions, that is, the possibilities for the individuals to influence each other. We assume that the interactions obey a linear rule that makes individuals be attracted by the opinions of those they are in contact with. As exceptions to this rule, two individuals hold fixed opposite opinions and do not change them: consequently, these two stubborn individuals exert their influences upon the network.
The research questions will be on following line. How does the structure of the network imply the prevalence of either influencer? Is it possible to systematically modify the network in order to favor one of them? What is the best way for each influencer to build up her/his own set of contacts?
The task of the student will be twofold: on the one side, (s)he shall explore the problem via simulations and deduce effective rules-of-thumb; on the other side, (s)he shall contribute to formalize the corresponding optimization problems and work towards their solution.

Candidate profile: The ideal candidate is expected to have good knowledge of optimization and of linear control theory.

Context: This work will be carried out in the NeCS team (Networked Control Systems), a joint CNRS/INRIA team at GIPSA-Lab laboratory in Grenoble, France. The team's innovative research concerns control and estimation of networked systems, with a broad spectrum of applications including security and privacy in control systems.

Bibliography
[VFFO14] L. Vassio, F. Fagnani, P. Frasca, A. Ozdaglar. Message passing optimization of harmonic influence centrality. IEEE Transactions on Control of Network Systems, 1(1): 109-120, 2014.
[ACFO14] D. Acemoglu, G. Como, F. Fagnani, A. Ozdaglar. Harmonic influence in large-scale networks. ACM SIGMETRICS, 42(3), Dec. 2014.