Evolution of Opinions in Societies with Memory

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In order to understand the collective behaviour of a society and the response to external unexpected events, we propose a model in which there are a number of agents interacting on a network, and the opinion of each individual is influenced by the opinion of the others, as well as their own ideas and the external influence.

The model has been inspired by Graded-Response Neural networks (Kühn, R., Bös, S., & van Hemmen, J. L. (1991)) but we can find examples of similar models also in social sciences (Macy, M. W., Kitts, J. A., Flache, A., & Benard, S. (2003)) and physics (Michard, Q., & Bouchaud, J. P. (2005)).

In our model we consider time-dependent interactions between agents which depend on the recent history of agreement or disagreement between those agents. This introduces as a new element in the dynamics the memory of previous opinions of the agents and develops interesting collective phenomena. In this way each agent has a network of friends and enemies which evolves in time and contributes to the dynamics of the opinions.

In this talk I will discuss the collective phenomena arising in this setting at the level of the dynamics of agents' opinions and of interactions bonds. I will show the emergent similarity between the reaction of a society modelled in this way and the Hopfield mechanism for information's retrieval. The model can be possibly applied to explain real societies' behaviour such as the reaction of the society in response to external unexpected events or the emergence of strong opinions as a result of the interactions or political polarization.
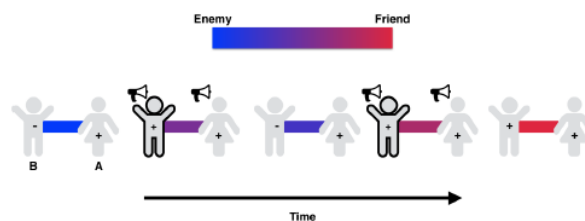

Figure 1: Here we can see a pair of representative agents of our model. In this example we can see how the memory of the opinion configurations and the external signal (megaphone) drive the evolution of the bonds between the agents. The two agents tend to be friends if they have agreed in the past, enemies otherwise. Initially the two agents are at equilibrium, they are enemies and have different opinions. Then, the first signal forces Bob to change his opinion, but it is not persistent enough to allow a great change in their mutual relation that remembers the previous opinion configuration. For this reason, as soon as the signal disappear, the bond drives the opinion back to its original value. However as a result of the last configuration, the agents are slightly less enemies. When the signal appears again, the change in the opinion of Bob makes the relation "friendly" enough to sustain his new opinion even when the signal is removed.