SURVEY and REVIEW

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"Dynamics over Signed Networks," by Guodong Shi, Claudio Altafini, and John S. Baras, is the Survey and Review article in the present issue. Networks play a crucial role in the applications of mathematics to engineering, the social sciences, and many other fields. Of much recent interest has been the study of *dynamics over networks*, i.e., of situations where, associated with each node i, there is a real variable x_i whose time evolution is driven by the values of the variables x_j corresponding to the nodes j linked to i. The time variable may be either continuous or discrete. In a simple example, each node i represents a person in a community, and x_i measures the opinion of i on some matter; under DeGroot's rule of social interactions, if two people i and j are linked and, at some point in time, $x_j < x_i$, the value x_i will tend to come down, while x_j will tend to go up. Under very general hypotheses, as time increases, a consensus will emerge where asymptotically all nodes i share a common value x_i.

The paper considers *signed* networks whose edges are either positive or negative. If i and j are linked by a positive edge, the values x_i and x_j will approach each other following DeGroot's rule as described above. A negative edge linking i and j is used to model situations where these two nodes antagonize each other, as would be the case if i and j represented two members of a community who mistrust each other. Such an antagonism may take different forms; for instance, in a so-called repelling interaction any gap between x_i and x_j will tend to increase. Again, under suitable conditions that take into account the topology of the graph, the long-term evolution of such signed networks will give rise to collective behaviors, but in the signed case there is a wide range of possible limiting states. The authors present a simple, general technique to study such long-term dynamics, including scenarios where the links between nodes are random.

The paper provides an easy entry point to the study of dynamics over graphs and therefore will be useful to many readers.

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