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On network synchronization

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Synchronization of coupled oscillators is frequently observed in nature and technology. A Kuramoto model for the phase dynamics of weakly coupled oscillators shows that as the coupling strength is increased there is a transition from incoherent behavior to synchronization, this transition does depend on network topology (see [1]). It has been recently noted that the topology of real world networks is often very complex. We discuss the synchronization of phase oscillators interacting on different networks with positive coupling using graph theory approach.

In the current paper, we discuss a role of the largest eigenvalue of the adjacency matrix of a network in various network processes. We consider different approximations to the largest eigenvalue of adjacency matrices for classes of networks (random graphs, all-to-all coupling, lattices).

- [1] J.G. Restrepo, E. Ott, B.R. Hunt, "Synchronization of Large Directed Networks of Phase Oscillators" *Chaos* **16**, 015107 (2006).