数学与系统科学研究院学术报告

报告题目:

Coherence in complex networks: synchronization, spectral characteristic, and graph toplogy

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摘要:

Synchronization is a general concept to define the time coordination between diverse processes. S ynchronization dynamics in complex networks is currently a rather wide topic across mathematics, physics, and engineering. Transverse stability can be regarded as a general concept of synchroniza tion, which provided a dynamical system method to study synchronization. Chaos synchronization represents a physical phenomenon containing both temporal coordination and spatial irregularity. A conensus/agreement protocol/algorithm is utiltized to reach coherence for multiagents. This issu e is based on the basic idea that system can be described by network: each individual is a vertex an d the interaction between two vertices is an edge linking them. Interactions between individuals pl ay the principal role for synchronization. But how to measure and analyze it is the main issue. I w ould like to, in this talk, give a review and comments on my and many others' work on the influen ce of the graph network toplogy on the synchronization by investigating the dynamics of networks of coupled maps. Algebraic theory is used to investigate this relation, which bridges the dynamica l system theory, graph theory, and statistical phsyics. For either a static or dynamical networks, the ir synchronizabilities can be read as a function of the characteristic exponent of the coupling matri ces which is related to its topology. The property of having spanning trees is the doorstill of wheth er it has chaos synchronizability. It should be pointed out that this synchronizability is also the con vergence rate of the corresponding consensus/agreement proctocol on this topology. However, the rigorous and satisfactory analysis of the realtion between graph topology and synchronizability, es pecially for complex dynamical networks, is still open and seems unlimited.