Complete synchronization of particle and kinetic Kuramoto models on networks

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In this talk, we will discuss the complete synchronization of particle and kinetic Kuramoto models with general couplings. The synchronization of many weakly coupled oscillators often appears in natural systems, e.g., two pendulum clocks suspended from the same bar, the flashing of fireflies, the singing of crickets and hand clapping by audiences in a concert hall, etc. These phenomena can be modeled by the coupled oscillators on some networks. The network associated with the Kuramoto model with all-to-all coupling is simply the Kuramoto oscillators on the complete graph. It is easy to say that the network structure will affect the synchronizability of Kuramoto oscillators scattered on the vertices of networks numerically. Then a natural question is how the network structure affects the complete synchronization of oscillators. For this, we consider two cases "symmetric connected graph and an asymmetric graph with hierarchical leadership" and we will provide some quantitative theorems for the synchronizability of particle and kinetic Kuramoto models.