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Emergent dynamics of classical and quantum oscillators

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Abstract

Synchronization of weakly coupled oscillators is ubiquitous in biological, chemical and physical complex systems. Recently, research on collective dynamics of many-body systems has been received much attention due to their possible applications in engineering. In this survey talk, we mainly focus on the large-time dynamics of several synchronization models and review state-of-art results on the collective behaviors for synchronization models. Following a chronological order, we begin our discussion with two classical phase models (Winfree and Kuramoto models), and two quantum synchronization models (Lohe and Schrodinger-Lohe models). For these models, we present several sufficient conditions for the emergence of synchronization using mathematical tools from dynamical systems theory, kinetic theory and partial differential equations in a unified framework.