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Synchronization for Systems with Spatially Correlated Coupling
HUAN-YU KUO, KUO-AN WU, Physics Department, National Tsing Hua University — Synchronization phenomenon in systems of large populations is of great interest in physical, biological, chemical, and social systems. The Kuramoto model describes elements as coupled oscillators whose natural frequencies are drawn from certain prescribed distribution. For globally coupled oscillators, as the coupling strength exceeds a certain threshold, part of the oscillators spontaneously synchronizes while others remain incoherent. However, the interaction between oscillators in many biological and physical systems depends on the distance between two oscillators. We analyze the Kuramoto model with spatial correlated coupling, and we find the existence of a universal critical coupling strength, beyond which a phase transition occurs for certain spatial correlated coupling. We will discuss the relation between the universality of critical coupling strength and the form of specific spatial couplings.

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