Synchronization of Coupled Noisy Oscillators: Coarse Graining from Continuous to Discrete Phases

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The theoretical description of synchronization phenomena often relies on coupled units of continuous time noisy Markov chains with a small number of states in each unit. It is frequently assumed, either explicitly or implicitly, that coupled discrete-state noisy Markov units can be used to model mathematically more complex coupled noisy continuous phase oscillators. Here we present conditions that justify this assumption by coarse-graining continuous phase units. In particular, we determine the minimum number of states necessary to justify this correspondence for Kuramoto-like oscillators.

[1] D. Escaff, A. Rosas, R. Toral, and K. Lindenberg, Phys. Rev. E, **94**, 052219 (2016).