

SYNCHRONIZATION OF OSCILLATORS WITH NOISY FREQUENCY ADAPTATION

Presented By Dr. Juan G. Restrepo



DATE:

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TIME:

12:30 p.m.

(Refreshments at 12:15pm)

LOCATION:

University Center Room 307

ABSTRACT: Large ensembles of coupled oscillators can undergo a transition from an incoherent to a synchronized state. This phenomenon has been observed, for example, in fireflies, pedestrians, and neurons. First I will provide an overview of the Kuramoto model, the classical model for spontaneous synchronization in ensembles of coupled heterogeneous oscillators. I will then consider the problem of synchronization in ensembles of oscillators with slow and noisy adaptation of frequencies. Such a model describes, for example, certain species of fireflies and synchronizing clapping audiences. As opposed to the classical Kuramoto model, we find that this new model has a bistable regime and hysteresis. We find that the ensemble of oscillators in the bistable regime can spontaneously synchronize after a long waiting time, in agreement with experiments on synchronizing clapping audiences. By treating finite size fluctuations as uncorrelated noise and using Kramer's escape time formula, we find that the expected waiting time for the transitions from incoherence to synchronization scales exponentially with the number of oscillators in the all-to-all coupling case.



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