Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Numerical scheme for predicting the order parameter of the Kuramoto model DAVID MERTENS, RICHARD WEAVER, University of Illinois — The Kuramoto model is a well-studied prototype model for synchronization of a large number N of coupled oscillators. Amongst its most notable feature is a second order phase transition to synchronization, as a function of the ratio between the coupling and the width of the distribution of the independent frequencies. Here we present a numerical scheme for predicting the order parameter for a specified finite set of oscillators. Comparison to direct numerical simulations of the differential equaions show that the scheme works well for large unimodal distributions ($N > 1000$). Even for small unimodal populations, the scheme accurately predicts larger values for the order parameter. We then apply this scheme to study the scaling behavior of avalanching (finite jumps in order parameter as a function of external forcing or coupling strength) in the Kuramoto model.

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Date submitted: 20 Nov 2009 Electronic form version 1.4