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Dynamic Scaling of Synchronization in Kuramoto-type Globally Coupled Oscillators MEESOON HA, Chosun University, CHULHO CHOI, BYUNGNAM KAHNG, Seoul National University — We investigate the dynamic scaling behavior of the phase synchronization order parameter in the framework of the original Kuramoto model with Gaussian natural frequecies near and at the critical value of the coupling strength. The temporal behavior has been never paid attention to in the earlier studies of synhronization and its transition nature including finite-size scaling (FSS), whereas the stationary critical behavior has been widely studied. We focus on the scaling behavior of the order parameter until the system reaches its steady state from various initial conditions in the context of the dynamic scaling form at criticality. It is found that dynamic scaling of synchronization can indicate the critical valule of the coupling strength and also estimate all critical exponents of the continuous synchronization transition, based on the scaling relation of the earlier suggested FSS theory. Moreover, we figure out that the dynamic scaling analysis is quite useful even though the system does not reach its steady state, provided that the system size is not too small. Finally, we argue how the generating method of natural frequecies and the thermal effect of phases affect dynamic scaling with the change of the dynamic exponent, which are numerically confirmed.

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