[P10] Dynamic Scaling in Synchronization Transition of Coupled Oscillators

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We propose the dynamic scaling form in synchronization of coupled oscillators in terms of the Kuramoto model, which provide another comprehensive view of the synchronization transition and the finite-size scaling (FSS) theory. In particular, we focus on the connection of the dynamic scaling to the FSS in the steady-state limit. Through extensive numerical tests in various topologies, such as fully-connected networks, random Erdős-Rényi networks, scale-free networks, and regular lattices, we find that the dynamic scaling properties can also clearly locate the critical coupling strength of the synchronization transition and the dynamical scaling results are in good agreement with the earlier FSS results[†]. Finally, we conjecture how initial conditions of oscillators and their natural frequency sequence types affect the dynamic scaling form, which is numerically confirmed[‡].

† H. Hong, H. Park, M.Y. Choi, Phys. Rev. E 70, 045204(R); the same authors, *ibid.* 72, 036217 (2005); H. Hong, H. Chaté, H. Park, and L.-H. Tang, Phys. Rev. Lett. 99, 184101 (2007); H. Hong, H. Park, and L.-H. Tang, Phys. Rev. E 76, 06610 (2007); S.-W. Son and H. Hong, *ibid.* 81, 061125 (2010); L.-H. Tang, J. Stat. Mech. (2011) P01034.
‡ C. Choi, M. Ha, and B. Kahng (in preparation)