Dynamics of mobile coupled phase oscillators

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We study the transient synchronization dynamics of locally coupled phase oscillators moving on a one-dimensional lattice. Analysis of spatial phase correlation shows that mobility speeds up relaxation of spatial modes and leads to faster synchronization. We show that when mobility becomes sufficiently high, it does not allow spatial modes to form and the population of oscillators behaves like a mean-field system. Estimating the relaxation timescale of the longest spatial mode and comparing it with systems with long-range coupling, we reveal how mobility effectively extends the interaction range[1].

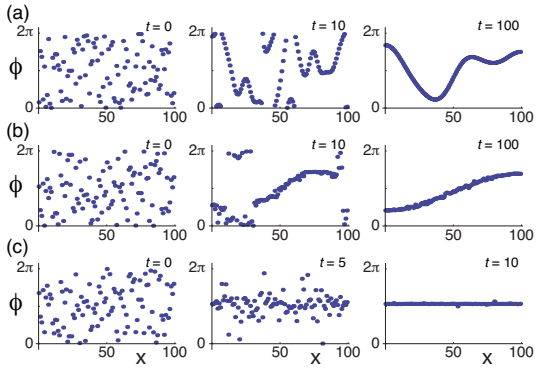

FIG. 1. Oscillator mobility speeds up synchronization. Snapshots of spatial phase profiles. Each dot represents an oscillator. (a) No oscillator mobility, (b) medium oscillator mobility, and (c) high oscillator mobility. t is time.

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