

Glassy state in coupled dynamical systems

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Abstract

Two interacting oscillations show the phenomena of phase synchronization if the interaction is sufficiently strong. The exact phase relationship between the oscillators depends on the interaction and the two extreme cases are the in-phase and anti-phase synchronization. We consider a lattice of oscillators with nearest neighbour interactions and choose some of the interactions to favor in-phase synchronization while the others to favor anti-phase synchronization. This can lead to frustration in the ordering of the phases. We show that we can get a phenomena similar to the spin glasses in magnetism and call the state of the oscillators as a *phase glass*. In the phase glass, there is a definite ordering of the phases. Though the individual phases continue to evolve dynamically the relative phases are frozen in time. We introduce a time average order parameter and study the properties of this phase glass.

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