Synchronization of intermittent behavior in ensembles of multistable dynamical systems

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Abstract

We propose a methodology to analyze synchronization in an ensemble of diffusively coupled multistable systems. First, we study how two bidirectionally coupled multistable oscillators synchronize and demonstrate the high complexity of the basins of attraction of coexisting synchronous states. Then, we propose the use of the Master Stability Function (MSF) for multistable systems to describe synchronizability, even during intermittent behaviour, of a network of multistable oscillators, regardless of both the number of coupled oscillators and the interaction structure. In particular, we show that a network of multistable elements is synchronizable for a given range of topology spectra and coupling strengths, irrespective of specific attractor dynamics to which different oscillators are locked, and even in the presence of intermittency. Finally, we experimentally demonstrate the feasibility and robustness of the MSF approach with a network of multistable electronic circuits.