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Analysis of cluster Rs behavior in ensembles of chaotic oscillators

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The phenomenon of chaotic synchronization in coupled chaotic dynamical systems may result in appearance and subsequent evolution of cluster structures V the sets of oscillators, demonstrating coherent chaotic dynamics. The conditions for appearance of coherent dynamic and typical cluster-splitting bifurcations were studied in [1, 2, 3, 4, 5, 6]. Nevertheless the spatial behavior of clusters,its dependence vs. coupling (local or global) is of interest and may be considered as from viewpoint of theoretical analysis and computer simulation.

The results of investigation of the processes giving rise to the cluster structures, and their typical dynamics in dependence of strength of coupling dimension of ensemble and initial conditions are presented in this paper. We consider the conditions for cluster Rs patterns occurring in the ensembles of globally and locally coupled logistic maps. The Slength of coupling T, that is the number of interacting oscillators in the vicinity of given one is the most interesting parameter, which gives rise to the set of various cluster structures. Computer simulator allowed us to control cluster dynamics and provided visualization of typical patterns. We also estimate some quantitative characteristics: the average size of cluster, current entropy of ensemble.

We also consider the dynamics of cluster structures under outside action. The adding of outside action was provide by maintaining the constant state of given number of oscillators or constant strength of coupling of some oscillators. The reason for such experiments was to find out: How such action influence to the ensemble dynamics? Are there any Smemory effects T in the ensembles of coupled chaotic oscillators? It was founded that the appearance of outside action can result in partial synchronization in the systems and gives rise to some stable patterns of clusters under essentially weak coupling parameters.

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