Driven coupled map lattices and emergence of patterns in systems with local and global interactions

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We study the dynamics and emergence of nontrivial colletive of behavior of a system of maps possesing both local and global interactions. Specifically, we consider a one-dimensional lattice of logistic maps with diffusive coupling plus a global coupling given by the mean field of the system. The phases of this system are characterized on its parameter space, given by two coupling parameters(one local, one global) and the local parameter of the logistic maps. In previous works, an analogy between a globally coupled map system and a single map driven by an external force was established. Here we extend this analogy to a general ralationship between a spatially distributed system with local and global couplings and a lattice subjected to an external driving force. It is show that the spatial patterns in both cases are similar. From the forced one-dimensional lattice, we get analytical results that allow the prediction of cluster formation in an associated coupled map system having both local and global couplings.

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References

(1) N. B. Ouchi and K. Kaneko, Chaos **10**, 359 (2000).
(2) M. G. Cosenza and A. Parravano, Phys. Rev. E. **64,** 036224 (2001).
(3) K. Kaneko, Prog. Theor. Phys. **72,** 480 (1984).
(4) I. Waller and R. Kapral, Phys. Rev. A. **30,** 2047 (1984)
(5) A. Parravano and M. G. Cosenza, Phys.Rev. E. **58,** 2 (1998).
(6) K. Kaneko, Phys. D. **41,** 137 (1990).
(7) A. Parravano and M. G. Cosenza, Int. J. Bifur. & Chaos **9,** 12 (1999).
(8) W. Wang, I. Z. Kiss and J. L. Hudson, Chaos. **10,** 1 (2000).
(9) D. H. Zanette and A.S. Mikhailov. Phys. Rev. E **57,** 276 (1998).
(10) F. H. Willeboordse, Phys.Rev. E. **65,** 026202 (2002).