Continuous attractors and attraction basins of a population decoding model with a parameter as a switch

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Abstract

This paper is concerned with continuous attractors and attraction basins of a population decoding model with a parameter as a switch. Since an attractor for a model is a equilibrium point of its phase space such that for "many" choices of initial point the model will evolve towards the point, the attractor belongs to the omega-limit sets of theses initial points. Therefore, we can construct the mapping between initial values and omega-limit sets to study the properties of attractors for the model. In this article, firstly, the omega-limit set of each initial value are obtained of the model, and the mapping between the initial values and the omega-limit sets is successfully constructed by the omega-limit set of each initial value for the model. Secondly, applying this mapping, we not only obtain the attraction basin of each attractor and the stability of these attractors, but also find a new sufficient condition of nonzero continuous attractors of this model. Finally, we get bifurcations can occur in which continuous attractors undergo qualitative changes as the model parameter passes through a critical bifurcation value.

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