Synchronization States in Coupled Cubic Maps with Delay Coupling

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SUMMARY

Generally, complex dynamical phenomena can be observed in networks formed by many elements with nonlinearity. Coupled Map Lattice (CML) has been proposed by Kaneko [1]-[4], to represent the complex high-dimensional dynamics, for example biological systems, networks in DNA, economic activities and neural networks. Furthermore, we focus on intermittency chaos and delay. The delay naturally occurs from information transmission and processing speeds in the realistic networks[5]. In [5], the study investigated the synchronization states of the coupled logistic maps with the delay. As a result, the synchronization state of coupled chaotic maps are induced by the delay. Therefore, the studies considered the delay in coupled chaotic maps are investigated actively. In addition, intermittency chaos has stability and mobility and gains good result for information processing. We consider that intermittency chaos is related to various phenomena[6][7], e.g, information processing of the brain. In order to make clear the mechanism of such phenomena in various fields, unveiling the roles of intermittency chaos is very important.

In this study, we focus on the influence of the delay in coupled cubic maps with intermittency chaos. When we set a control parameter of cubic map to generate intermittency chaos near the four periodic window, various synchronization states are confirmed in laminar part. The relation between average length of laminar part and combination of the delay is investigated. We could consider coupled cubic maps with four periodic solution easily to become to the synchronization states by delay.

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