Investigation of Synchronization Patterns in Simple Chaotic Circuits Connected as a Ring

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SUMMARY

Synchronization phenomena in complex systems are very good models to describe various higher-dimensional nonlinear phenomena in the field of natural science. Studies on chaos synchronization in coupled chaotic circuits are extensively carried out in various fields [1][2]. On the other hand, many people have been trying to develop some applications to information processing by exploiting oscillatory phenomena in neural networks. Such neural networks can produce some kinds of phase patterns, and they may be utilized for associative memory or image processing [3][4]. In our past studies [5][6], we investigated an interesting state transition phenomenon observed in simple coupled chaotic circuits. This state transition phenomena can be observed around in-phase synchronization, anti-phase synchronization and quadrature-phase synchronization. Also, we have reported the phase patterns characterized by synchronization in a ring of cross-coupled chaotic circuits [7]. As a result, we confirmed that several patterns could be observed by giving different initial conditions to the circuits. In this study, we investigate the synchronization patterns by computer simulations, when the coupling parameter is changed. Furthermore, we carry out circuit experiments.

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