Clustering Phenomena in the Network of Coupled Chaotic Circuits

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SUMMARY

Synchronization phenomena are the most familiar phenomena that exist in nature and they have been studied in various fields. Synchronization phenomena can be observed everywhere in our life. For example, we can confirm flashing firefly lights, metronome, gate patterns of four-leg animals, beating rhythm of the heart and so on. Especially, synchronization phenomena of oscillatory network are interesting. In addition, complex networks attract attention from various fields. The feature of networks is the degree distribution, the path length and the clustering coefficient.

In recent years, we often deal with huge amounts of data. The similar date needs to be divided same group by clustering. This group is called "cluster". It is useful to partition such data sets into the cluster. Moreover, clustering is one of the interesting phenomena. The phenomena are also applied to many applications, such as data mining, image processing and biological fields. Many kinds of models and algorithms by using Coupled Map Lattics (CML) are proposed for clustering [1]-[2]. However, there are not many discussions clustering of coupled nonlinear circuits.

In this study, we focus on the clustering phenomena in the network of coupled chaotic circuits. The chaotic circuit is used Shinriki-Mori circuit. The Shinriki-Mori circuit consists of an inductor, two capacitors, a negative resistance and dual-directional diodes[3]. For this investigation, the coupling strength reflected the distance information when the nonlinear circuits are placed on 3-dimensional space. Moreover, we investigate what kind of synchronization phenomena can be observed in the far distance and near distance[4]. The first step investigates from two clusters. From there, we increase the number of clusters. Finally, we consider the case of complex networks to extend to large scale networks and apply to the real world data for clustering.

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