Abstract

Complex networks have applied widely in various disciplines and fields, and synchronization is a typical cluster behavior of complex networks. In recent years, more and more researchers have been attracted by the problem of synchronization of complex networks, and major result has been established. However, almost all of these results are built upon the assumption that the communication of the nodes are a continue mode. Namely, the information between the nodes in networks is updated and transmitted immediately, which would not only lead to wasting the communication bandwidth, but also reduce anti-interference ability. So the discrete communication control strategy is more practical significance.

This thesis mainly discusses how to construct a suitable event-triggered rule and corresponding control method to achieve synchronization of complex networks with Markov switching in random environment. The main work includes the following aspects:

First of all, I introduce the background of complex networks and research status about synchronization and corresponding definitions, basic knowledge of random process theory, necessary lemma and some symbol description.

Secondly, the mean square exponential synchronization issue of complex networks with Markov switching nonlinear and randomly occurring coupling and random coupling strength is studied. Bernoulli random variables sequence and normal random variables sequence are introduced to depict the random occurring coupling and random coupling strength. In order to reduce the frequency of communication between the nodes and the update of the controller, Two different decentralized event-triggered rules base on synchronization error upper bound and exponential upper bound are proposed in the continuous monitoring and discrete monitoring. The key nodes are pinned to prompt the networks realizing synchronization by using control method with decentralized event-triggered sample strategy and pinning control. According to Lyapunov stability theory, the stochastic process theory and Gronwall-Bellman inequality, the sufficient conditions of mean square exponential synchronization are derived. In the numerical example part, it is not only confirm the synchronization conditions are valid vote, but also compare the differences about four different rules in the synchronous speed and triggered frequency.

Next, I study exponential synchronization problems for an array of Markovian jump delayed complex networks with partially unknown transition rates. In the networks model, the topological relationship not only switch in limited mode, but also the switching