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LOCAL AND GLOBAL EXPONENTIAL SYNCHRONIZATION IN UNCERTAIN COMPLEX DYNAMICAL NETWORKS

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Abstract. *This paper studies the local and global exponential synchronization of uncertain complex dynamical networks. The network model considered is general complex dynamical networks with unknown network structure and unknown coupling functions but bounded. Novel linear controllers are designed via the Lyapunov stability theory. Especially, it is shown that the controlled networks are exponentially synchronized with a given convergence rate. The designed linear controllers for network synchronization are rather simple. It is very useful for future practical engineering design. Moreover numerical simulation results showed the effectiveness of proposed synchronization approaches.*
Keywords: Global synchronization, Complex dynamical network, Exponential stability, Controller design

1. **Introduction.** Recently, complex dynamical networks have attracted a great deal of attentions from various fields of science and engineering [1-3]. One of the interesting and significant phenomena in complex dynamic networks is the synchronization of all dynamic nodes in the network [4-8]. Network synchronization can not only explain many natural phenomena [9,10], but also has many applications, such as secure communication, synchronous information exchange in the internet and the synchronous transfer of digital in communication network[5,11-14]. Over the past two decades, synchronization of complex networks, particularly, large-scale networks of coupled chaotic oscillators has been extensively investigated in the fields of science and engineering [15].

In the current study of complex networks, most of the existing works on synchronization of complex networks consider a given network, that is, the structure and the coupling functions of the network are known a priori [5-8]. And an essential assumption is the uniform inner couplings in complex networks, which means that the inner coupling between arbitrary two linked nodes is the same [6,7,16-19]. Generally, the previous research on synchronization of complex networks mostly focused on the certain coupling strength and certain network structure. However, in practice, it is hard to get the exact estimation of the coupling strength. And there is very little information about the network structure. In addition, the network has the complicated inner couplings, and it is that the inner