Preface

One of the main purposes for the study of complex network topology and modeling is to understand the influence of network structure on its function and consequently to find effective ways to improve network performance. In practice, directly controlling every node in a dynamical network with a huge number of nodes might be impossible but might also be unnecessary. Therefore, a pinning control strategy, that is, to achieve the goal of control by directly adding control input to a fraction of nodes selected from the network, is very important for the control of networked systems.

This monograph intends to investigate the synchronization, consensus and flocking of networked systems via pinning control strategy, which aims to control the whole dynamical network via imposing controllers on only a fraction of nodes. For a dynamical network with fixed and connected topology, the feasibility and effectiveness of different pinning control strategies are investigated. For a dynamical network with time-varying and possibly disconnected topology, consensus and flocking control of mobile multi-agent systems with limited communication capabilities are studied. Research on pinning control of networked systems can not only help better understand the mechanisms of natural collective phenomena, but also benefit the applications in mobile sensor/robot networks.

This monograph is organized as follows. Chapter 1 overviews recent research in pinning control of complex networked systems. Chapters 2 and 3 introduce synchronization of complex dynamical networks via pinning, including pinning control for complete synchronization and pinning control for cluster synchronization. Chapters 4 and 5 study consensus of multi-agent systems via pinning, including distributed pinning-controlled second-order consensus of multi-agent systems and distributed pinning-controlled consensus in a heterogeneous influence network. The pinning-controlled flocking of multi-agent systems is investigated with a virtual leader in Chap. 6 and with preserved network connectivity in Chap. 7, respectively.

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