Distributed Consensus of Multi-Agent Systems with or without Attacks

Abstract: Distributed consensus of multi-agent systems has received much attention from various scientific research communities due to applications to autonomous driving, multi-robot factories, computer games, etc. To ensure consensus in the whole group, agents need to communicate with their neighbors. However, the underlying topology among the agents may be time-varying, due to limited communication range, commination link failures, and actuator failures. Distributed consensus for general multi-agent systems under switching directed topologies will be discussed first. Noting that failures or attacks may occur on vulnerable points of large-scale multiagent systems, designing distributed control algorithms that guarantee acceptable performance in the presence of faults or adversaries is very important. How to design attack-resilient distributed control algorithms to be able to withstand the compromise of a subset of agents and still ensure the consensus of normal agents will be discussed. Since the network attack can intercept and tamper with the observer information transmitted among the agents' group, to make the protocol free from attack is to propose a novel protocol without observer information exchange. The presented fully distributed adaptive protocol uses only local output measurement of each agent and its neighbors.