

Introduction to Cyber-Physical Systems against Attacks

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Abstract:

Cyber-Physical Systems (CPSs) are the integration of computation, networking and physical processes, which play an increasingly important role in critical infrastructure, government and everyday life. Compared with traditional control systems, CPSs are more vulnerable to cyber attacks implemented by adversaries in the sense of more open degree of their cyber layer. Both false data injection (FDI) attacks and denial-of service (DoS) attacks may cause serious damages to the operation of physical layers. Thus, it is important to investigate security issues concerning with secure control and estimation design. In this talk, we focus on CPSs under DoS and FDI attacks, for which the former violate data timeliness by blocking available data flows while the latter temper transmitted data packets to destroy the trustworthiness. Preliminary studies on control and estimation for CPSs are presented to ensure desired system performance.

Formation Control and Analysis of Multi-Robot Systems

Abstract:

Multi-robot Systems are systems with characteristics of cooperation and decentralization. The robots in such systems could be working in a large area, where the dynamics of the robots can be approximated by first order equations. As the robots often work under complex circumstances, limitations of the hardware that include limited and short-range communication and short-range and passive sensing are likely to be present. As a result of the localization conditions above, the robots need to cooperate in a distributed manner. The fundamental objective for the system is to reach a desired formation of the robots and maintain the formation. In this talk, the formation control problem for a team of robots will be investigated. We will consider the sensors on the robots have limited ranges, that could be limited or none communication among the robots; and the objective formation could have variable scales or in an arbitrary shape. Control and protocol design will be introduced and analysed, and examples will be given to demonstrate the effectiveness of the proposed techniques.