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Modeling, Control and Diagnosis of Discrete Event Systems under Cyberattacks

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摘要:
In this talk, we will discuss how to model cyberattacks in discrete event systems, how to control discrete event systems under cyberattacks, and how to diagnose faults in discrete event systems under cyberattacks. After introducing CA-controllability and CA-observability, we prove that the supervisory control problem under cyberattacks is solvable if and only if the given specification language is CA-controllable and CA-observable. Furthermore, we obtain methods to calculate the state estimates under sensor attacks and to synthesize a state-estimate-based supervisor to achieve a given safety specification under cyberattacks. For fault diagnosis, we introduce CA-diagnosability that ensures faults can always be diagnosed even under sensor attacks. A testing procedure for CA-diagnosability is developed, and its correctness is proven. We further apply diagnosability theory to investigate conditions under which the presence of the attacker can be detected.

简介:
Feng Lin received his B.Eng. degree in electrical engineering from Shanghai Jiao Tong University, Shanghai, China, in 1982, and the M.A.Sc. and Ph.D. degrees in electrical engineering from the University of Toronto, Toronto, ON, Canada, in 1984 and 1988, respectively. He was a Post-Doctoral Fellow with Harvard University, Cambridge, MA, USA, from 1987 to 1988. Since 1988, he has been with the Department of Electrical and Computer Engineering, Wayne State University, Detroit, MI, USA, where he is currently a professor. His current research interests include discrete event systems, hybrid systems, robust control, and their applications in alternative energy, biomedical systems, and automotive control. He authored a book entitled "Robust Control Design: An Optimal Control Approach" and coauthored a paper that received a George Axelby outstanding paper award from the IEEE Control Systems Society. He is a Fellow of IEEE.