上海交通大学自动化系
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系统控制与信息处理教育部重点实验室
Key Laboratory of System Control and Information Processing, Ministry of Education

学术报告会

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地　点：电院群楼2-410会议室

State estimation and diagnosis of discrete event systems

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Abstract:

Fault diagnosis in dynamic systems is a subject that has received a lot of attention in the past decades: the objective is that of understanding if a system is affected by a malfunctioning, and if so of identifying its nature. In the context of discrete event systems, faults are modeled by unobservable events whose firing cannot be directly detected but must be reconstructed on the basis of the observed evolution. This implies that the approaches for diagnosis are strictly related to the problems of designing an observer for state and event sequence estimation and build on these basic results.

An additional interesting problem in the context of fault diagnosis is diagnosability analysis, which aims to determine if a system is diagnosable, i.e., if the occurrence of a fault can be identified in a finite number of steps. This a fundamental property, required in many critical systems to ensure that a proper error recovery procedure is triggered after a fault occurs. Both diagnosis and diagnosability have been mostly studied in the context of finite state automata, and the complexity of solving these problems is often unmanageable due to the state space explosion. However, these shortcomings can be overcome using more powerful and efficient models, such as Petri nets. This talk aims to present the basic approaches for state estimation, diagnosis and diagnosability of discrete event systems. The practical advantages of using Petri net with respect to automata are also shown by means of some examples.

Biography:

Alessandro Giua is professor of Automatic Control at the Department of Electrical and Electronic Engineering (DIEE) of the University of Cagliari, Italy. He received a Ph.D. degree in computer and systems engineering from Rensselaer Polytechnic Institute, Troy, NY, USA in 1992. He has also held visiting positions in several institutions worldwide, including Xidian University, Xi'an, China. His research interests include discrete event systems, hybrid systems, networked control systems, Petri nets and failure diagnosis. On this topic he has published extensively, given several talks and managed international and national research projects.

He is currently Editor in Chief of the IFAC journal Nonlinear Analysis: Hybrid Systems; Senior Editor of the IEEE Trans. on Automatic Control; and Department Editor of the journal Discrete

Event Dynamic Systems. He has served the IEEE Control Systems Society in the role of General Chair of CDC 2016 and member of the Board of Governors (2013-15) and has served the International Federation of Automatic Control as chair of the IFAC Technical Committee 1.3 on Discrete Event and Hybrid Systems (2008-11 and 2011-14). He is a Fellow of the Institute of Electrical and Electronics Engineers for contributions to discrete event and hybrid systems and a recipient of the IFAC Outstanding Service Award. He was a laureate in 2017 of the People's Republic of China Friendship Award, and in 2014 of the Shaanxi government’s Sanqing Friendship Award.