

IEEE ICUS 2022
Invited Session Summary

Title of Session

Distributed Learning Introspective Control and Security Operations for
Autonomous Unmanned Systems

Name, Salutation and Affiliation of Organizers

1. Prof. Guanghui Wen

Southeast University, China

2. Prof. Zhi-Wei Liu

Huazhong University of Science and Technology, China

3. Prof. Hong-Xiang Hu

Hangzhou Dianzi University, China

Biosketches of Organizers



Prof. Guanghui Wen received the Ph.D. degree in mechanical systems and control from Peking University, China, in 2012. Currently, he is a Full Professor with the Department of Systems Science, Southeast University, Nanjing, China. His current research interests include cooperative control of multi-agent systems, analysis and synthesis of complex networks, cyber-physical systems, and resilient control. Dr. Wen was the recipient of the Best Student Paper Award in the 6th Chinese Conference on Complex Networks in 2010. He was named a Highly Cited Researcher by Clarivate Analytics since 2018. Dr. Wen was awarded a National Natural Science Fund for Excellent Young Scholars in 2017. Moreover, he was a recipient of the Australian Research Council Discovery Early Career Researcher Award in 2018. He currently serves as an Associate Editor of IEEE Journal of Emerging and Selected Topics in Industrial Electronics, IEEE Trans. Systems, Man and Cybernetics: System, and Asian J. Control. He is an IET Fellow.



Prof. Zhi-Wei Liu is currently a professor in the School of Artificial Intelligence and Automation, Huazhong University of Science and Technology (HUST). He received the B.S. degree in information management and system from Southwest Jiaotong University, Chengdu, China, in 2004 (from Sep. 2000 to Jun. 2004), and the Ph.D. degree in control theory and applications

from HUST, Wuhan, China, in 2011 (from Sep. 2006 to Jun. 2011). From Aug. 2004 to Aug. 2006, he was a teacher in the Department of Information Engineering, Nanchang Institute of Technology. From Jul. 2011 to Sep. 2013, he was a postdoc in the Department of Automation, Wuhan University (WHU), Wuhan, China working with Prof. Hong Zhou. From Sep. 2013 to Sep. 2015, he was a lecturer in the Department of Automation, WHU. He was promoted to Associate Professor in Sep. 2015. He was moved to HUST in Feb. 2017, and promoted to professor in Oct. 2020. From Dec. 2012 to Feb. 2013, He held the position of Senior Research Associate with the Department of Mechanical and Biomedical Engineering, City University of Hong Kong. From Sep. 2014 till Sep. 2015, he held the position of Visit Research Fellow with the School of Electrical and Computer Engineering, RMIT University. Dr. Liu is a recipient of the Excellent PhD Dissertation of Hubei Province in 2004, China.



Prof. Hong-Xiang Hu received the Ph.D. degree in control theory and control engineering from the Zhejiang University of Technology, Hangzhou, China, in 2013. From July 2013 to December 2016, he was a lecturer in Department of Mathematics, HDU. He was promoted to Associate Professor in January 2017, and promoted to professor in January 2020. From September 2015 to June 2018, he was a postdoc in the School of Mathematics, Southeast University, Nanjing, China working with Prof. Wenwu Yu. He was a Senior Research Associate with the Department of Electronic Engineering, City University of Hong Kong, Hong Kong, in 2017, and a Visiting Scholar with the School of Electrical and Electronics Engineering, Nanyang Technological University, Singapore, in 2019.

Details of Session

In recent years, intelligent unmanned systems have developed rapidly and have more and more powerful capabilities such as perception, communication and calculation. Through the online networking and cooperation, the network of autonomous unmanned systems can complete important tasks such as joint attack, collaborative search and ocean exploration, and play an increasingly important role in the fields of national defense, transportation and energy. Autonomous unmanned systems usually need to work for a long time in the environment with high uncertainty. So the security operations of the systems play a key role in the wide practical application of autonomous unmanned systems. Distributed learning

introspective control means that the autonomous unmanned systems evaluate the effect of operation strategy or control method in the current environment online through distributed interaction, and then adjust the control scheme in real time through feedback, so as to realize the adaptability and immunity to time-varying and uncertain environment. At the same time, the autonomous unmanned systems should be able to timely transfer the information of changes in the internal and external environment to the monitoring or operating personnel based on artificial intelligence and other technologies to realize the intelligent monitoring and operation.

This topic will focus on distributed learning introspective control and security operations techniques which are applicable to complex autonomous unmanned systems and provide an effective communication platform for researchers in this field to display, summarize and discuss recent developments. Topics include but are not limited to:

- The introspective control framework of distributed learning for autonomous unmanned systems
- Efficient communication technology for autonomous unmanned systems
- Intelligent sensing method for autonomous unmanned systems
- Distributed state fusion and estimation
- Distributed learning fault diagnosis and fault tolerant control
- Safety control of autonomous unmanned systems
- Human-computer interaction methods for autonomous unmanned systems
- Distributed artificial intelligence and optimization methods