IEEE ICUS 2022 Invited Session Summary

Title of Session

Autonomous and Intelligent Cooperation Technologies

for Unmanned Swarm Systems

Name, Salutation, Affiliation of Organizers

1. Assoc. Prof. Yongzhao Hua

Beihang University, China

2. Prof. Jianping He

Shanghai Jiao Tong University, China

- **3. Prof. Yang Tang** East China University of Science and Technology, China
- 4. Prof. Xiwang Dong

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Biosketches of Organizers



Yongzhao Hua received the B.E. and Ph.D. degrees in Navigation, Guidance and Control from Beihang University, Beijing, China in 2014 and 2019, respectively. From 2019 to 2020, he was a Postdoctoral Research Associate with Department of Aerospace Engineering, University of Bristol, Bristol, UK. He is currently an Associate Professor in Institute of Artificial Intelligence, Beihang University, Beijing, China.

His current research interests include distributed control, optimization, and game for multi-agent systems. He was selected in the "Young Elite Scientists Sponsorship Program" by China Association for Science and Technology (CAST) in 2021.



Jianping He is currently an associate professor in the Department of Automation at Shanghai Jiao Tong University. He received the Ph.D. degree from Zhejiang University, Hangzhou, China, in 2013. He had been a research fellow at the University of Victoria, Canada, from 2013 to 2017. His research interests include Cooperative Control of Networked Robotics, Distributed Control and

Optimization, Security and Privacy, Wireless Sensor and Vehicle Network, etc. Dr. He serves as an Associate Editor for IEEE Trans. Control of Network Systems, IEEE Open Journal of Vehicular Technology and KSII Trans. Internet and Information Systems. He was also a Guest Editor of the IEEE TAC, IEEE TII, IJRNC, etc. He was the winner of the Outstanding Thesis Award, Chinese Association of Automation, 2015. He received the best paper award from IEEE WCSP'17, the best conference paper award from IEEE PESGM'17, the finalist best student paper award from IEEE ICCA'17, and the best conference paper award runner-up from IEEE VTC'20-Fall.



Yang Tang received the B.S. and Ph.D. degrees in electrical engineering from Donghua University, Shanghai, China, in 2006 and 2010, respectively. From 2008 to 2010, he was a Research Associate with The Hong Kong Polytechnic University, Hong Kong. From 2011 to 2015, he was a Post-Doctoral Researcher with the Humboldt University of Berlin, Berlin, Germany, and with the Potsdam Institute for Climate Impact Research,

Potsdam, Germany. He is now a Professor with the East China University of Science and Technology, Shanghai. His current research interests include distributed estimation/control/optimization, cyber-physical systems, hybrid dynamical systems, computer vision, reinforcement learning and their applications. Prof. Tang was a recipient of the Alexander von Humboldt Fellowship and has been the ISI Highly Cited Researchers Award by Clarivate Analytics from 2017. He is a Senior Board Member of Scientific Reports, an Associate Editor of IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Cybernetics, IEEE Transactions on Circuits and Systems-I: Regular Papers, IEEE Transactions on Emerging Topics in Computational Intelligence, IEEE Systems Journal and Engineering Applications of Artificial Intelligence (IFAC Journal), etc. He is a leading guest editor for special issues in IEEE Transactions on Emerging Topics in Computational Intelligence and IEEE Transactions on Emerging Topics in Systems.



Xiwang Dong received the Ph.D. degree in Control Science and Engineering from Tsinghua University, Beijing, China, in 2014. He has been a Research Fellow with the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, from 2014 to 2015, a Lecturer and an Associate Professor with the School of Automation Science and Electrical Engineering, Beihang University, Beijing, China from 2014 to

2018. Currently, he is a Full Professor and an Associate Dean at Institute of Artificial Intelligence, Beihang University, Beijing, China, and IEEE Senior Member. His research focuses on cooperative control of multi-agent systems, intelligent control of swarm systems, and distributed control UAV swarm systems. He is the first author or corresponding author of more than 70 referred international journal papers (6 ESI Highly Cited Papers), receiving more than 3000 non-self SCI citations with H-index 31 according to Web of Science. He serves as the Associate Editor and an Editorial Board Member of several journals, including the Drones, and National Science Open. Dr. Dong was the recipient of the Best Paper Award of IEEE International Conference on Control and Automation (IEEE ICCA) in 2018, Best Paper Award of IEEE Guidance, Navigation and Control Conference (IEEE GNCC) in 2018, the Young Author Prize of IEEE CSS Beijing Chapter (CCC) in 2019, and the Springer Outstanding Thesis Award in 2015. He was the recipient of the First Prize of Innovation Award of Chinese Institute of Command and Control in 2019. He was the Top Reviewer of Asian Journal of Control (2016) and the Outstanding Reviewer of Journal of the Franklin Institute (2017). He was selected in the "Young Elite Scientists Sponsorship Program" by China Association for Science and Technology (CAST) in 2017 and was awarded a National Natural Science Fund for Excellent Young Scholars in 2019.

Details of Session

Unmanned swarm systems have broad application prospects in both military and civil fields, such as micro satellite swarm cooperative detection, UAV swarm cooperative interference, UGV swarm cooperative transportation, and so on. Autonomous and intelligent cooperation technology is a hot and difficult research topic in the field of swarm intelligence and has important application value in swarm system cooperative task execution. How to design distributed cooperative approaches to realize the organic collaboration of perception and cognition, decision and

planning, guidance and control, and evaluation and verification is a hot topic of the current academia and industry.

This invited session focuses on the latest research results for the autonomous and intelligent cooperation technologies for unmanned swarm systems. In particular, papers related to swarm intelligent perception and cognition, autonomous decision and planning, cooperative guidance and control, multi-agent reinforcement learning, distributed optimization and game, evaluation and verification are welcome.