

Plenary Panel Discussion 2

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成都世纪城新国际会展中心会议中心五楼水晶厅

Crystal Hall, Fifth Floor of Convention Center, NICEC

Development and Prospect of UAVs

无人机的发展与展望

Chair: Jie Chen (Beijing Institute of Technology, China)

Panelists: Ben M. Chen (National University of Singapore (NUS), Singapore)
 Yunhui Liu (The Chinese University of Hong Kong, China)
 Wen-Hua Chen (Loughborough University, UK)
 Gangyin Tian (Beijing ZHZ technology CO., Ltd)

Abstract: The conference proudly presents the plenary panel session on Development and Prospect of UAVs. We are honored to be able to invite four prominent professors in this field to be panelists. The UAV first appeared in 1920s, was used as the training target. Decades have passed, what achievements we have gained in the field of UAVs, and what's the new direction for the further development of this field, panel members will share their special experiences and visions on this issue with audience through effective face-to-face dialogues.



Prof. Ben M. Chen is currently a Professor and Director of Control, Intelligent Systems & Robotics Area, Department of Electrical and Computer Engineering, National University of Singapore (NUS), and Head of Control Science Group, NUS Temasek Laboratories. His current research interests are in systems and control, unmanned aerial systems, and financial market modeling.

Dr. Chen is an IEEE Fellow. He is the author/co-author of 10 research monographs including H₂ Optimal Control (Prentice Hall, 1995), Robust and H_∞ Control (Springer, 2000), Hard Disk Drive Servo Systems (Springer, 1st Edition, 2002; 2nd Edition, 2006), Linear Systems Theory (Birkhäuser, 2004), Unmanned Rotorcraft Systems (Springer, 2011), and Stock Market Modeling and Forecasting (Springer, 2013). He had served on the editorial boards of a number of journals including IEEE

Transactions on Automatic Control, Systems & Control Letters, and Automatica. He currently serves as an Editor-in-Chief of Unmanned Systems and a Deputy Editor-in-Chief of Control Theory & Technology.



Prof. Yunhui Liu received the B.Eng. degree in applied dynamics from the Beijing Institute of Technology, Beijing, China, in 1985; the M. Eng. degree in mechanical engineering from Osaka University, Osaka, Japan, in 1989; and the Ph.D. degree in mathematical engineering and information physics from the University of Tokyo, Tokyo, Japan, in 1992. He was with the Electrotechnical Laboratory, Ministry of International Trade and Industry, Ibaraki, Japan, from 1992 to 1995. Since February 1995, he has been with the Chinese University of Hong Kong (CUHK), Shatin, N.T., Hong Kong, where he is currently a Professor with the Department of Mechanical and Automation Engineering and the Director of the CUHK T Stone Robotics Institute. He has published more than 200 papers in refereed journals and refereed conference proceedings and was listed in the Highly Cited Authors (Engineering) by Thomson

Reuters in 2013. His research interests include visual servoing, medical robotics, multifingered robot hands, mobile robots, sensor networks, and machine intelligence. Dr. Liu has received numerous research awards from international journals and international conferences in robotics and automation and government agencies. He is the Editor-in-Chief of Robotics and Biomimetics and an Editor of Advanced Robotics. He served as an Associate Editor of the IEEE TRANSACTION ON ROBOTICS AND AUTOMATION and General Chair of the 2006 IEEE/RSJ International Conference on Intelligent Robots and Systems. He is an IEEE Fellow.



Prof. Wen-Hua Chen holds Professor in Autonomous Vehicles in the Department of Aeronautical and Automotive Engineering at Loughborough University, UK, where he is leading the Autonomous Systems Laboratory. He is also the Head of Control and Reliability Research Group. Prof. Chen has a considerable experience in control and signal processing and their applications in aerospace and automotive systems. His research is featured by working in the interface between theoretic developments and practical applications, and across a number of disciplines including aerospace, automotive engineering, control, electronics, and computer science. He has made considerable contributions in the development of Nonlinear Model Predictive Control and Disturbance Observer Based Control. In the last decade, much of his effort has

been spent in developing research in autonomous system technologies and their applications in unmanned aircraft systems and intelligent vehicles, covering most of the aspects from autopilots, situational awareness, decision making to system integration and verification. His unmanned vehicles related research has been widely supported by the UK government (e.g. Engineering and Physics Science Research Council) and industry.

Dr Chen received the M.Sc. and Ph.D. degrees in control engineering from Northeastern University, Shenyang, China, in 1989 and 1991, respectively. He was a Lecturer and then Associate Professor with the Department of Automatic Control, Nanjing University of Aeronautics and Astronautics, Nanjing, China before moved to UK. He joined the Department of Aeronautical and Automotive Engineering, Loughborough University, in 2000 after having held a research position and then a Lecturer in control engineering with the Centre for Systems and Control, University of Glasgow, Scotland.

Prof Chen has received Loughborough Excellence Awards for Developing Research Leadership by Loughborough University. He was awarded Charles Sharpe Beecher prize by the Institution of Mechanical Engineers, 2013, for a paper in unmanned helicopter control, and his team also won the first Royal Aeronautical Society Unmanned Aircraft Systems Innovation Award in 2012. Prof. Chen is a Chartered Engineer (CEng), a Fellow of the Institution of Mechanical Engineers, and a Fellow of the Institution of Engineering and Technology (formerly IEE). He is also a visiting Changjiang Chair Professor in Beihang University.



Mr. Gangyin Tian is the CEO of Beijing ZHZ technology CO., Ltd, one of the China's leading UAV companys. He holds the Director of Unmanned-Flight Control Research institute, Beijing Institute of Technology, China. Tian has a considerable experience in flight control and algorithm and their applications in unmanned aerial vehicle. Tian received the Bachelor degrees in aircraft design from Beijing Institute of Technology, Beijing, China, in 2005. He was a core R&D engineer in Beijing BVE technology Co., Ltd before established his own company.

In the last decade, much of his effort has been spent in developing research in modern robust control algorithm and their applications in unmanned aircraft systems. When he was in university, as a core member of Aviation Association, he began to study and research modern robust control algorithms and attempted to use his research in UAV control and engine control. In 2007, he completed the research and development of unmanned helicopter autopilot based on Hinf algorithm and its application has been successfully make an unmanned helicopter automatically and independently takeoff, land, hover and conduct path planning.

Tian established a company in 2008, which he made considerable contributions in the commercialization of the unmanned helicopter autopilot. In 2010, he was responsible for the research and development of the 300-kilogram coaxial unmanned helicopter and has been successfully make it become autonomous drone in late 2010. This unmanned helicopter holds a number of invention patents, developed and applied in multiple industries. In 2013, he was in charge of 3 tons of unmanned helicopter research and development program. The flight time of this drone can be up to 30 hours, which is the longest fight time of an unmanned helicopter, currently.