

Enhance Safety of UAVs towards Practical Applications through Fault-Tolerant Guidance, Navigation and Control

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Abstract

Benefited from technical advances in materials, mechatronics, communication, computation, control, sensors, actuators and new/smart designs, Unmanned Aerial Vehicles (UAVs) are gaining more and more attention and rapid development during the last a few years due to their relatively easy and cost-effective uses in various application tasks such as surveillance, sensing, search and rescue, agriculture, forest, environment, pipelines, powerlines, military and security applications. In this talk, brief overall view on the challenges and latest developments on Guidance, Navigation, and Control (GNC) of UAVs integrating with Remote Sensing (RS) techniques for autonomous, efficient and reliable applications to forest and environment monitoring and fires/damages/risks detection will be presented first, then some of new developments and current research works being carried out at presenter's group will be introduced as the second part of the presentation. In particular, recent developments on Fault Detection and Diagnosis (FDD), Fault-Tolerant Control (FTC), and Fault-Tolerant Cooperative Control (FTCC) techniques towards autonomous and reliable use of single and multiple UAVs to the above-mentioned practical applications will be introduced. New technical developments based on deep learning strategies for detection of fires/damages/risks using remotely sensed signals/images from onboard UAVs will also be presented.

About the speaker

Youmin Zhang received the B.S., M.S., and Ph.D. degrees from Northwestern Polytechnical University, Xi'an, China, in 1983, 1986, and 1995, respectively. He is currently a Professor with the Department of Mechanical, Industrial and Aerospace Engineering and the Concordia Institute of Aerospace Design and Innovation, Concordia University, Montreal, Quebec, Canada.



Dr. Zhang's current research interests include condition monitoring, health management, FDD, FTC, and FTCC of single and multiple unmanned vehicles and their applications to forest fires, pipelines, power lines, environment, natural resources and natural disasters monitoring, detection, and emergency responses by combining with remote sensing techniques; dynamic systems modeling, estimation, identification, advanced control techniques and signal processing techniques for diagnosis, prognosis, and health management of safety-critical systems, renewable energy systems and smart grids, and smart cities. He has authored 4 books, over 500 journal and conference papers.

Dr. Zhang is a Fellow of Canadian Society of Mechanical Engineering (CSME), a Senior Member of AIAA and IEEE, the President of International Society of Intelligent Unmanned Systems (ISIUS), Executive Committee Member of International Conference on Unmanned Aircraft Systems (ICUAS), Steering Committee Member of International Symposium on Autonomous Systems (ISAS), and a member of the Technical Committee for several international and national scientific societies. He has been invited to deliver keynote, plenary and tutorial talks at international conferences/workshops and research seminars worldwide for over 100 times. He has been an Editor-in-Chief, an Editor-at-Large, an Editorial Board Member, and Associate Editor of several international journals, including IEEE Transactions on Neural Networks & Learning Systems and IET Cyber-systems and Robotics. He has served as General Chair, Program Chair, General/Program Co-Chair of several international conferences, including currently as General Chair of the 2020 International Conference on Unmanned Aircraft Systems (ICUAS'20) to be held at Athens, Greece during Sept. 1-4, 2020 (www.uasconferences.com). More detailed information can be found at <http://users.encs.concordia.ca/~ymzhang/>.