

# Collaborative Fault Diagnosis and Fault-Tolerant Control

## Technologies for Swarm Unmanned Systems

Professor Zehui Mao 冒泽慧

College of Automation Engineering, Nanjing University of Aeronautics and  
Astronautics

### Abstract

Swarm unmanned systems are typical distributed networked multi-agent systems that integrate technologies such as perception, communication, computing, control, and optimization. As the scale of swarm systems increases, the task execution time extends, and the on-site environment becomes more variable, the probability of encountering external attacks, interference, and deception leading to faults also rises. Due to the information exchange and transmission within the swarm, faults can spread to neighbors or even the entire swarm systems, affecting the swarm's efficiency and causing immeasurable losses. This talk is going to introduce the fault diagnosis methods under the fault propagation, the task search and allocation problem of remaining healthy unmanned units under the communication distance and delay constraints, as well as fault-tolerant control schemes under the constraints of swarm performance, individual mechanical characteristics, and complex external environments. In addition, some experiments are presented to show the actual unmanned formation.



**Zehui Mao** received the Ph.D. (Hons.) degree in control theory and control engineering from Nanjing University of Aeronautics and Astronautics, Nanjing China, in 2009. she is currently a Full Professor with the College of Automation Engineering, Nanjing University of Aeronautics and Astronautics. She has published over 80 technical papers in peer-refereed journals and prestigious conference proceedings. She has won the second class prize of National Natural Science of China (rank 4), the first class prize of Natural Science of the Ministry of Education (rank 4), the first class prize of Science and Technology of Jiangsu Provincial (rank 3). She currently serves as an Associate Editor for IEEE Transactions on Industrial Informatics and Neurocomputing, as well as a Youth Editorial Board Member for IEEE/CAA Journal of Automatica Sinica. Her current research interests include the fault diagnosis and fault-tolerant control and their applications in transport and equipment systems.