

IEEE ICUS 2022

Invited Session Summary

Title of Session

Computational Guidance and Control for Unmanned Aerospace Systems

Name, Salutation and Affiliation of Organizers

1. Prof. Yanqian Liang

Shanghai Institute of Aerospace System Engineering, China

2. Asst. Prof. Tao Jia

China Aerodynamics Research and Development Center, China

3. Asst. Prof. Jinbo Wang

Sun Yat-sen University, China

Biosketches of Organizers



Yanqian Liang, deputy director of the general design department of the Shanghai institute of aerospace systems engineering, eighth academy of china aerospace science and technology corporation. Assistant chief engineer of the Long March 4 launch vehicle, senior engineer, and currently a member of the space transportation committee of the international astronautical federation (IAF). As the project leader, he undertook the 13th five-year civil aerospace project “Launch Vehicle Fault Diagnosis and Flight Reconstruction Technology”, which was included in the national key strategic project. He has long been engaged in technical research on the general design of launch vehicles, flight control, vertical take-off and landing recovery, etc. He participated in the lunar exploration project Chang'e-4 relay satellite mission, presided over the development of “multi-window, narrow width, high-precision mission design technology”, and won the CAST Technology progress second prize. He has published more than 10 papers and 6 patents.



Tao Jia, assistant researcher of the China Aerodynamics Research and Development Center, graduated from Harbin Institute of Technology with a bachelor's degree in 2011 and a master's degree from National University of Defense Technology in 2013. Mainly engaged in the research and engineering of UAV flight control system and intelligent flight

technology. In 2014, he designed and realized the over-stall maneuver control law of a certain jet UAV, and passed the flight verification of 5 typical over-stall maneuvers, which is the first case in China. In 2021, he led the team to design and verify the perception and obstacle avoidance technology of fixed-wing swarm formation, and used the above-mentioned intelligent flight system technology to obtain a competition score at least 175 times higher than other participating teams in the subject one of the “Air Force Unmanned Competition”. He has published more than 10 papers.



Jinbo Wang, assistant professor and master tutor of the School of Systems Science and Engineering, Sun Yat-Sen University. He has been engaged in the research of aerospace trajectory optimization, computational guidance and control methods, and UAV application technology for a long time. As the first author or the corresponding author, he has published more than 10

papers in journals and conferences including Journal of Guidance Control and Dynamics, AIAA GNC, etc.

Details of Session

With the advent of the era of intelligent autonomous robots, the development of unmanned aerospace systems has entered a new stage, and the task requirements and constraints are becoming more and more complex. At the same time, advanced computational theories and computational tools for GNC applications are also emerging rapidly. The new paradigm of “Computational Guidance and Control (CG&C)” has triggered a new climax in the research of GNC technology for unmanned aerospace vehicles, and has received extensive attention from scholars. CG&C methods are based on intensive on-line numerical computation, usually involving considerable iterations and convergence processes. Compared with traditional analytical or explicit G&C methods, CG&C has a completely different mechanism for the combined application with the rocket/aircraft/space-borne computing platforms. Breakthroughs in algorithm theory and computer application technology are the keys to promoting the development of CG&C methods and enabling new unmanned aerospace systems to complete complex tasks.

The invited session invites original papers of innovative ideas and concepts, new discoveries and improvements, and novel applications relevant to the following

selected topics of “Computational Guidance and Control for Unmanned Aerospace Systems”.

- CG&C for new generation launch vehicles
- CG&C for VTVL rockets
- CG&C for new missile weapons
- CG&C for autonomous space vehicles
- CG&C for autonomous rendezvous and docking
- CG&C for planetary EDL
- CG&C for deep space exploration
- CG&C for hypersonic vehicles
- CG&C for autonomous UAVs
- Rocket/aircraft/space-borne computer technology