

**IEEE ICUS 2022**  
**Invited Session Summary**

**Title of Session**

Plateau Scientific Exploration Oriented Robots: Technologies, Systems and Applications

**Name, Salutation and Affiliation of Organizers**

**1. Prof. Yuqing He**

Shenyang Institute of Automation, Chinese Academy of Sciences, China

**2. Assoc. Prof. Liying Yang**

Shenyang Institute of Automation, Chinese Academy of Sciences, China

**3. Dr. Xinxuan Sun**

31432 Unit of the PLA, China

**Biosketches of Organizers**



**Yuqing He** is currently a full professor at the State Key Laboratory of Robotics (SKLR) in Shenyang Institute of Automation (SIA), Chinese Academy of Sciences. He received his B.S. degree in automation from North-eastern University at Qinhuangdao in 2002 and Ph.D. degree in pattern recognition and intelligent system from SIA in 2008. In 2012, he was a visiting researcher at Institute for automatic control theory in Technique University of Dresden (Germany). He is now the director of innovation center of UAV intelligent control of Liaoning Province. He is also the executive member of the Chinese Institute of Command and Control and the secretary-general of robot professional committee, Chinese Chemical Society. He has been engaged in the researches of autonomy of unmanned systems and got series of achievements in the fields of high performance control, real-time sensing, behavior decision and cooperation/coordination of multiple-robot systems. Based on those, he proposed and perfected the autonomous behavior generic technology architecture of the robotized unmanned system. He has developed series and practical unmanned systems including air, ground and surface unmanned systems having been applied in disaster rescue, public security anti-terrorism and polar scientific research. He also proposed and constructed the cross-domain collaborative technology architecture of UAV/UGV/USV/UUV system, and the related technologies are realized in joint air-ground public security anti-terrorism, joint air-ground Qinghai-Tibet plateau

scientific exploration and joint air-sea exploration. These achievements are funded by several key projects of the national natural science foundation of China and national key research and development program projects. He has published more than 200 SCI/EI indexed academic papers and applied more than 20 patents in the related fields.



**Liying Yang** is currently an Associate Research fellow at the State Key Laboratory of Robotics (SKLR) in Shenyang Institute of Automation (SIA), Chinese Academy of Sciences. She received her Ph.D. degree in pattern recognition and intelligent system from SIA in 2011. She has been engaged in the research of autonomous control, planning and the related applications of Unmanned Aerial Vehicles (UAVs). She led the

research and development of Yunxiao-100 unmanned helicopter system and Yunque multiple rotor UAV, which is applied firstly in the survey of Qinghai-Tiber Plateau. Both of the two UAVs have carried out the application demonstration in the fields of precision agriculture, power industry, oceanic observation and Qinghai-Tiber Plateau survey. She has hosted numbers of projects such as National Natural Science Foundation of China, sub-task of National Defense 973 Project, Sub-task of National Key R & D Programs, etc. She has published more than 30 SCI/EI indexed academic papers and applied more than 10 patents in the related fields.



**Xinxuan Sun**, Unit 31432 of the PLA, Ph.D./Senior Engineer, He mainly focuses on research on information automation and UAV applications. He has got lots of achievements in the fields of Information data processing technology, assistant decision-making and marine baseline data. He has published 2 monographs and more than 30 papers in the related journals and

international conferences.

### **Details of Session**

The plateau scientific exploration is of great significance for researching on the evolution of the earth and global climate change. Currently, plateau scientific exploration activities are still mainly carried out by manpower. However, the extreme weather, complex environments and harsh living conditions in high-altitude areas have a great impact on human activities, and thus have seriously restricted the regions of scientific explorations. This topic will focus on ‘configuration design of scientific

exploration robots’, ‘design of robotic payload’, and ‘autonomous behavior and teleoperation of mobile robots’, ‘design and development of scientific exploration robot system’, and ‘robotic scientific exploration applications’.

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 “Plateau Scientific Exploration Oriented Robots”.

- High altitude oriented ground robots
- High altitude oriented underwater robots
- High altitude oriented flying robots
- High altitude oriented surface robots
- Environmental modeling and perception of complex environment
- Autonomous positioning and navigation of exploration robots
- Control, planning and decision-making of exploration robots
- Exploration mission oriented Human-Robot cooperation
- Implementations and applications of robotic scientific exploration