

IEEE ICUS 2022

Invited Session Summary

Title of Session

Key Technologies on Autonomous Unmanned Medical Robotics and Systems based on Artificial intelligence (AI)

Name, Salutation and Affiliation of Organizers

1. Assoc. Prof. Zhengzhi Zhu

The First Affiliated Hospital of USTC, China

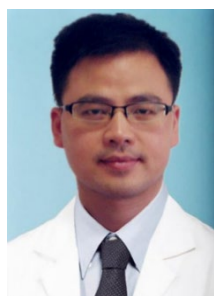
2. Dr. Chengbo Wang

Dalian Maritime University, China

3. Dr. Hu Zhou

The First Affiliated Hospital of USTC, China

Biosketches of Organizers



Zhengzhi Zhu is the Deputy Chief Physician of the Head and Neck Oncology Surgery and Breast Clinic Center of the First Affiliated Hospital of the University of Science and Technology of China, and a Doctor of Oncology. He is mainly engaged in clinical and basic research of tumor surgery. In recent years, he has focused on the application of AI technology in tumor imaging diagnosis and pathological image recognition, and the application of robot-assisted technology in tumor surgery and operation. He serves as a member of member of Endocrine Surgery Group, Oncology Branch of Anhui Medical Association, a Young Committee Member of Breast Disease Branch, a member of the Standing Committee and Secretary General of the Cancer Endocrine Therapy Committee of Anhui Anti-Cancer Association, a member of the Standing Committee of Thyroid Cancer Professional Committee, a member of Breast Cancer Professional Committee, a member of the Professional Committee of Minimally Invasive Medicine of Anhui Medical Doctor Association, Deputy Director and Secretary of Thyroid and Breast Surgery Branch of Anhui General Medical Association, a member of the Cancer Prevention and Control Committee of Anhui Preventive Medicine Association, and a Mmember of the breast cancer expert group for the treatment of serious diseases for the rural poor in Anhui Province. He presided over 3 projects and published more than 10 related academic papers.



Chengbo Wang is a Ph.D. student in the Marine Intelligent Transportation Research Team of the Navigation College, Dalian Maritime University. He is a member of the institute of Marine Engineering, Science and Technology (IMarEST), a member of the Chinese Association of Automation, and a member of the Chinese Association for Artificial Intelligence.

The main research directions are artificial intelligence-based unmanned system technology, reinforcement learning decision-making theory and key technologies for autonomous navigation for MASS. As the main force, he participated in and completed 8 scientific research projects such as major special projects of the Ministry of science and technology and the National Natural Science Foundation of China. He has published 18 related academic papers, of which 9 are indexed by SCI/EI. Participated in the compilation of monographs "Offshore Robotics" and "Encyclopedia of China Traffic Volume 3rd Edition", authorized/accepted 8 national invention patents, and authorized 8 software copyrights. He won the Dalian Outstanding Graduate, and the Transportation Major Scientific and Technological Innovation Achievement Award (Transportation Technology Paper). He has served as many international authoritative journals such as IEEE Transactions on Neural Networks and Learning Systems, IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions on Automation Science and Engineering, Ocean Engineering, Journal of Electrical Engineering & Technology, Cognitive Computation and System, as well as TRB, CAC Reviewer for international high-impact conferences.



Hu Zhou is the deputy chief physician of the West District of the First Affiliated Hospital of the University of Science and Technology of China (Anhui Cancer Hospital). He received the Ph.D. degree from the Shandong University. He is a postdoctoral fellow at Tongji Medical College of Huazhong University of Science and Technology (co-supervisor:

Academician MaDing), and he is the head of the subspecialty of Haifu Knife and Microwave Ablation. His specialty is gynecological oncology. He is mainly good at surgical treatment of benign and malignant gynecological tumors and minimally invasive surgical treatment. His characteristic techniques are high-intensity focused ultrasound ablation and microwave ablation. In 2018, he went to South Korea for the teaching and training of Haifu Knife. He serves as a member of the Focused Ultrasound Special Committee of the China Anti-Cancer Association, a member of Zhongguancun Tumor Minimally Invasive Treatment Industry Technology Innovation Strategic Alliance, a member of the Professional Committee of Molecular Diagnosis and Treatment of Gynecological Tumors, a member of the Special Committee of Gynecology Trans-natural Orifice Surgery, Anhui Minimally Invasive Medical Association, and a member of the Tumor Endocrinology Committee of Anhui Anti-Cancer Association. He presided over 2 provincial and ministerial-level projects, and published 10 papers in SCI and other core journals as the first author (IF>10 points for 2 papers).

Details of Session

In recent years, robots have not only been used in industrial fields, but have also been popularized and applied in medical systems. Robotic systems may help efficiently execute complicated tasks that require a high degree of accuracy, and this, in large part, explains why autonomous unmanned medical robotics and systems are currently the most widely used and most promising. Especially in medical treatment represented by surgery, its function overcomes the problems of poor precision, long operation time, doctor fatigue, and lack of three-dimensional precision vision. The key technologies of autonomous unmanned medical robotics and systems involve medical and internet big data technology, multi-modal medical image processing technology, rehabilitation robotics technology, artificial intelligence technology, real-time feature extraction, advanced imaging, high-level features tracking, navigation of continuum surgical devices, autonomous control and operation technology for surgical delicate tasks, etc., which are the common focus of academic and industrial circles.

This invited session focuses on the latest research results for the key technologies on autonomous unmanned medical robotics and systems:

- Medical and internet big data technology
- Multi-modal medical image processing technology
- Rehabilitation robotics technology
- Artificial intelligence technology for medical robots
- Real-time feature extraction techniques for autonomous surgical tasks
- Advanced imaging technologies for autonomous surgical tasks
- High-level surgical tools or features tracking
- Telesurgery technology
- Navigation of continuum surgical devices
- Autonomous control technology for delicate tasks in surgery
- Autonomous technology for delicate tasks in surgery