

S06 计算机辅助外科 (ACCAS 2023)

19<sup>th</sup> Asian Conference on Computer Aided Surgery (ACCAS 2023)



主席：杨广中  
Chair: Guang-Zhong Yang



主席：王广志  
Chair: Guangzhi Wang

2023 年 5 月 20 日 星期六 (Saturday, May 20, 2023)		
8:25-17:08		
会议室: A 区 301 (Room 301)		
时间 (Time)	演讲题目 (Title)	演讲者姓名和单位 (Name and Affiliation)
8:25-8:30	致辞 (Address)	杨广中 Guang-Zhong Yang 上海交通大学 Shanghai Jiao Tong University 王广志 Guangzhi Wang 清华大学 Tsinghua University
Session 1 Chair: Hongen Liao		
8:30-9:00	医用机器人前沿与创新 发展 (特邀报告) Frontiers and Innovative Development of Medical Robots (Invited Speech)	孙立宁 Lining Sun 苏州大学 Suzhou University
Session 2 Chair: Siyang Zuo & Kovit Khampitak		
9:00-9:12	A Soft Robot Using Magnetic-pneumatic Hybrid Actuation that Functions in Unstructured Environments	Zhuxiu Liao Tsinghua University

9:12-9:24	Design of a Mobile Robot for Endotracheal Intubation Surgery	Dongqian Hu Shanghai Jiao Tong University
9:24-9:36	A parallel mechanism and compliant rod-driven lightweight 6-DOF mini manipulator for microsurgery	Liang Li Nanjing Medical University
9:36-9:48	Robot-assisted Optical Coherence Tomography for Automatic Wide-field Scanning	Yangxi Li Tsinghua University
9:48-10:00	Development of a novel robotic system for fast and accurate localization of lung nodules with respiratory compensation	Dongyuan Li Shanghai Jiao Tong University
10:00-10:12	Design of a bionic whisker force sensor for GI endoscopy	Zheng Zhang Tianjin University
Session 3 Chair: Junchen Wang & Byung-Ju Yi		
10:30-10:42	Introducing superelasticity into Cosserat theory for modeling a compliant surgical manipulator	Jiawei Ren Kyushu University
10:42-10:54	Design and development of position control system for Laparoscope Manipulating Robot based on deep learning of endoscopic images	Suphachoke SONSILPHONG Rajamangala University of Technology Isan Khon Kaen Campus
10:54-11:06	Cryogenically storable microcarrier bioink for bone repair	Xiyuan Zhao Chinese Academy of Sciences
11:06-11:18	Modeling of tendon driven soft robot with stiffness-tunable structure	Shangqi Dai Tsinghua University
11:18-11:30	Research on surgical robot system for free fibula flap mandibular reconstruction	Yan Guo Shanghai Jiao Tong university
11:30-11:42	One-arm and Two-arm Switchable Positioning Robot	JAEHYUN BYUN DGIST
11:42-11:54	Inverse-Reinforcement-Learning-Based Robotic Ultrasound Control	Guochen Ning Tsinghua University
12:54-12:06	Design and development of force feedback control system on surgical instruments for single-port laparoscopic manipulating robot	Amornthep SONSILPHONG Rajamangala University of Technology Isan Khon Kaen Campus
Session 4 Chair: Fang Chen & Longfei Ma		
13:30-13:42	Digital Health and Telemedicine in Thailand	Kovit KHAMPITAK Khon Kaen University

13:42-13:54	An End-to-end Spatial-temporal Transformer Model for Surgical Action Triplet Recognition	Xiaoyang Zou Shanghai Jiao Tong University
13:54-14:06	Feature-oriented lesion segmentation based on CT images of acute cerebral hemorrhage	Bohao Xu Beijing Institute of Technology
14:06-14:18	Automatic Segmentation of Zygomatic Bone Surface from 2D-Ultrasound Images Using Transformer Network	Mengning Yuan Peking University Hospital of Stomatology
14:18-14:30	An Image Fusion Method Combining the Advantages of Dual-mode Optical Imaging in Endoscopy	Shipeng Zhang Tsinghua University
14:30-14:42	YOLOv7-Based Multiple Surgical Tool Localization and Detection in Laparoscopic Videos	MD FOYSAL AHMED Southwest University of Science and Technology
14:42-14:54	Semantics-Preserved Domain Adaptation with Target Diverse Perturbation and Test Ensembling for Image Segmentation	Xiaoru Gao Shanghai Jiao Tong University
Session 5 Chair: Guochen Ning & Yinwei Fan		
15:20-15:32	Proximal Femur Fractures Segmentation and Bone Classification	Xu Lu Tsinghua University
15:32-15:44	Clinical Accuracy Verification of the Orthognathic Surgical Reconstruction Network (OSR-Net) of Bone Tissue Position after Orthognathic Surgery	Lei Hou Peking University School and Hospital of Stomatology
15:44-15:56	Stage-specific and location-specific Cartilage calcification in osteoarthritis development	Xiaozhao Wang Zhejiang University
15:56-16:08	Biomechanical analysis of an osteocyte model by considering bone matrix's piezoelectricity	Xiaogang Wu Taiyuan University of Technology
16:08-16:20	A Model-Guided Method for Ultrasound Probe Calibration	Jiasheng Zhao Tsinghua University
16:20-16:32	2D/3D Reconstruction of Patient-specific Surface Models and Uncertainty Estimation via Posterior Shape Models	Wenyuan Sun Shanghai Jiao Tong University
16:32-16:44	Automatic Reduction of Unilateral Zygomatic Fractures Based on ICP Algorithm: A Preliminary Study	Runqi Liu Peking University School and Hospital of Stomatology
16:44-16:56	A Novel Model-Independent Approach for Autonomous Retraction of Soft Tissue	Jiaqi Chen Tsinghua University
16:56-17:08	Adversarial Detection and Defense for Medical Ultrasound Images: From A Frequency Perspective	Jian Wang Nanjing University of Aeronautics and Astronautics

2023年5月21日 星期日 (Sunday, May 21, 2023)

8:30-12:06

会议室: A 区 301 (Room 301)

时间 (Time)	演讲题目 (Title)	演讲者姓名和单位 (Name and Affiliation)
Session 1 Chair: Dong-Soo Kwon		
8:30-9:00	Data driven surgical assistance and multimodal language models (Invited Speech)	Kiyoyuki CHINZEI National Institute of Advanced Industrial Science and Technology (AIST)
Session 2 Chair: Xiaojun Chen & Dong-Soo Kwon		
9:00-9:12	Automatic registration algorithm design and surgical planning software development for prosthetic driven oral implantology	Yueang Liu Shanghai Jiao Tong University
9:12-9:24	Non-rigid Registration-Based Virtual Planning on Maxillofacial Surgery with Bone Lesions Across the Midline	Bimeng Jie Peking University School and Hospital of Stomatology
9:24-9:36	Real-time medical tool runout monitor based on dual laser displacement sensors	Sheng Yang Tsinghua University
9:36-9:48	Development and validation of a treatment planning tool for transforaminal epidural steroid injection	Naiwen Zhang Xi'an Jiaotong University
9:48-10:00	A Novel Algorithm for Automatic Implantation of Internal Fixation Screws in Pelvic Fracture Closed Reduction Surgery	Haitao Li Shanghai Jiao Tong University
10:00-10:12	Establishment of digital diagnosis and treatment platform for zygomatic complex fracture based on artificial intelligence	Yanhang Tong Peking University School and Hospital of Stomatology
Session 3 Chair: Boyu Zhang & Liang Li		
10:30-10:42	A VR Environment for Cervical Tumor Segmentation through Three-Dimensional Spatial Interaction	Nan Zhang Tsinghua University
10:42-10:54	Evaluation and analysis of the effect of posterior cruciate ligament surgery based on computer simulation technology	Yansong Qi Inner Mongolia People's Hospital
10:54-11:06	Correction of premature closure of sagittal suture with small-incision traction bow	Shanshan Du Beihang University

11:06-11:18	Inside-out Accurate Head Tracking with Head-Mounted Augmented Reality Device	Haowei Li Tsinghua University
11:18-11:30	Cartilage Lacuna-inspired Microcarriers Drive Hyaline Neocartilage Regeneration	Shenglong Ding Capital Medical University
11:30-11:42	EATSNet: Event-type Aware Time-Sensitive Network for medical event prediction	Hao Chen Harbin Institute of Technology (Shenzhen)
11:42-12:54	3D Liver Tissue Model with Branched Vascular Networks by Multimaterial Bioprinting	Xin Liu Chinese Academy of Sciences
12:54-12:06	Microcarriers promote the through interface movement of mouse trophoblast stem cells by regulating stiffness	Zili Gao Chinese Academy of Sciences

## 邀请报告摘要

### 医用机器人前沿与创新发展的

孙立宁

随着人口老龄化趋势的加剧，以医用康复机器人为代表的医疗健康产业正呈现迅猛发展的态势。同时，伴随着人工智能、互联网、大数据等技术加速迭代和深度融合下，医疗健康正朝向精准化、个性化、智能化、网络化方向发展。

报告分析国内外医疗健康产业的发展现状，介绍基于微纳制造、机器人、人工智能等多学科交叉融合在医用机器人领域中的研究成果和应用现状，分享打造“政产学研医工”协同创新平台实现成果转化的经验，并概要展望医用机器人前沿技术和应用创新中的发展趋势。



孙立宁，博士、教授、博导，何梁何利基金获得者、国家杰出青年基金获得者、长江学者特聘教授、国家高层次专家、俄罗斯工程院外籍院士、苏州大学机电学院院长、机器人与微系统研究中心主任、先进机器人技术与系统国家重点实验室副主任、江苏省先进机器人技术重点实验室主任。担任国家科技部“十五”、“十一五”、“十二五”863计划先进制造领域机器人与微纳制造技术主题专家。主要从事工业机器人及机电一体化装备、微纳米操作机器人与装备、医疗与特种机器人的等研究。主持国家自然科学基金、863计划、973计划、国家重大专项等项目 20 多项，获国家技术发明\科技进步二等奖 2 项、省部级技术发明\科技进步一等奖 5 项，发表论文 500 多篇，授权国家发明专利 50 多项，多项成果实现了产业化。

## Data Driven Surgical Assistance and Multimodal Language Models

Kiyoyuki CHINZEI, Ph.D.

Prime Senior Researcher,

National Institute of Advanced Industrial Science and Technology (AIST)

In early 2022 Saedi et.al. reported an autonomous robotic system could perform intestinal anastomosis. Although this was a great progress in the decade, we also realized that it was yet far away from practical use. There was none or very limited hints how we can train a robot to perform surgery as a continuous flow of tasks like dissecting, peeling off, suturing, decision making, and more and more.

One year later, we are seeing a completely different landscape brought by the natural language models, such as GPT-3 and 4. Multimodal language models (MLM) are around the horizon, which will combine language models and other source of data. Our question is not 'if', but rather 'when', 'by whom' and 'how' MLM will be implemented in autonomous surgical robots.

Top question is, as always so, the data sources; what types of data and labeling are necessary to build MLM for surgical robots? Videos are widely used, huge amount of data is available, and the affinity with existing MLM is good. However, there are some technical issues to overcome. One fundamental challenge is that controlling robot means numerically controlling 3D working space with precision and accuracy. In this speech 'data driven surgical assistance' is discussed and some of the state of art works including ours will be presented, and legal and ethical issues that we need to address will be introduced.



Kiyoyuki CHINZEI, Ph.D.

Prime Senior Researcher, National Institute of Advanced Industrial Science and Technology (AIST)

Visiting professor of Kobe University since 2020. Project leader of IEC/SC 62D/JWG 35 (Safety of surgical robot). Board member of Asian Society of Computer Aided Surgery (ASCAS) and Japan Society of Computer Aided Surgery (JSCAS). Board member of Science Committee of Pharmaceuticals and Medical Device Agency (PMDA) Japan between 2018 and 2021.

Research works in the fields of biomedical engineering including surgical robotics, MR (magnetic resonance) robotics, biomechanics for surgery, and regulatory science for medical devices.