



ICIRA 2023

The 16th International Conference on Intelligent Robotics and Applications

SMART ROBOTICS FOR SUSTAINABLE SOCIETY

5th-7th July 2023 Hangzhou, China



About ICIRA 2023

The 16th International Conference on Intelligent Robotics and Applications (ICIRA 2023) is held in Hangzhou, China, from July 5th to 7th, 2023. The Conference with a theme on “Smart Robotics for Sustainable Society” offers a unique and constructive platform for scientists and engineers throughout the world to present and share their recent research and innovative in the areas of robotics, automation, mechatronics, and applications.

Conference Chair

Huayong Yang, ZJU, China

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Youlun Xiong, HUST, China

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Honghai Liu, HIT, China

Lianqing Liu, CAS, China

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Zhiyong Chen, U. Newcastle, Australia

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Ming Xie, NTU, Singapore

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Zhaojie Ju, U. Portsmouth, UK

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Jianda Han, NKU, China

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Hong Liu, HIT, China

Daokui Qu, SIASUN, China

Guobiao Wang, NSFC, China

Yuechao Wang, SIA, CAS, China

Yangsheng Xu, CUHK, China

Nanning Zheng, XJTU, China

Organization

Welcome Speech from the Conference Chair

On behalf of the Organizing Committee, we are pleased to welcome all distinguished guests and friends to the Hangzhou to join the 16th International Conference on Intelligent Robotics and Applications (ICIRA 2023).

The conference is hosted by Zhejiang University, co-hosted by Harbin Institute of Technology, Huazhong University of Science and Technology, Chinese Academy of Sciences, Shanghai Jiao Tong University, co-organized by State Key Laboratory of Fluid Power and Mechatronic Systems, State Key Laboratory of Robotics and System, State Key Lab of Digital Manufacturing Equipment and Technology, State Key Laboratory of Mechanical

System and Vibration, State Key Laboratory of Robotics, and School of Machinal Engineering of Zhejiang University.

The Conference with a theme of "Smart Robotics for Sustainable Society" offers a unique and constructive platform for scientists and engineers worldwide to present and share their recent research and innovation in robotics, automation, mechatronics, and applications. The conference aims to promote top-level research and globalize the quality research in general, making discussions, and presentations more internationally competitive and focusing on the latest outstanding achievements, future trends, and demands.

Hangzhou is one of the seven ancient capitals of China. Hangzhou is described as "the most beautiful and elegant city in the world". There are many more places of interest in Hangzhou waiting to be explored, such as West Lake, Qiandao Lake, please enjoy these beautiful scenes, and also enjoy the knowledge of Intelligent Robotics and Applications. We would like to take this opportunity to express our sincere thanks to everyone who contributed to the preparation of ICIRA 2023. Most of all, we need to give many thanks to all members of the Organizing Committee, all Session Chairs, all staff of the conference affair groups, all the sponsors, and all the conference volunteers who make the confrenece

a success. Once again, we warmly welcome all the attendees to ICIRA 2023 and hope you have an enjoyable and remarkable experience in this conference.

ICIRA 2023 Conference Chair
Huayong Yang
Zhejiang University, China

ICIRA 2023

Smart Robotics for Sustainable Society

Catalogue

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Conference Program at a Glance

Day1/July 5th, 2023

9:00–22:00 Conference Check-in, Registration

17:30–19:30 Buffet

Day2/July 6th, 2023

8:30–8:40 Opening Ceremony

8:30–8:40 Academician Huayong Yang (杨华勇)

8:40–10:10 Plenary Speech I

8:40–9:10 Plenary Speech 1 Prof. Jie Zhao (赵杰)

9:10–9:40 Plenary Speech 2 Prof. Xianmin Zhang (张宪民)

9:40–10:10 Plenary Speech 3 Prof. Xinjun Liu (刘辛军)

10:10–10:25 Coffee & Tea Break

10:25–11:55 Plenary Speech II

10:25–10:55 Plenary Speech 4 Prof. Zhiwu Han (韩志武)

10:55–11:25 Plenary Speech 5 Prof. Qinchuan Li (李秦川)

11:25–11:55 Plenary Speech 6 Prof. Jouni Mattila

11:55–14:00 Lunch & Break

14:00–15:45 Session | Oral (S01 – S08, Best 01, Best 02)

Session 01	Session 02	Session 03	Session 04	Session 05
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Human-centric Technologies for Seamless Human-robot Collaboration	Multimodal Collaborative Perception and Fusion	Intelligent Robot Perception in Unknown Environments	Vision-Based Human Robot Interaction and Application	Reliable AI on Machine Human Reactions
Session 06	Session 07	Session 08	Best 01	Best 02
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 258, 多功能厅258	Multifunctional Hall 268, 多功能厅268
Wearable Sensors and Robots	Wearable Robots for Assistance, Augmentation and Rehabilitation of Human Movements	Perception and Manipulation of Dexterous Hand for Humanoid Robot	Best Student Paper Competition (I)	Best Student Paper Competition (II)

15:45–16:00 Coffee & Tea Break

16:00–17:45 Session II Oral(S09 – S16, Best 03, Best 04)

Session 09	Session 10	Session 11	Session 12	Session 13
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Medical Imaging for Biomedical Robotics	Advanced Underwater Robot Technologies	Innovative Design and Performance Evaluation of Robot Mechanisms (I)	Evaluation of Wearable Robots for Assistance and Rehabilitation	3D Printing Soft Robots
Session 14	Session 15	Session 16	Best 03	Best 04
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 258, 多功能厅258	Multifunctional Hall 268, 多功能厅268
Dielectric Elastomer Actuators for Soft Robotics	Human-like Locomotion and Manipulation	Pattern Recognition and Machine Learning for Smart Robots	Best Paper Competition (I)	Best Paper Competition (II)

14:00–15:45 Poster Session I

14:00–15:45 Poster Presentation I

14:00–15:45 Poster Presentation II

15:45–16:00 Coffee & Tea Break

16:00–17:45 Poster Session II

16:00–17:45 Poster Presentation III

16:00–17:45 Poster Presentation IV

18:30–21:00 Banquet and Award

Day3/July 7th, 2023

8:30–10:00 Plenary Speech III

8:30–9:00 Plenary Speech 7 Prof. Guangzhong Yang (杨广中)
 9:00–9:30 Plenary Speech 8 Prof. Li Zhang (张立)
 9:30–10:00 Plenary Speech 9 Prof. Caihua Xiong (熊蔡华)

10:10–10:15 Coffee & Tea Break

10:15–11:45 Plenary Speech IV

10:15–10:45 Plenary Speech 10 Prof. Jianda Han (韩建达)
 10:45–11:15 Plenary Speech 11 Prof. Shijie Guo (郭士杰)
 11:15–11:45 Plenary Speech 12 Prof. Ning Jiang (江宁)

11:45–14:00 Lunch & Break

14:00–15:45 Session III Oral (S17 – S24, C 01)

Session 17	Session 18	Session 19	Session 20	Session 21
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Robotic Tactile Sensation, Perception, and Applications	Advanced Sensing and Control Technology for Human-robot Interaction	Knowledge-based Robot Decision-making and Manipulation	Design and Control of Legged Robots	Robots in Tunnelling and Underground Space
Session 22	Session 23	Session 24	C01	
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 268, 多功能厅268	
Robotic Machining of Complex Components	Clinically Oriented Design in Robotic Surgery and Rehabilitation	Visual and Visual-tactile Perception for Robotics	Cutting-edge Research in Robotics (I)	

15:45–16:00 Coffee & Tea Break

16:00–17:45 Session IV Oral (S25 – S32, C 02)

Session 25	Session 26	Session 27	Session 28	Session 29
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Perception, Interaction, and Control of Wearable Robots	Marine Robotics and Applications	Multi-robot Systems for Real World Applications	Physical and Neurological Human-Robot Interaction	Advanced Motion Control Technologies for Mobile Robots
Session 30	Session 31	Session 32	C02	
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 268, 多功能厅268	
Intelligent Inspection Robotics	Robotics in Sustainable Manufacturing for Carbon Neutrality	Innovative Design and Performance Evaluation of Robot Mechanisms (II)	Cutting-edge Research in Robotics (II)	

Conference Program with Paper Arrangement

Day2/July 6th, 2023

8:30–8:40 Opening Ceremony Chair: Zhouping Yin (尹周平), Huazhong University of Science and Technology

8:30–8:40 Academician Huayong Yang (杨华勇), Zhejiang University

8:40–10:10 Plenary Speech I Chair: Prof. Zhouping Yin (尹周平), Huazhong University of Science and Technology

8:40–9:10 Plenary Speech 1 Prof. Jie Zhao (赵杰), Harbin Institute of Technology

9:10–9:40 Plenary Speech 2 Prof. Xianmin Zhang (张宪民), South China University of Technology

9:40–10:10 Plenary Speech 3 Prof. Xinjun Liu (刘辛军), Tsinghua University

10:10–10:25 Coffee & Tea Break

10:25–11:55 Plenary Speech II Chair: Xinyu Wu (吴新宇), Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences

10:25–10:55 Plenary Speech 4 Prof. Zhiwu Han (韩志武), Jilin University

10:55–11:25 Plenary Speech 5 Prof. Qinchuan Li (李秦川), Zhejiang Sci-Tech University

11:25–11:55 Plenary Speech 6 Prof. Jouni Mattila, Tampere University, Finland

11:55–14:00 Lunch & Break

14:00–15:45 Session | Oral (S01 – S05)

Session 01	Session 02	Session 03	Session 04	Session 05
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Human-centric Technologies for Seamless Human-robot Collaboration	Multimodal Collaborative Perception and Fusion	Intelligent Robot Perception in Unknown Environments	Vision-Based Human Robot Interaction and Application	Reliable AI on Machine Human Reactions
Chair: Xin Zhang (张鑫) Qing Gao (高庆)	Chair: Yixuan Sheng (盛译萱) Jinbiao Liu (刘金标)	Chair: Sixian Chan (产思贤) Zhaomin Chen (陈钊民) Haibin Cai (蔡海斌)	Chair: Zhiyong Wang (王志永) Jing Li (李菁)	Chair: Meng Han (韩蒙) Jiahui Yu (于佳辉) Changting Lin (林昶廷)
113	28	25	82	78
160	128	255	209	111
193	291	256	237	140
194	389	279	260	156
218	469	406	344	184
	534	516	363	257
	594			286

14:00–15:45 Session I Oral (S06 – S08, Best 01, Best 02)

Session 06	Session 07	Session 08	Best 01	Best 02
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 258, 多功能厅258	Multifunctional Hall 268, 多功能厅268
Wearable Sensors and Robots	Wearable Robots for Assistance, Augmentation and Rehabilitation of Human Movements	Perception and Manipulation of Dexterous Hand for Humanoid Robot	Best Student Paper Competition (I)	Best Student Paper Competition (II)
Chair: Tao Liu (刘涛) Yinlai Jiang (姜银来)	Chair: Ting Zhang (张庭) Jianjun Meng (孟建军) Jiejunyi Liang (梁杰俊一)	Chair: Guanjun Bao (鲍官军) Haoyong Yu (喻豪勇) Tao Wang (王涛)	Chair: Gong Xiang (向巩) Liang Hu (胡亮) Wei Song (宋伟)	Chair: Zhi Han (韩志) Mingming Zhang (张明明) Dong Han (韩冬)
158	105	148	75	213
166	127	297	119	299
321	154	353	147	302
327	230	383	205	374
334	235	522	208	507
367	459			
463	549			

15:45–16:00 Coffee & Tea Break

16:00–17:45 Session II Oral (S09 – S13)

Session 09	Session 10	Session 11	Session 12	Session 13
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Medical Imaging for Biomedical Robotics	Advanced Underwater Robot Technologies	Innovative Design and Performance Evaluation of Robot Mechanisms (I)	Evaluation of Wearable Robots for Assistance and Rehabilitation	3D Printing Soft Robots
Chair: Yingke Xu (许迎科)	Chair: Gong Xiang (向巩) Yong Lei (雷勇)	Chair: Yanbiao Li (李研彪) Lifeng Zhou (周利峰)	Chair: Shuo Ding (丁硕)	Chair: Dong Wang (王东) Biao Zhang (张彪) Yuanfang Zhang (章圆方) Yi Xiong (熊异)
69	124	117	271	17
89	183	248	358	229
103	192	268	359	241
112	196	318	378	295
204	342	499	475	323
343	508	558	479	465
			531	513

16:00–17:45 Session II Oral (S14 – S16, Best 03, Best 04)

Session 14	Session 15	Session 16	Best 03	Best 04
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 258, 多功能厅258	Multifunctional Hall 268, 多功能厅268
Dielectric Elastomer Actuators for Soft Robotics	Human-like Locomotion and Manipulation	Pattern Recognition and Machine Learning for Smart Robots	Best Paper Competition (I)	Best Paper Competition (II)
Chair: Jiang Zou (邹江) Chongjing Cao (曹崇景)	Chair: Anhuan Xie (谢安桓) Xin Wang (王鑫)	Chair: Zhi Han (韩志) Lianqing Liu (刘连庆)	Chair: Jianfeng Tao (陶建峰) Tao Liu (刘涛) Guanjun Bao (鲍官军) Huimin Shen (申慧敏) Qinchuan Li (李秦川)	Chair: Bo Jin (金波) Fei Gao (高飞) Xiaoping Ouyang (欧阳小平) Yongjun Gong (弓勇军) Anhuan Xie (谢安桓)
24	95	62	37	272
85	139	90	99	288
121	187	114	169	338
132	250	115	181	490
346	287	186	245	494
356	349	504		
562				

14:00–15:45 Poster Session I

14:00–15:45 Poster Presentation I	14:00–15:45 Poster Presentation II
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15:45–16:00 Coffee & Tea Break

16:00–17:45 Poster Session II

16:00–17:45 Poster Presentation III	16:00–17:45 Poster Presentation IV
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18:30–21:00 Banquet and Award Chair: Honghai Liu (刘洪海), Harbin Institute of Technology, Shenzhen

Day3/July 7th, 2023

8:30–10:00 Plenary Speech III Chair: Honghai Liu (刘洪海), Harbin Institute of Technology, Shenzhen

8:30–9:00 Plenary Speech 7 Prof. Guangzhong Yang (杨广中), Shanghai Jiao Tong University
 9:00–9:30 Plenary Speech 8 Prof. Li Zhang (张立), The Chinese University of Hong Kong
 9:30–10:00 Plenary Speech 9 Prof. Caihua Xiong (熊蔡华), Huazhong University of Science and Technology

10:00–10:15 Coffee & Tea Break

10:15–11:45 Plenary Speech IV Chair: Lianqing Liu (刘连庆), Shenyang Institute of Automation, Chinese Academy of Sciences

10:15–10:45 Plenary Speech 10 Prof. Jianda Han (韩建达), Nankai University
 10:45–11:15 Plenary Speech 11 Prof. Shijie Guo (郭士杰), Hebei University of Technology
 11:15–11:45 Plenary Speech 12 Prof. Ning Jiang (江宁), West China Hospital, Sichuan University

11:45–14:00 Lunch & Break

14:00–15:45 Session III Oral (S17 – S21)

Session 17	Session 18	Session 19	Session 20	Session 21
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Robotic Tactile Sensation, Perception, and Applications	Advanced Sensing and Control Technology for Human-robot Interaction	Knowledge-based Robot Decision-making and Manipulation	Design and Control of Legged Robots	Robots in Tunnelling and Underground Space
Chair: Jixiao Liu (刘吉晓) Rui Wang (王睿)	Chair: Qinchuan Li (李秦川) Gang Chen (陈刚) Wei Ye (叶伟)	Chair: Wei Song (宋伟) Jianfeng Liao (廖建峰)	Chair: Haihui Yuan (袁海辉) Ruiling Du (杜睿龙) Chunjiang Fu (付春江)	Chair: Jianfeng Tao (陶建峰) Lintao Wang (王林涛)
141	33	70	71	125
168	254	79	102	289
309	273	137	143	329
445	320	157	228	348
527	336	387	351	370
	366		446	377
	368			424

14:00–15:45 Session III Oral (S22 – S24, C 01)

Session 22	Session 23	Session 24	C 01
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 268, 多功能厅268
Robotic Machining of Complex Components	Clinically Oriented Design in Robotic Surgery and Rehabilitation	Visual and Visual-tactile Perception for Robotics	Cutting-edge Research in Robotics (I)
Chair: Xingwei Zhao (赵兴炜) Zhoulong Li (李洲龙)	Chair: Kang Li (李康) Ning Jiang (江宁)	Chair: Hua Yang (杨华) Shuang Mei (梅爽) Zeyu Gong (龚泽宇)	Chair: Shuo Ding (丁硕)
67	131	178	27
214	150	236	77
243	275	238	189
317	290	339	285
440	461	488	203
498	484	521	350
	525		

15:45–16:00 Coffee & Tea Break

16:00–17:45 Session IV Oral (S25 – S29)

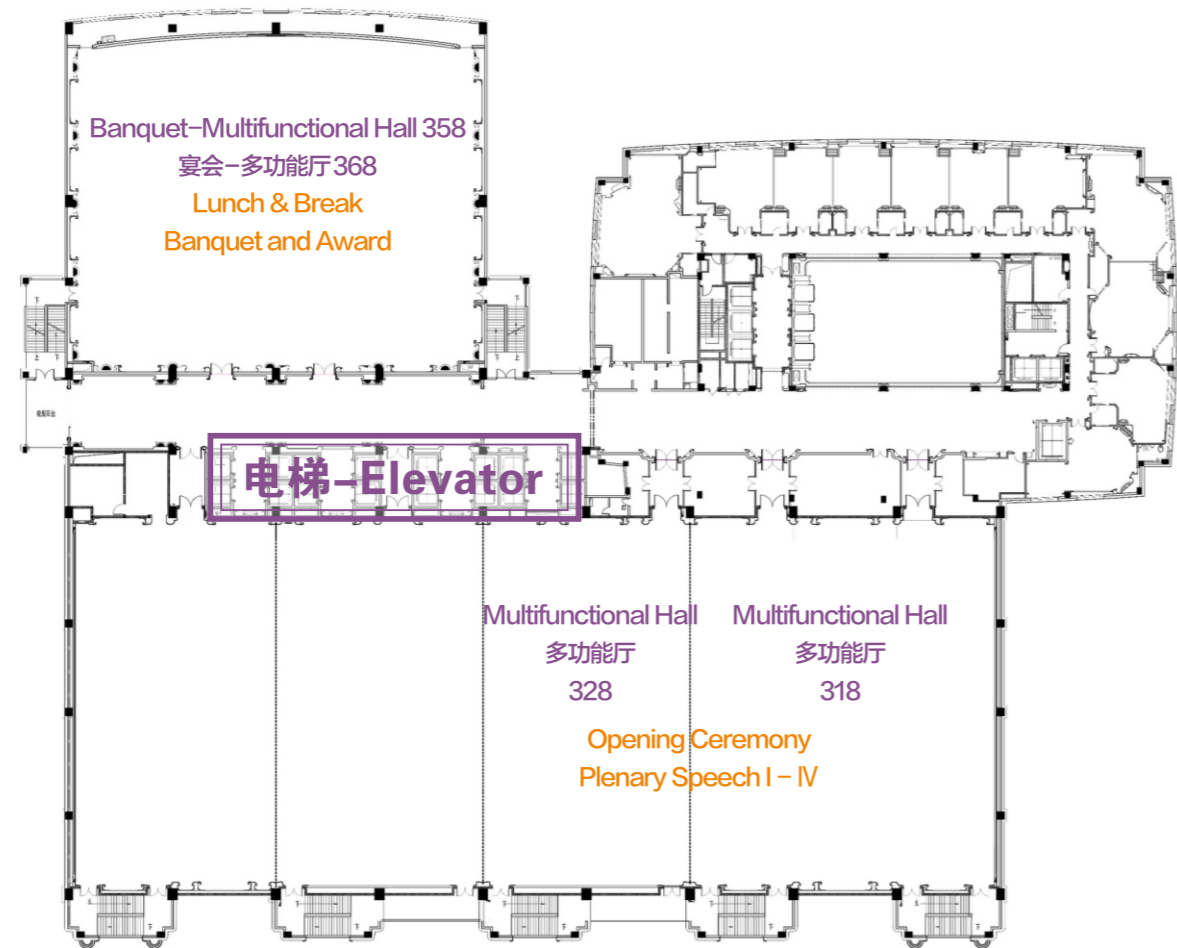
Session 25	Session 26	Session 27	Session 28	Session 29
Multifunctional Hall 278, 多功能厅278	Multifunctional Hall 287, 多功能厅287	Multifunctional Hall 288, 多功能厅288	Multifunctional Hall 289, 多功能厅289	Multifunctional Hall B01, 多功能厅B01
Perception, Interaction, and Control of Wearable Robots	Marine Robotics and Applications	Multi-robot Systems for Real World Applications	Physical and Neurological Human-Robot Interaction	Advanced Motion Control Technologies for Mobile Robots
Chair: Kui Xiang (向燧) Yuquan Leng (冷雨泉)	Chair: He Shen (沈贺) Jian Gao (高剑) Zhengxing Wu (吴正兴) Gang Wang (王刚)	Chair: Qiuguo Zhu (朱秋国) Fei Gao (高飞)	Chair: Huimin Shen (申慧敏) Rui Huang (黄瑞) Mingming Zhang (张明明) Mingjie Dong (董明杰)	Chair: Zhang Chen (陈章) Zhan Li (李湛) Yang Deng (邓颺) Linqi Ye (叶林奇)
109	74	50	76	180
361	174	65	146	296
451	308	159	161	385
453	380	202	240	414
502	520	207	441	485
	526	470	464	533
	557	554	547	

16:00–17:45 Session IV Oral (S30 – S32, C 02)

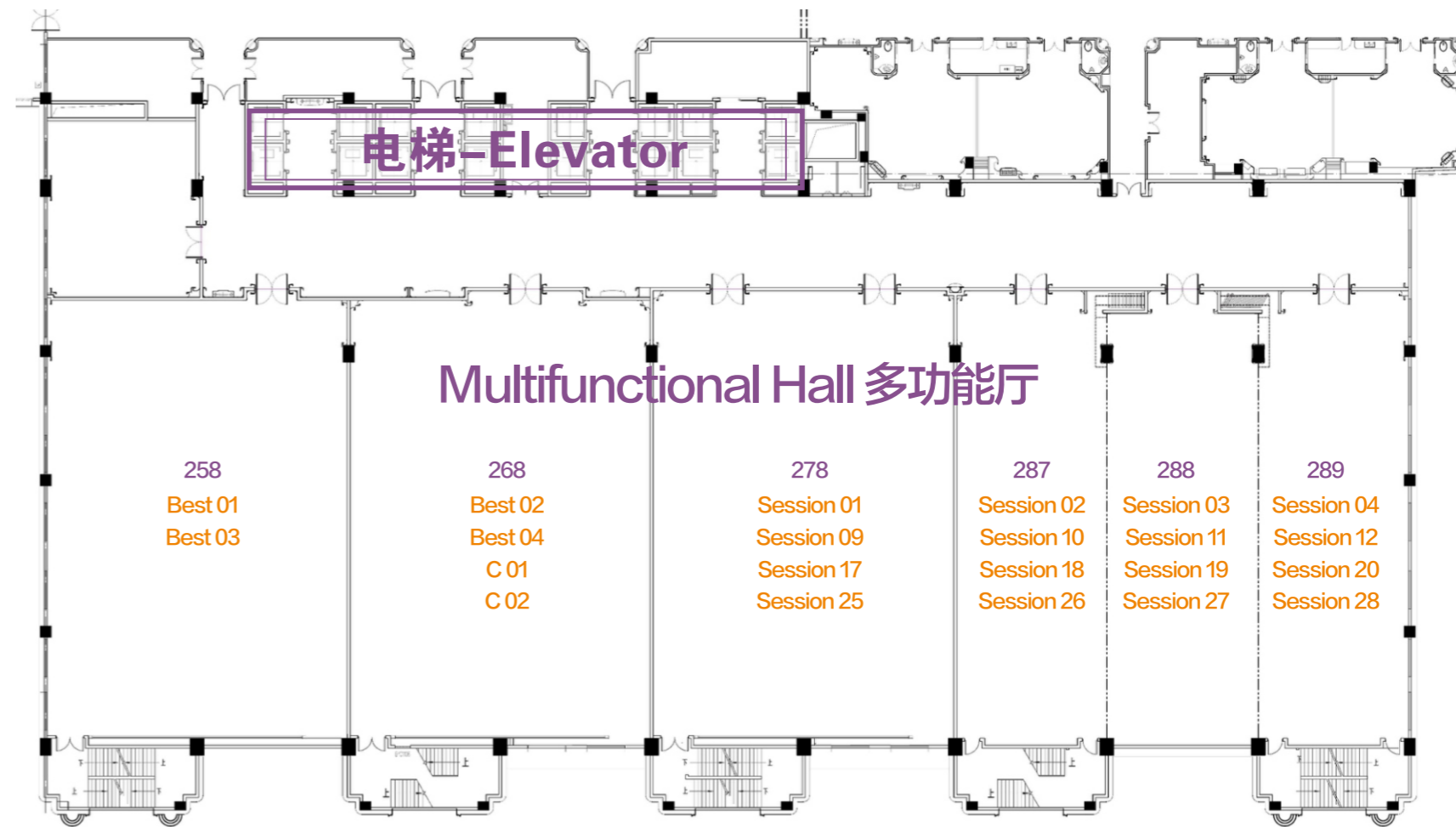
Session 30	Session 31	Session 32	C 02
Multifunctional Hall B02, 多功能厅B02	Multifunctional Hall B03, 多功能厅B03	Multifunctional Hall B05, 多功能厅B05	Multifunctional Hall 268, 多功能厅268
Intelligent Inspection Robotics	Robotics in Sustainable Manufacturing for Carbon Neutrality	Innovative Design and Performance Evaluation of Robot Mechanisms (II)	Cutting-edge Research in Robotics (II)
Chair: Laihao Yang (杨来浩) Zhongdong Jiao (焦中栋) Xin Dong (东昕) Yu Sun (孙瑜)	Chair: Bin He (何斌) Long Chen (陈龙) Bai Chen (陈柏)	Chair: Duanling Li (李端玲) Yisheng Guan (管贻生) Kaijie Dong (董凯捷)	Chair: Wei Ye (叶伟)
122	86	198	165
177	151	249	185
239	227	345	439
324	400	369	524
450	491	417	553
546		497	561
		517	

Floor Plan and Meeting Rooms

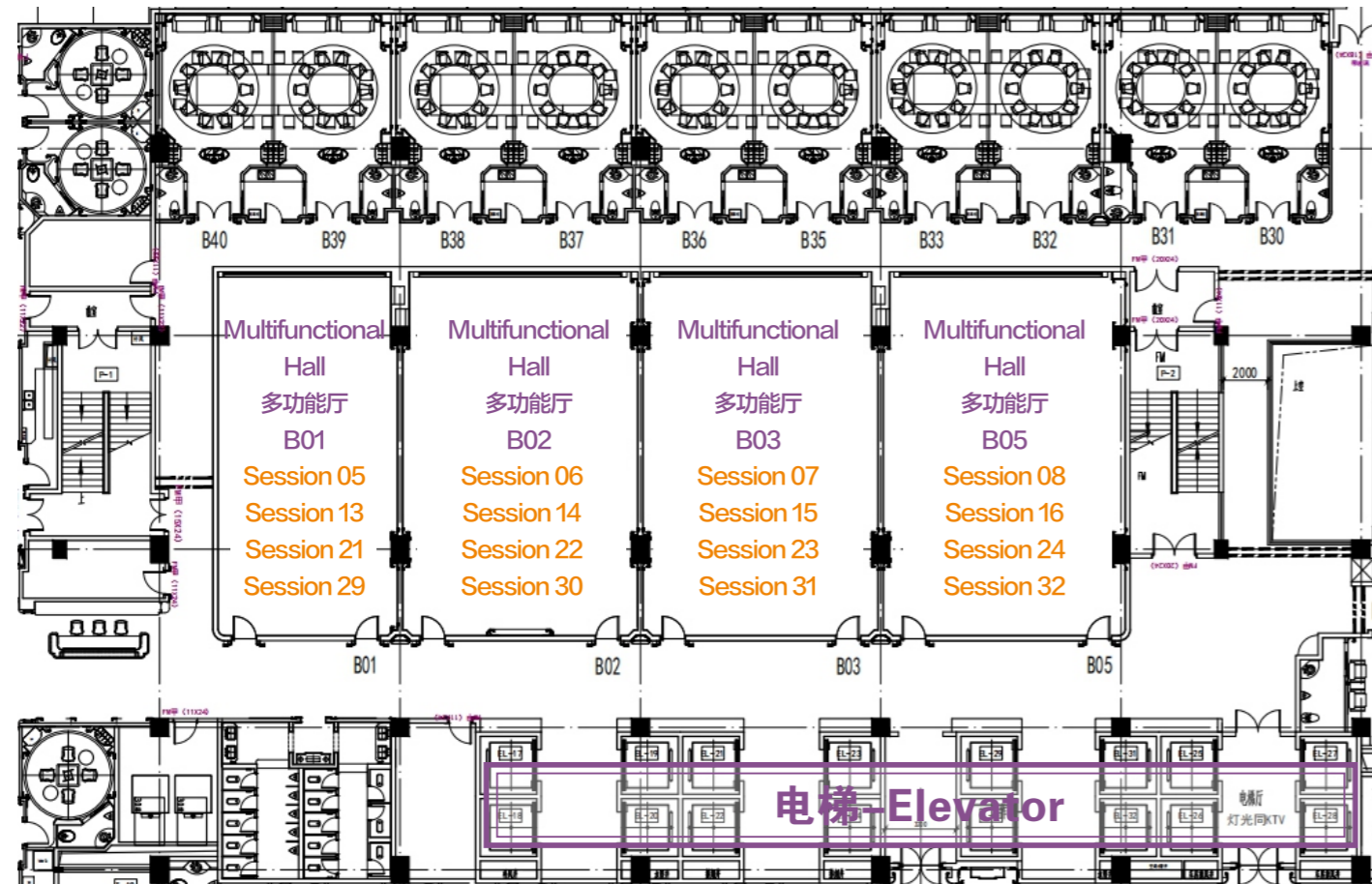
Floor Plan of the 3rd Banquet Hall 3层宴会厅平面图



Floor Plan of the 2nd Banquet Hall 2层宴会厅平面图



Floor Plan of the B1 Banquet Hall B1层宴会厅平面图



Conference Program Details

8:30–11:55, Morning, July 6th, 2023

8:30–8:40 Opening Ceremony (Multifunctional Hall 318&328, 多功能厅318与328)

Chair: Zhouping Yin (尹周平), Huazhong University of Science and Technology

8:30–8:40 Academician Huayong Yang (杨华勇), Zhejiang University

8:40–10:10 Plenary Speech I (Multifunctional Hall 318&328, 多功能厅318与328)

Chair: Prof. Zhouping Yin (尹周平), Huazhong University of Science and Technology

8:40–9:10 Plenary Speech 1 Prof. Jie Zhao (赵杰), Harbin Institute of Technology
[Robotics Progress in China](#)

9:10–9:40 Prof. Xianmin Zhang (张宪民), South China University of Technology
[Compliant Scanning Mechanisms and Scanning Method of Atomic Force Microscopy](#)

9:40–10:10 Prof. Xinjun Liu (刘辛军), Tsinghua University
[Type Synthesis and Potential Application of Complex Multi-Closed-Loop Space Deployable Mechanisms](#)

10:10–10:25 Coffee & Tea Break

10:25–11:55 Plenary Speech II (Multifunctional Hall 318&328, 多功能厅318与328)

Chair: Xinyu Wu (吴新宇), Shenzhen Institutes of Advanced Technology, Chinese Academy of Sciences

10:25–10:55 Plenary Speech 4 Prof. Zhiwu Han (韩志武), Jilin University
[Low Energy Consumption in Biological Identification](#)

10:55–11:25 Plenary Speech 5 Prof. Qinchuan Li (李秦川), Zhejiang Sci-Tech University
[Skeleton of Robot-From the Perspective of Mechanism Topology](#)

11:25–11:55 Plenary Speech 6 Prof. Jouni Mattila, Tampere University, Finland
[Exploring Advancements and Opportunities of Robotic Automation in Infra Construction](#)

11:55–14:00 Lunch & Break (Multifunctional Hall 368, 多功能厅368)

14:00–15:45, Afternoon, July 6th, 2023

Session 01 (Multifunctional Hall 278, 多功能厅278): Human-centric Technologies for Seamless Human-robot Collaboration

Chair: Xin Zhang (张鑫), Qing Gao (高庆)

14:00–14:15 113: Changqian Feng, Zhengcang Chen, Weiqing Jin, Wanjin Guo
[Motion Control and Simulation Analysis of a manipulator Based on Computed Torque Control Method](#)

14:15–14:30 160: Jiayan Li, Honghao Lv, Nan Zhang, Haiteng Wu, Geng Yang
[Design and Realization of a Multi-DoF Robotic Head for Affective Humanoid Facial Expression Imitation](#)

14:30–14:45 193: Yufeng Li, Meng Han, Jiahui Yu, Changting Lin, Zhaojie Ju
[Adversarial Attacks on Skeleton-based Sign Language Recognition](#)

14:45–15:00 194: Letian Fu, Xiaoben Lin, and Yunjiang Lou
[Adaptive Goal-Biased Bi-RRT for Online Path Planning of Robotic Manipulators](#)

15:00–15:15 218: Jingbo Yang, Zhiwei Liao, Fei Zhao
[A Novel 3-DOF Spherical Hybrid Mechanism for Wrist Movement: Design, Kinematics, and Simulation](#)

15:15–15:30 281: Zhen He, Hanliang Fang, Jun Zhang
[Dimensional Synthesis of a Novel Redundantly Actuated Parallel Manipulator](#)

15:30–15:45 518: Yinglong Chen, Pengyu Zhao, Qing Sun, Fujun Song and Yongjun Gong
[Study on Shared Compliance Control of Teleoperated Abdominal Ultrasonic Robot](#)

Session 02 (Multifunctional Hall 287, 多功能厅287): Multimodal Collaborative Perception and Fusion

Chair: Yixuan Sheng (盛译萱), Jinbiao Liu (刘金标)

14:00–14:15 28: Gangqiang Tang, Xin Zhao, Yujun Ji, Chun Zhao, Dong Mei, Yanjie Wang
[Influence of Contact Characteristics on Pressure Sensing of IPMC Sensors](#)

14:15–14:30 128: Qiwei Meng, Jianfeng Liao, Jun Shao, Nuo Xu, Zemin Xu, Yinan Sun, Yao Sun, Shiqiang Zhu, Jianjun Gu, Wei Song
[Vision-based Categorical Object Pose Estimation and Manipulation](#)

14:30–14:45 291: Weian Li, Huiwen Wu, Dongping Yang
[Powerful Encoding and Decoding Computation of Reservoir Computing](#)

14:45–15:00 389: Wenbang Dou, Wei Hong Chin, Naoyuki Kubota
[Growing Memory Network with Random Weight 3DCNN for Continuous Human Action Recognition](#)

15:00–15:15 469: Siwei Xie, Tao Tang, Linqing Feng, Feng Lin, Yina Wei
[Sleep-dependent Memory Replay Enables Brain-like Robustness in Neural Networks](#)

15:15–15:30 534: Jingyuan Xia, Zecai Lin, Huanghua Liu, Anzhu Gao
[A Six-Dof Parallel Robot-Assisted Dispensing Platform with Visual Servoing and Force Sensing for Accurate Needle Positioning and Mass Control](#)

15:30–15:45 594: Yicheng Yang, Xiaoxin Wang, Ziliang Zhou, Honghai Liu
[Factors Affecting the Perception Performance of Biomimetic Tactile Sensing System](#)

Session 03 (Multifunctional Hall 288, 多功能厅288): Intelligent Robot Perception in Unknown Environments

Chair: Sixian Chan (产思贤), Zhaomin Chen (陈钊民), Haibin Cai (蔡海斌)

- 14:00–14:15 25: Jixue Mo, Gao Changqing, Fei Liu, Qingkai Yang, Hao Fang
A Modified Artificial Potential Field Method Based on Subgoal Points for Mobile Robot
- 14:15–14:30 255: Bin Pu, Zhenguo Wu, Riming Lou, Jing Lu, Ze'an Liu, Xuanyin Wang
Droque Pose Estimation Based on Ultraviolet Camera and Asymmetric Markers
- 14:30–14:45 256: Jixiang Tang, Jiangtao Chen, Xuanyin Wang, Bin Pu, Ze'an Liu
Vision Based Flame Detection Using Compressed Domain Motion Prediction and Multi-Feature Fusion
- 14:45–15:00 279: Tao Liu, Zheng Zhang, Kairu Li
Gesture Recognition Based on LightViT Network Against sEMG Electrode Shift
- 15:00–15:15 406: Feng Du, Zhuorong Li, Jiafa Mao, Yanjing Lei, Sixian Chan
Relational Alignment and Distance Optimization for Cross-modality Person Re-identification
- 15:15–15:30 516: Zhan'ge Zhang, Zhongtan Zhang, Jiarui He, Yancheng Wang
A Flexible and Highly Sensitive Ultrasonic Transducer for Accurate Three-Dimensional Positioning

Session 04 (Multifunctional Hall 289, 多功能厅289): Vision-Based Human Robot Interaction and Application

Chair: Zhiyong Wang (王志永), Jing Li (李菁)

- 14:00–14:15 82: Yixiao Feng, Xiangyu Tian, Tiemin Li, Yao Jiang
Design of a Visual Guidance Robotic Assembly System for Flexible Satellite Equipment Unit Assembly
- 14:15–14:30 209: Yufei Zhang, Zheyu Hu, Dawei Tu, Xu Zhang
Human-Robot Interactive Operating System for Underwater Manipulators Based on Hand Gesture Recognition
- 14:30–14:45 237: Nianfeng Wang, Junhao Lin, Xianmin Zhang
Automatic Loading and Unloading System with Workpiece Identification Based on YOLOv5
- 14:45–15:00 260: Ziwan Li, Shibei Liu, Zhuxuan Cheng, Zhencheng Yu, Huijie Fan
Object Tracking Algorithm Based on Dual Layer Attention
- 15:00–15:15 344: Dongchen Wang, Jialing Liu, Xianglong Xu, Yubao Chen, Qingyang Hu, Jianhua Zhang
Large-Parallax Multi-Camera Calibration Method for Indoor Wide-Baseline Scenes
- 15:15–15:30 363: Yubao Chen, Xiujie Wang, Jiajia Wang, Dongchen Wang, Hao Zhou, Jianhua Zhang
A Real-Time and Globally Consistent Meshing Reconstruction without GPU

Session 05 (Multifunctional Hall B01, 多功能厅B01): Reliable AI on Machine Human Reactions

Chair: Meng Han (韩蒙), Jiahui Yu (于佳辉), Changting Lin (林昶廷)

- 14:00–14:15 78: Xiaowen You, Qing Gao, Hongwei Gao, Zhaojie Ju
A Feature Fusion Network for Skeleton-Based Gesture Recognition
- 14:15–14:30 111: Bohong Wu, Zhiwen Deng, Qing Gao
Dynamic Hand Gesture Recognition Based on Multiskeletal Features for Sign Language Recognition System
- 14:30–14:45 140: Sen Xu, Ye Ding
An Amended Time-Scaling Algorithm for Kino-Dynamic Trajectories
- 14:45–15:00 156: Jun Tian, Xungao Zhong, Xunyu Zhong, Xiafu Peng
Adapted Mapping Estimator in Visual Servoing Control for Model-Free Robotics Manipulator
- 15:00–15:15 184: Liyuan Liu, Ying Kong, Gaolei Li, Meng Han
FairShare: An Incentive-based Fairness-Aware Data Sharing Framework for Federated Learning
- 15:15–15:30 257: Yifan Chen, Zide Liu, Shengnan Xue, Jiahui Yu, Zhaojie Ju
Combating Label Ambiguity with Smooth Learning for Facial Expression Recognition
- 15:30–15:45 286: Guoyan Sun, Kairu Li
EMG Denoising Based on CEEMDAN-PE-WT Algorithm

Session 06 (Multifunctional Hall B02, 多功能厅B02): Wearable Sensors and Robots

Chair: Tao Liu (刘涛), Yinlai Jiang (姜银来)

- 14:00–14:15 158: Ruohan Wang, Xi Cui, Honghao Lv, Guangyao Zhang, Haiteng Wu, Geng Yang
Enable Intuitive and Immersive Teleoperation: Design, Modeling and Control of a Novel Wearable Exoskeleton
- 14:15–14:30 166: Medhanit Alemu, Yuan Lin, Peter Shull
Design and Fabrication of an Artificial Skin Integrated with Soft Ultrasonic Waveguides for Finger Joint Motion Detection
- 14:30–14:45 321: Xiangyu Han, Tao Liu
Noncontact Heart Rate Variability Monitoring Based on FMCW Radar
- 14:45–15:00 327: Qi Tang, Jingeng Mai, Tiantong Wang, Qining Wang
A Diving Glove with Inertial Sensors for Underwater Gesture Recognition
- 15:00–15:15 334: Xiangzhi Liu, Zexia He, Meimei Han, Ningtao Cheng, Tao Liu
A Clinic-Oriented Ground Reaction Force Prediction Method in Gait
- 15:15–15:30 367: Bingfei Fan, Fugang Yi, Shuo Yang, Mingyu Du, Shibo Cai
Development of a Novel Plantar Pressure Insole and Inertial Sensor System for Daily Activity Classification and Fall Detection
- 15:30–15:45 463: Wu Fan, Zhe Dai, Wenyu Li, Xiufeng Zhang, João Paulo Ferreira, Tao Liu
A Rotary-Cage Valve (RCV) for Variable Damper in Prosthetic Knee

Session 07 (Multifunctional Hall B03, 多功能厅B03): Wearable Robots for Assistance, Augmentation and Rehabilitation of Human Movements

Chair: Ting Zhang (张庭), Jianjun Meng (孟建军), Jiejunyi Liang (梁杰俊一)

14:00–14:15	105: Yunzhe Li, Zongtian Yin, Jianjun Meng <i>Decoding Discrete Gestures Across Different Arm Positions Based on Multimodal Fusion Strategy</i>
14:15–14:30	127: Minghao Ji, Shang Shi, Mengyang Zhu, Songwei Li, Jianjun Meng <i>A Brain-Controlled Spherical Robot Based on Augmented Reality (AR)</i>
14:30–14:45	154: Chengzhi Zhao, Yi Cao, Xifang Liu, Wendong Wang <i>Research on Interactive Force Control Method of Upper Limb Exoskeleton Based on Active Intention Recognition</i>
14:45–15:00	230: Zeshi Sun, Nianfeng Wang, Jianliang Zhang, Shuhao Xia, Xianmin Zhang <i>Design and Control of a Soft Hip Exoskeleton for Assisting Human Locomotion</i>
15:00–15:15	235: Nianfeng Wang, Zicong Wang, Zitian Li, Shuhao Xia, Xianmin Zhang <i>Design and Control of a Portable Soft Exosuit by Musculoskeletal Model-Based Optimization</i>
15:15–15:30	459: Shumin Wang, Xiongfei Zheng, Jiejunyi Liang, Xiufeng Zhang <i>The Influence of Task Objectives and Loads on the Synergies Governing Human Upper Limb Movement</i>
15:30–15:45	549: Sen Huang, Xinzhili Chen, Liugang Zhao, Yiyu Li, Dong Yuan, Minchao Liu, Jiahong Liu, Bo Li <i>Biomechanical Design and Evaluation of a Lightweight Back Exoskeleton for Repetitive Lifting Tasks</i>

Session 08 (Multifunctional Hall B05, 多功能厅B05): Perception and Manipulation of Dexterous Hand for Humanoid Robot

Chair: Guanjun Bao (鲍官军), Haoyong Yu (喻豪勇), Tao Wang (王涛)

14:00–14:15	148: Xiantao Sun, Changsheng Gan, Wenjie Chen, Weihai Chen, Yuanyuan Liu <i>Design of a Three-finger Underactuated Robotic Gripper Based A Flexible Differential Mechanism</i>
14:15–14:30	297: Yuming Ning, Tuanjie Li, Cong Yao, Yonghua Huang <i>A Novel Skill Learning Framework for Redundant Manipulators Based on Multi-Task Dynamic Movement Primitives</i>
14:30–14:45	353: Xiaolong Ma, Zhenwu Guo, Yangqing Ye, Guanjun Bao <i>Soft Fingertip with Sensor Integrated for Continuous in-Hand Manipulation</i>
14:45–15:00	383: Jun Guo, Haoyi Wu, Yuhao Liang, Yixin Li, Zhenfeng Wu and Yong Zhong <i>Design and Control of a Two-Segment Rotatable Wire-Driven Flexible Arm</i>
15:00–15:15	522: Tianya You, Ju Gao, Xiangrong Xu <i>Design and Research of a New Underactuated Manipulator</i>

Best 01 (Multifunctional Hall 258, 多功能厅258): Best Student Paper Competition (I)

Chair: Gong Xiang (向巩), Liang Hu (胡亮), Wei Song (宋伟)

14:00–14:15	75: Fuguang Wang, Zhidong Xu, Jihong Yan <i>A Dual-Mode Micro Flapping Wing Robot with Water Gliding and Taking-Off Motion</i>
14:15–14:30	119: Xiantong Xu, Haibo Xie, Cheng Wang, Huayong Yang <i>Research on Snake-Like Robot for Cutter Inspection in Tunnel Boring Machine</i>
14:30–14:45	147: Xingyu Ding, Jianhua Shan, Ziwei Xia, Fuchun Sun, Bin Fang <i>Soft Humanoid Finger with Magnetic Tactile Perception</i>
14:45–15:00	205: Yayu Huang, Zhenghan Wang, Xiaofei Shen, Qian Liu, Peng Wang <i>Human-Like Dexterous Manipulation for Anthropomorphic Hand-Arm Robotic System via Teleoperation</i>
15:00–15:15	208: Jiatao Zhang, Jianfeng Liao, Tuocheng Hu, Tian Zhou, Haofu Qian, Haoyang Zhang, Han Li, LanLing Tang, Qiwei Meng, Wei Song, Shiqiang Zhu <i>Experience Adapter: Adapting Pre-Trained Language Models for Continual Task Planning</i>

Best 02 (Multifunctional Hall 268, 多功能厅268): Best Student Paper Competition (II)

Chair: Zhi Han (韩志), Mingming Zhang (张明明), Dong Han (韩冬)

14:00–14:15	213: Hongyu Wan, Silu Chen, Chi Zhang, Chin-Yin Chen, Guilin Yang <i>Admittance Control of Flexible Joint with Dual-Disturbance Observer</i>
14:15–14:30	299: Yuankai Lin, Yulin Zhou, Kaiji Huang, Qi Zhong, Tao Cheng, Hua Yang, Zhouping Yin <i>GelSplitter: Tactile Reconstruction from Near Infrared and Visible Images</i>
14:30–14:45	302: Honghao Lv, Huiying Zhou, Ruohan Wang, Haiteng Wu, Zhibo Pang, Geng Yang <i>Towards Intercontinental Teleoperation: A Cloud-Based Framework for Ultra-Remote Human-Robot Dual-Arm Motion Mapping</i>
14:45–15:00	374: Boyi Wang, Yang Deng, Feilong Jing, Yu Tian, Zhang Chen, Bin Liang <i>Equilibrium-Compensation-Based Sliding Mode Control for Accurate Steering Tracking of a Single-Track Two-Wheeled Robot</i>
15:00–15:15	507: Junbao Sun, Xu Li, Yili Fu, Haopeng Liu, Haibo Feng, Songyuan Zhang <i>Hierarchical Trajectory Optimization for Humanoid Robot Jumping Motion</i>

15:45–16:00 Coffee & Tea Break

16:00–17:45, Afternoon, July 6th, 2023

Session 09 (Multifunctional Hall 278, 多功能厅278): Medical Imaging for Biomedical Robotics

Chair: Yingke Xu (许迎科)

- 16:00–16:15 69: Jinwei Shi, Jiahui Yu, Yinfeng Fang, Hongwei Gao, Zhaojie Ju
Examining the Impact of Muscle–Electrode Distance in sEMG Based Hand Motion Recognition
- 16:15–16:30 89: Fuqiang Zhao, Mingchang Li, Mengde Li, Zhongtao Fu, Miao Li
Fast Calibration for Ultrasound Imaging Guidance Based on Depth Camera
- 16:30–16:45 103: Hui Meng, Lingkai Chen, Shiqiang Zhu, Chentao Fei, Yong Zhang, Miaojuan Zheng, Jianda Han, Wei Song
Zero–Shot Kidney Stone Segmentation Based on Segmentation Anything Model for Robotic–Assisted Endoscope Navigation
- 16:45–17:00 112: Bo Han, Hanwei Chen, Chao Liu, Xinjun Sheng
Sutures and Landmarks Joint Detection Method Based on Convolutional Neural Network for Rat Stereotactic Surgery
- 17:00–17:15 204: Chenzhuo Lu, Zhuang Fu, Zeyu Fu, Jian Fei
Prior Region Mask R–CNN for Thyroid Nodule Segmentation in Ultrasound Images
- 17:15–17:30 343: YongLin Wu, Dongxu Gao, Hongwei Gao, Zhaojie Ju
SW–YOLO: Improved YOLOv5s Algorithm for Blood Cell Detection

Session 10 (Multifunctional Hall 287, 多功能厅287): Advanced Underwater Robot Technologies

Chair: Gong Xiang (向巩), Yong Lei (雷勇)

- 16:00–16:15 124: Sun Xiao, Bing Sun, Zinan Su
Cooperative Pursuit–Evasion Game for Multi–AUVs in the Ocean Current and Obstacle Environment
- 16:15–16:30 183: Wenjun Tan, Hengshen Qin, Chuang Zhang, Ruiqian Wang, Yiwei Zhang, Lianchao Yang, Qin Chen, Feifei Wang, Ning Xi, Lianqing Liu
Rock–Climbing Fish Inspired Skeleton–Embedded Rigid–Flexible Coupling Suction Disc Design for Adhesion Enhancement
- 16:30–16:45 192: Yurui Zhang, Bohao He, Anzhe Yi, Yanhu Chen
An Underwater Inductively Coupled Power Transfer System with a Ring–Shaped Coupler for ROV Charging
- 16:45–17:00 196: Xu Wang, Demin Zhang, Qi Lan, Cong Wang, Junpeng Zhang, Mengruo Shen, Yong Lei
Micro–Needle Dynamic Anchoring Foot Design for Underwater Drilling Robot
- 17:00–17:15 342: Yangming Zhang, Rongxin Cui, Xiaofei Song, Ye Li
SLAM Algorithm of Underwater Vehicle Based on Multi–Beam Sonar
- 17:15–17:30 508: Yinglong Chen, Fei Gao, Shuangxi Yang
Research on Structure Design and Drive Control of Soft Joint on Underwater Snake–Like Robot

Session 11 (Multifunctional Hall 288, 多功能厅288): Innovative Design and Performance Evaluation of Robot Mechanisms (I)

Chair: Yanbiao Li (李研彪), Lifeng Zhou (周利峰)

- 16:00–16:15 117: Fuqun Zhao, Donglai Xu, Xiaodong Jin, Sheng Guo, Kun Xu
Design and Workspace Evaluation of a Novel Parallel Grasping Manipulator with Configurable Platform
- 16:15–16:30 248: Sai Wang, Hongjian Jiang, Wei Song, Yu Zhang, Daming Nie, Jianjun Gu
Stiffness Calculation Method and Deformation Energy of Lattice Filled Structure
- 16:30–16:45 268: Qinghao Du, Tuopu Zhang, Guilin Yang, Weijun Wang, Chin–Yin Chen, Chi Zhang
Analytical Backlash Model for 3K–Type Planetary Gear Train with Flexure–Based Anti–Backlash Carrier
- 16:45–17:00 318: Zhangwei Chen, Hongfei Zu, Xiang Zhang, Xuwen Chen, Zhirong Wang
Graded Error Compensation Method for Heavy–Load Manipulators Based on Laser Tracking Measurement
- 17:00–17:15 499: Jinpeng Diao, Chao Qian, Xiao Xiao, Xingguang Duan, Changsheng Li
A Flexible Parallel Robotic Wrist Towards Transluminal Endoscopic Surgery
- 17:15–17:30 558: Zhou Su, Lin Li, Qiuhong Lin, Jingya Ma, Duanling Li, Qiang Cong
Design and Analysis of Space Extra Long Deployable Telescopic Boom Based on Cable Drive
- 17:30–17:45 563: Yufei Liu, Yongyao Li, Zeyuan Sun, Dongdong Zheng, Boyang Xing, Zhirui Wang
Research on Foot Slippage Suppression of Mammal Type Legged Robot Based on Optimal Force Allocation

Session 12 (Multifunctional Hall 289, 多功能厅289): Evaluation of Wearable Robots for Assistance and Rehabilitation

Chair: Shuo Ding (丁硕)

- 16:00–16:15 271: Yonghua Guo, Wangru Zhu, Wanquan Liu, Jianqing Peng
A Reconfigurable Cable–Driven Hybrid Robot Synchronous Calibration Method Considering Multiple Mapping Relationships
- 16:15–16:30 358: Yunfeng Zhang, Yihao Chen, Min Zhuang, Zuojun Cao, Jue Liu, Jing Tian
Wearable Robots Improve Upper Limb Function in Stroke Patients
- 16:30–16:45 359: Rongrong Lu, Erkang Xie, Tianhao Gao, Yulong Bai
Design and Evaluation of a Pelvic–Assisted Gait Training Method for Mobility Improvement in Stroke Patients
- 16:45–17:00 378: Yuean Yang, Jiamin Lu
Effect of Lower Limb Exoskeleton Robot on Walking Function of Stroke Patients
- 17:00–17:15 475: Wei Yang, Lianghong Gui, Luying Feng, Canjun Yang, Qiaohuan Cao
Design and Control of a Novel Underactuated Soft Exosuit
- 17:15–17:30 479: Qian Wang, Seyram Ofori, Qiulei Liu, Haoyong Yu, Shuo Ding, Haitao Yang
Morphology Design of Soft Strain Sensors with Superior Stability for Wearable Rehabilitation Robots
- 17:30–17:45 531: Rui Huang, Shuaishuai Han, Ling Jin, Jianhua Zhou, Xiaoxiao Chen, Shichen Ruan, Haoyong Yu
The Feasibility, Safety and Efficacy of Robot–Assisted Gait Training Based on a Wearable Ankle Robot in Stroke Rehabilitation

Session 13 (Multifunctional Hall B01, 多功能厅B01): 3D Printing Soft Robots

Chair: Dong Wang (王东), Biao Zhang (张彪), Yuanfang Zhang (章圆方), Yi Xiong (熊异)

- 16:00–16:15 17: Moise Raphael Tsimbo Fokou, Yida Zhu, Yihan Yang, Erbao Dong
Design and Control of a Miniature Soft Robotic Fish Actuated by Artificial Muscles
- 16:15–16:30 229: Kehan Ding, Ruichen Zhen, Li Jiang
A Rigid–Soft Pneumatic Wrist with Fixed Rotation Axes and Active Jamming Variable Stiffness Mechanisms
- 16:30–16:45 241: Ruiqi Feng, Renwu Han, Biao Zhang
Ultraviolet Curable Materials for 3d Printing Soft Robots: From Hydrogels to Elastomers and Shape Memory Polymers
- 16:45–17:00 295: Weihao Li, Yonghua Guo, Yu Han, Jianqing Peng
Design and Grasping Experiments of a Three–Branch Dexterous Soft Gripper
- 17:00–17:15 323: Weizhuang Gong, Qin Bao, Kai Feng, Yinlong Zhu
Modelling Analysis of a Soft Robotic Arm Based on Pneumatic–Network Structure
- 17:15–17:30 465: Qinghua Yu, Zixiao Zhu, Xiru Fan, Dong Wang
Integrated DLP and DIW 3D Printer for Flexible Electronics
- 17:30–17:45 513: Youchao Zhang, Huangyu Chen, Siqi Qiu, YuanFang Zhang, Xiaoyang Zhu
Multi–Material Integrated Printing of Reprogrammable Magnetically Actuated Soft Structures

Session 14 (Multifunctional Hall B02, 多功能厅B02): Dielectric Elastomer Actuators for Soft Robotics

Chair: Jiang Zou (邹江), Chongjing Cao (曹崇景)

- 16:00–16:15 24: Xufei Yan, Renliang Chen, Anhuan Xie
Landing Trajectory and Control Optimization for Helicopter in Tail Rotor Pitch Lockup
- 16:15–16:30 85: Chuang Wu, Xing Gao, Chongjing Cao
A Self–Loading Suction Cup Driven by Resonant–Impact Dielectric Elastomer Artificial Muscles
- 16:30–16:45 121: Dun Mao, Yue Zhang, Jundong Wu, Yawu Wang
Model–Free Adaptive Control of Dielectric Elastomer Actuator
- 16:45–17:00 132: Jianing Wu, Kai Luo, Peinan Yan, Xiazi Hu, Huangwei Ji, Feifei Chen
Modeling and Design Optimization of a Pre–Stretched Rolled Dielectric Elastomer Actuator
- 17:00–17:15 346: Han Chen, Junjie Dai, Chin–Yin Chen, Yongfeng An, Bing Huang
Force Sensor–Based Linear Actuator Stiffness Rendering Control
- 17:15–17:30 356: Peinan Yan, Guoying Gu, Jiang Zou
Design, Modeling and Control of a Dielectric Elastomer Actuated Micro–Positioning Stage
- 17:30–17:45 562: Wenjie Sun, Weihu Liang, Chenyang Wang, Fei Zhang
Design and Analysis of a Flexible Joint Actuator Based on Peano–Hasel with Performance Enhancement Characteristics

Session 15 (Multifunctional Hall B03, 多功能厅B03): Human–like Locomotion and Manipulation

Chair: Anhuan Xie (谢安桓), Xin Wang (王鑫)

- 16:00–16:15 95: Qiang Hua, Weigang Zhou, Chao Cheng, Xiao Liu, Xingyu Chen, Lingyu Kong, Anhuan Xie, Shiqiang Zhu, Jianjun Gu
Design of an Actuator for Biped Robots Based on the Axial Flux Motor
- 16:15–16:30 139: Wenjuan Du, Nan Li, Yeheng Chen, Jiangping Wang
Reinforcement Learning and Sim–to–Real Method of Dual–Arm Robot for Capturing Non–Cooperative Dynamic Targets
- 16:30–16:45 187: Jiaming Xiong, Dingkun Liang, Xin Wang, Yongshan Huang, Anhuan Xie, Jason Gu
Nonsmooth Dynamic Modeling and Standing Balance Control of a Humanoid Robot with Parallel Mechanisms
- 16:45–17:00 250: Chunyu Chen, Ligang Ge, Jiangchen Zhou
Application of Compliant Control in Position–Based Humanoid Robot
- 17:00–17:15 287: Yun Liu, Jiawei Weng, Fan Wang, Jingge Tang, Yunchang Yao, Xingyu Chen, Lingyu Kong, Dingkun Liang, Xin Wang, Shiqiang Zhu, Anhuan Xie, Jason Gu
Design and Control of the Biped Robot HTY
- 17:15–17:30 349: Keyao Liang, Fusheng Zha, Wentao Sheng, Wei Guo, Pengfei Wang, Lining Sun
Research on Target Trajectory Planning Method of Humanoid Manipulators Based on Reinforcement Learning

Session 16 (Multifunctional Hall B05, 多功能厅B05): Pattern Recognition and Machine Learning for Smart Robots

Chair: Zhi Han (韩志), Lianqing Liu (刘连庆)

- 16:00–16:15 62: Wentao Li, Jian Cui, Haiqing Cao, Huixuan Zhu, Sen Lin, Yandong Tang
Multiscale Dual–Channel Attention Network for Point Cloud Analysis
- 16:15–16:30 90: Yanqin Wen, Jun Zhang, Zhe Liang, Di Wang, Ping Wang
Study on Quantitative Precipitation Estimation and Model’ s Transfer Performance by Incorporating Dual Polarization Radar Variables
- 16:30–16:45 114: Feifan Wang, Xiai Chen, Xudong Wang, Weihong Ren, Yandong Tang
Research on Object Detection Methods in Low–Light Conditions
- 16:45–17:00 115: Xudong Wang, Xiai Chen, Feifan Wang, Chonglong Xu, Yandong Tang
Image Recovery and Object Detection Integrated Algorithms for Robots in Harsh Battlefield Environments
- 17:00–17:15 186: Huan Liu, Sen Lin, Zhi Han
Is the Encoder Necessary in DETR–Type Models? – Analysis of Encoder Redundancy
- 17:15–17:30 504: Xianyi Chen, Hongyun Kong, Huiting Zha, EnLai Zhang
Micro Speaker Quality Inspection Based on Time–Frequency Domain Feature Learning

Best 03 (Multifunctional Hall 258, 多功能厅258): Best Paper Competition (I)

Chair: Jianfeng Tao (陶建峰), Tao Liu (刘涛), Guanjun Bao (鲍官军), Huimin Shen (申慧敏), Qinchuan Li (李秦川)

16:00–16:15	37: Qi Yang, Ze Yu, Binbin Lian, Tao Sun <i>A Modular Tensegrity Mobile Robot with Multi-Locomotion Modes</i>
16:15–16:30	99: Haoxian Zheng, Bin Fang, Junxia Yan, Huaping Liu, Fuchun Sun <i>Soft Humanoid Hand with C-Shaped Joint and Granular-Jamming Palm</i>
16:30–16:45	169: Qizhi Meng, Lianhui Jia, Lijie Jiang, Yongliang Wen, Ruijie Tang, Xin Yuan, Xinjun Liu <i>Support Boot Mechanisms of Shaft Boring Machine for Underground Vertical Tunnel Construction</i>
16:45–17:00	181: Fuqiang Zhao, Bidan Huang, Mingchang Li, Mengde Li, Zhongtao Fu, Ziwei Lei, Miao Li <i>A Novel Tactile Palm for Robotic Object Manipulation</i>
17:00–17:15	245: Shanwei Liu, Qiang Fu, Yisheng Guan, Haifei Zhu <i>Development and Analysis of a Wheel-Legged Mobile Robot for Ground and Rail Inspection</i>

Best 04 (Multifunctional Hall 268, 多功能厅268): Best Paper Competition (II)

Chair: Bo Jin (金波), Fei Gao (高飞), Xiaoping Ouyang (欧阳小平), Yongjun Gong (弓永军), Anhuan Xie (谢安桓)

16:00–16:15	272: Tingrui Li, Kaijie Dong, Tianyu Zhou, Duanling Li <i>Design and Analysis of a Novel Membrane Deployable Solar Array Based on STACER Deployable Mechanism for CubeSats</i>
16:15–16:30	288: Jianfeng Liao, Haoyang Zhang, Haofu Qian, Qiwei Meng, Miaoyu Zhang, Yinan Sun, Yao Sun, Wei Song, Shiqiang Zhu, Jason Gu <i>Decision-Making in Robotic Grasping with Large Language Models</i>
16:30–16:45	338: Xin Shu, Xinyang Fan, Zhu Ji, Kang Ming, Fenglei Ni, Hong Liu <i>Dual-Arm Dynamic Planning with Considering Arm Reachability Constraint in Task Space</i>
16:45–17:00	490: Wanglin Qiu, Yaohui Wang, Xiangnan He, Qi Ge, Yi Xiong <i>Bi-Directional Deformation, Stiffness-Tunable, and Electrically Controlled Soft Actuators Based on LCEs 4D Printing</i>
17:00–17:15	494: Lei Zheng, Huaying Liu, Hongsheng Zhu, Xingwei Zhao, Bo Tao <i>Vision-Guided Mobile Robot System for the Assembly of Long Beams on Aircraft Skin</i>

18:30–21:00 Banquet and Award Chair: Honghai Liu (刘洪海), Harbin Institute of Technology, Shenzhen

08:30–11:45, Morning, July 7th, 2023

8:30–10:00 Plenary Speech III (Multifunctional Hall 318&328, 多功能厅318与328)

Chair: Honghai Liu (刘洪海), Harbin Institute of Technology, Shenzhen

8:30–9:00	Plenary Speech 7 Prof. Guangzhong Yang (杨广中), Shanghai Jiao Tong University <i>Medical Robotics—the 5th Generation</i>
9:00–9:30	Plenary Speech 8 Prof. Li Zhang (张立), The Chinese University of Hong Kong <i>Magnetic Miniature Robots for Endoluminal Interventions</i>
9:30–10:00	Plenary Speech 9 Prof. Caihua Xiong (熊蔡华), Huazhong University of Science and Technology <i>Research on Human Kinesiology and Reconstruction of the Missing Limb</i>

10:00–10:15 Coffee & Tea Break

10:15–11:45 Plenary Speech IV (Multifunctional Hall 318&328, 多功能厅318与328)

Chair: Lianqing Liu (刘连庆), Shenyang Institute of Automation, Chinese Academy of Sciences

10:15–10:45	Plenary Speech 10 Prof. Jianda Han (韩建达), Nankai University <i>Active Modeling and Control for Soft Robots</i>
10:45–11:15	Plenary Speech 11 Prof. Shijie Guo (郭士杰), Hebei University of Technology <i>State of the Art and Future Trend of Nursing-Care Robots: From Single Functional Devices to Multifunctional Robots</i>
11:15–11:45	Plenary Speech 12 Prof. Ning Jiang (江宁), West China Hospital, Sichuan University <i>Bio-Robotics Research for Non-Invasive Myoelectric Neural-Interfaces for Prosthetic Control —a Ten-Year Perspective Review</i>

11:45–14:00 Lunch & Break (Multifunctional Hall 368, 多功能厅368)

14:00–15:45, Afternoon, July 7nd, 2023

Session 17 (Multifunctional Hall 278, 多功能厅278): Robotic Tactile Sensation, Perception, and Applications

Chair: Jixiao Liu (刘吉晓), Rui Wang (王睿)

14:00–14:15	141: Yingxuan Zhang, Qi Jiang, Feiwen Wang, Jie Wang FBG Tactile Sensor Integrated on Bronchoscope for Force and Contact Position Sensing
14:15–14:30	168: Sun Chang, Boyi Duan, Kun Qian, Yongqiang Zhao Learning Tactilemotor Policy for Robotic Cable Following via Sim-to-Real Transfer
14:30–14:45	309: Yuru Gong, Yan Xing, Jianhua Wu, Zhenhua Xiong Tactile-Based Slip Detection Towards Robot Grasping
14:45–15:00	445: Xiujian Liang, Hang Gao, Peng Wang, Jixiao Liu, Shijie Guo Intelligent Tactile System and Human-Robot Interaction for Collaborative Robots
15:00–15:15	527: Jieji Ren, Jiang Zou, Guoying Gu MC-Tac: Modular Camera-Based Tactile Sensor for Robot Gripper

Session 18 (Multifunctional Hall 287, 多功能厅287): Advanced Sensing and Control Technology for Human-robot Interaction

Chair: Qinchuan Li (李秦川), Gang Chen (陈刚), Wei Ye (叶伟)

14:00–14:15	33: Jianfeng Liao, Shiqiang Zhu, Qiwei Meng, Yinan Sun, Haoyang Zhang, Wei Song, Jason Gu Integrated Direct/Indirect Adaptive Robust Control for Electrical Driven Injection Machine Mold Closing with Accurate Parameter Estimations
14:15–14:30	254: Lin Yang, Wenjie Chen, Che Hou, Yuqiang Wu, Xiaoqiang Chen Physical Reality Constrained Dynamics Identification of Robots Based on CAD Model
14:30–14:45	273: Ruihong Xiao, Hong Zhan, Yiming Jiang, Chenguang Yang Demonstration Shaped Reward Machine for Robot Assembly Reinforcement Learning Tasks
14:45–15:00	320: Mengdi Wang, You Wu, Tao Ding, Xingwei Zhao, Bo Tao The Construction of Intelligent Grasping System Based on EEG
15:00–15:15	336: Zhongyi Ding, Jianmin Li, Lizhi Pan Comparing of Electromyography and Ultrasound for Estimation of Joint Angle and Torque
15:15–15:30	366: Guanyi Zhao, Yuqiang Wu, Che Hou, Wenjie Chen, Chenguang Yang A Force Exertion Method for Redundant Mobile Manipulators Safely Operating in Small Spaces
15:30–15:45	368: Yunli Xia, Haojie Liu, Chang Zhu, Wei Meng, Quan Liu Prediction of Elbow Torque Using Improved African Vultures Optimization Algorithm in Neuromusculoskeletal Model

Session 19 (Multifunctional Hall 288, 多功能厅288): Knowledge-based Robot Decision-making and Manipulation

Chair: Wei Song (宋伟), Jianfeng Liao (廖建峰)

14:00–14:15	70: Yaohua Zhou, Chin-Yin Chen, Guilin Yang, Chi Zhang Performance Optimization of Robotic Polishing System With a 3-DOF End-Effector Using Trajectory Planning Method
14:15–14:30	79: Zonghao Mu, Wenyun Zhao, Yue Yin, Xiangming Xi, Wei Song, Jianjun Gu, Shiqiang Zhu KGGPT: Empowering Robots with OpenAI's ChatGPT and Knowledge Graph
14:30–14:45	137: Bing Xie, Xiangming Xi, Xinan Zhao, Yuhang Wang, Wei Song, Jianjun Gu, Shiqiang Zhu ChatGPT for Robotics: A New Approach to Human-Robot Interaction and Task Planning
14:45–15:00	157: Qixian Wang, Manzhi Qi, Yangxiu Xia, Zheng Chen Precision Control and Simulation Verification of Hydraulic Manipulator under Unknown Load
15:00–15:15	387: Saikun Huang, Zhenwei Zhu, Jin Liu, Chaoqun Wang, Fengyu Zhou Language Guided Grasping of Unknown Concepts Based on Knowledge System

Session 20 (Multifunctional Hall 289, 多功能厅289): Design and Control of Legged Robots

Chair: Haihui Yuan (袁海辉), Ruilong Du (杜睿龙), Chunjiang Fu (付春江)

14:00–14:15	71: Limin Yang, Yunpeng Yin, Zelin Wang, Liangyu Wang, Feng Gao, Xianbao Chen, Hong Gao Design and Control of a Novel Six-Legged Robot for Flat, Downhill, and Uphill Skiing
14:15–14:30	102: Weigang Zhou, Qiang Hua, Chao Chen, Xingyu Chen, Yunchang Yao, Lingyu Kong, Anhuan Xie, Shiqiang Zhu, Jianjun Gu Joint Torque and Ground Reaction Force Estimation for a One-Legged Hopping Robot
14:30–14:45	143: Peiyuan Cai, Danfu Liu, Lijun Zhu Predefined-Time External Force Estimation for Legged Robots
14:45–15:00	228: Wei Liu, Zhijun Chen, Fei Yang, Yong Zhao, Jianzhong Yang, Feng Gao Movement Analysis of a Landing Buffer Mobile Mechanism with Eccentric Load
15:00–15:15	351: Jiayi Li, Linqi Ye, Yujie Sun, Houde Liu, Bin Liang Recovery from Injury: Learning Bipedal Jumping Skills with a Motor Output Torque Limit Curriculum
15:15–15:30	446: Guifu Luo, Ruilong Du, Anhuan Xie, Hua Zhou, Jason Gu Leg Mass Influences the Jumping Performance of Compliant One-Legged Robots

Session 21 (Multifunctional Hall B01, 多功能厅B01): Robots in Tunnelling and Underground Space

Chair: Jianfeng Tao (陶建峰), Lintao Wang (王林涛)

- 14:00–14:15 125: Lintao Wang, Zikang Liu, Ning Hao, Meng Gao, Zihan Wang
Shield Tail Seal Detection Method Driven by Twin Simulation Model Based on Intelligent Shield
- 14:15–14:30 289: Zhen Wu, Hao Chen, Shangqi Chen, Junzhou Huo
Design of Hybrid Shield Cutter–Changing Robot and Its Motion Control Method
- 14:30–14:45 329: Lianhui Jia, Heng Wang, Yongliang Wen, Lijie Jiang
TBM Tunnel Surrounding Rock Debris Detection Based on Improved Yolo V8
- 14:45–15:00 348: Yixin Zhai, Chi Zhang
Development and Application of Large Curved Shape Pipe–Roof with Rectangular Jacking Machine under the Yangtze River
- 15:00–15:15 370: Tao Zhu, Haibo Xie, Huayong Yang
Kinematics and Workspace Analysis of a Disc Cutter Replacement Manipulator for TBM in a Constrained Motion Space
- 15:15–15:30 377: Qi Wei, Jianfeng Tao, Hao Sun, Chengliang Liu
Mechanism Surrogate Based Model Predictive Control of Hydraulic Segment Assembly Robot with Sliding Friction
- 15:30–15:45 424: Yitang Wang, Yong Pang, Suhang Wang, Xueguan Song
Outlier Detection and Correction for Time Series of Tunnel Boring Machine

Session 22 (Multifunctional Hall B02, 多功能厅B02): Robotic Machining of Complex Components

Chair: Xingwei Zhao (赵兴炜), Zhoulong Li (李洲龙)

- 14:00–14:15 67: Yuhao He, Fugui Xie, Xinjun Liu, Zenghui Xie
Error Sensitivity Analysis and Tolerance Allocation Simulation of a Five–Axis Parallel Machining Robot
- 14:15–14:30 214: Bingbing Li, Teng Zhang, Hao Sun, Runpeng Deng, Fangyu Peng, Rong Yan, Xiaowei Tang
High–Precision Point Cloud Data Acquisition for Robot Based on Multiple Constraints
- 14:30–14:45 243: Lei Fu, Zhihua Liu, Meng Tao, Chenguang Cai, Ming Yang
Passive Rotation Compensation for The Cylindrical Joints of the 6–Ucu Parallel Manipulator
- 14:45–15:00 317: Haodong Qu, Xiaowei Tang, Tao Ma, Fangyu Peng, Rong Yan, Lei Zhang
Research on the Milling Process Damping and Stability Considering Additional Vibration
- 15:00–15:15 440: Guotao Jiang, Xingwei Zhao, Bo Tao
Research on High Precision Scanning Reconstruction Algorithm for Robot with Line Laser Scanner
- 15:15–15:30 498: Anjie Wang, Lai Zou, Xinli Wang
Generation of Collision–Free Tool Posture for Robotic Belt Grinding Blisk Using Visualization Toolkit

Session 23 (Multifunctional Hall B03, 多功能厅B03): Clinically Oriented Design in Robotic Surgery and Rehabilitation

Chair: Kang Li (李康), Ning Jiang (江宁)

- 14:00–14:15 131: Fashu Xu, Wenjun Huang, Hao He, Nan Li, Hongchen He, Kang Li
A Segmented Dynamic Movement Primitives–Based Gait Assistive Strategy for Soft Ankle Exosuit
- 14:15–14:30 150: Mengyue Li, Niandong Jiao, Xiaodong Wang, Lianqing Liu
A Magnetically Actuated Diatom–Biohybrid Microrobot as a Drug Delivery Capsule
- 14:30–14:45 275: Hao Zheng, Tenghui Wang, Feng Gao, Chenkun Qi, Renqiang Liu
Kinematics Analysis and Control of a Novel Macro–Micro Integrated Hybrid Robot for Medical Surgery
- 14:45–15:00 290: Peng Ling, Kai Xi, Peng Chen, Xi Yu, Kang Li
The Effect of Channel Ordering Based on the Entropy Weight Graph on the MI–EEG Classification
- 15:00–15:15 461: Yong Tao, Dongming Han, Tianmiao Wang, Yufan Zhang, He Gao, Jiahao Wan
Fuzzy Variable Admittance Control –Based End Compliance Control of Puncture Ablation Robot
- 15:15–15:30 484: Hai Wang, Qing Tao
Deep Forest Model Combined with Neural Networks for Finger Joint Continuous Angle Decoding
- 15:30–15:45 525: Yanxin Jiang, Kang Li, Lei Li, Hairong Tao, Moyu Shao, Xiaomin Cheng, Hongkai Wang
2D/3D Shape Model Registration with X–Ray Images for Patient–Specific Spine Geometry Reconstruction

Session 24 (Multifunctional Hall B05, 多功能厅B05): Visual and Visual–tactile Perception for Robotics

Chair: Hua Yang (杨华), Shuang Mei (梅爽), Zeyu Gong (龚泽宇)

- 14:00–14:15 178: Liang Li, Yiping Li, Zhibin Jiang, Hailin Wang
Real–Time Detection of Surface Floating Garbage Based on Improved Yolov7
- 14:15–14:30 236: Bin Cheng, Zonggang Li, Jianjun Jiao, Guanglin An
MLP Neural Network–Based Precise Localization of Robot Assembly Parts
- 14:30–14:45 238: Ze'an Liu, Zhenguo Wu, Bin Pu, Jixiang Tang, Xuanyin Wang
6D Pose Estimation Method of Metal Parts for Robotic Grasping Based on Semantic–Level Line Matching
- 14:45–15:00 339: Zhentao Guo, Guiyu Zhao, Jinyue Bian, Hongbin Ma
Detection and Positioning of Workpiece Grinding Area in Dark Scenes with Large Exposure
- 15:00–15:15 488: Kangyu Li, Xifeng Wang, Yangqing He, Lijuan Ji
A Structure–Responsive CNN–Based Approach for Loop Closure Detection in Appearance–Changing Environments
- 15:15–15:30 521: Bo Peng, Feifan Zheng, Fan Zhang, Shilin Ming, Yan Li, Xutao Deng, Zeyu Gong, Bo Tao
Visual Sensor Layout Optimization of a Robotic Mobile Adhesive Removal System for Wind Turbine Blade Based on Simulation

C 01 (Multifunctional Hall 268, 多功能厅268): Cutting-edge Research in Robotics (I)

Chair: Shuo Ding (丁硕)

- 14:00–14:15 27: Wei Wang, Jiahao Zhao, Zhi Chen, Bin Zi
Real-Time Monitoring System of Spray-Painting Robot Based on Five-Dimension Digital Twin Model
- 14:15–14:30 77: Chao Yang, Fengli Huang, Wei Ye, Tianze Sun, Qiaohong Chen
A Methodology for Optimization Design of Parallel Manipulators with Similar Stiffness Performance Design
- 14:30–14:45 189: Zhong Chen, Tianhua Ye, Xianmin Zhang
Collaborative Robot-Oriented Joint Real-time Control Based on Heterogeneous Embedded Platform
- 14:45–15:00 285: Jingzhou Dai, Ling Tian
A Novel Prognostic Method for Wear of Sliding Bearing Based on SFENN
- 15:00–15:15 203: Liping Wang, Mengyu Li, Guang Yu
A Novel Sensitivity Analysis Method for Geometric Errors of a Parallel Spindle Head
- 15:15–15:30 350: Jun Fang, Bingran Li, Hui Zhang, Peiqing Ye
Accurate Interpolation Algorithm Based on Fir Filters with Local Dynamic Adjustment

15:45–16:00 Coffee & Tea Break

16:00–17:45, Afternoon, July 7th, 2023

Session 25 (Multifunctional Hall 278, 多功能厅278): Perception, Interaction, and Control of Wearable Robots

Chair: Kui Xiang (向燧), Yuquan Leng (冷雨泉)

- 16:00–16:15 109: Lijun Yang, Kui Xiang, Muye Pang, Mingxiang Luo, Meng Yin, Wenju Li, Wujing Cao
An Autoencoder-Based Feature Extraction Method Applied to the Detection of Lateral Walking Gait Phase
- 16:15–16:30 361: Qigao Cheng, Haoyun Yan, Kui Xiang, Jing Luo, Muye Pang, Yuquan Leng, Chenglong Fu
Simulation Analysis of Synchronous Walking Control for Centaur System
- 16:30–16:45 451: Rongtian Huo, Qing Gao, Jing Qi, Zhaojie Ju
3D Human Pose Estimation in Video for Human-Computer/Robot Interaction
- 16:45–17:00 453: Yuhang Xu, Qing Gao, Xiang Yu, Xin Zhang
A Real-time AGV Gesture Control Method Based on Body Part Detetcion
- 17:00–17:15 502: Yuanwen Zhang, Jingfeng Xiong, Yuepeng Qian, Xinxing Chen, Yixuan Guo, Chenglong Fu, Yuquan Leng
Predict Hip Joint Moment Using CNN for Control

Session 26 (Multifunctional Hall 287, 多功能厅287): Marine Robotics and Applications

Chair: He Shen (沈贺), Jian Gao (高剑), Zhengxing Wu (吴正兴), Gang Wang (王刚)

- 16:00–16:15 74: Shihao Zhang, Xin Zhang, Jihong Yan
Optimization of Energy Storage for a Miniature Water Jumping Robot
- 16:15–16:30 174: Xuechao Cheng, Yuanbo Guo, Jian Gao, Yimin Chen, Guang Pan
Coordinated Passive Maneuvering Target Tracking by Multiple Underwater Vehicles Based on Asynchronous Sequential Filtering
- 16:30–16:45 308: Wenjie Li, Jian Gao, Yimin Chen, Pei Cui, Junjun Lv, Guang Pan
Multi-UUV/USV Adaptive Cooperative Search Using Online State Information
- 16:45–17:00 380: Chihao Du, Tao Wang, Shuo Liu, Shanmin Zhou, Yong Cai, Zijing Yu
Design and Analysis of Co-Axial Twin-Propeller Trans-Media Vehicle
- 17:00–17:15 520: Hongwen Zhang, Yongxing Tang, Zhanxia Zhu
A Novel Motion Planning Algorithm Based on RRT-Connect and Bidirectional Approach for Free-Floating Space Robot
- 17:15–17:30 526: Xubo Yang, Jian Gao, Haozhe Zhang, Yimin Chen, Jingwei Guo, Sijia Su
A Hybrid Workspace Mapping Method Based on Force Feedback for Underwater Teleoperation Systems
- 17:30–17:45 557: He Shen, Jinxin Zeng, Yixin Yang
Overview of Technologies in Marine Robotics

Session 27 (Multifunctional Hall 288, 多功能厅288): Multi-robot Systems for Real World Applications

Chair: Qiuguo Zhu (朱秋国), Fei Gao (高飞)

- 16:00–16:15 50: Mohamed Elbeltagy, Zhufeng Shao
Intelligent Scalable and Fault-Tolerant Coordination Approach for Collective Construction Robots
- 16:15–16:30 65: Dongxing Li, Senhao Hou, Yuheng Wang, Xiaoqiang Tang
Dynamic Modeling and Control of Winch-Integrated Cable-Driven Parallel Robots Using Singular Perturbation Method
- 16:30–16:45 159: Yuhang Zhong, Yangxiu Hu, Yang Chen, Ningyu He, Guangtong Xu, Chao Xu, Fei Gao
Efficient Trajectory Planning for Coordinated Arrival of Fixed-Wing UAV Swarm
- 16:45–17:00 202: Ji Zhang, Han Li, Haoyuan Du, Yiming Liang, Jason Gu, Wei Song, Tiefeng Li
Spontaneous Emergence of Multitasking in Minimal Robotic Systems
- 17:00–17:15 207: Yuanyuan Li, Guilin Yang, Wenjing Wu, Wenjie Chen
Cooperative Control of Dual-Manipulator System with Unknown Dynamic Parameters
- 17:15–17:30 470: Chaoyu Xue, Tianhao Zhao, Qiuguo Zhu, Jun Wu, Rong Xiong
Efficient Autonomous Exploration of Unknown Environment using Regions Segmentation and VRP
- 17:30–17:45 554: Xuru Yang, Han Gao, Pingping Zhu, Chang Liu
Risk-Aware Motion Planning for Very-Large-Scale Robotics Systems Using Conditional Value-at-Risk

Session 28 (Multifunctional Hall 289, 多功能厅289): Physical and Neurological Human-Robot Interaction

Chair: Huimin Shen (申慧敏), Rui Huang (黄瑞), Mingming Zhang (张明明), Mingjie Dong (董明杰)

- 16:00–16:15 76: Yanjiang Huang, Haoyang Chen, Zhaoyu Cui, Xianmin Zhang
An Adaptive Impedance Control Method for Human-Robot Interaction
- 16:15–16:30 146: Zhao Yi, Ge Xu, Wenrui Liu
Upper Limb Motion Rehabilitation Training Robot Based on A Spatial RRSS Rigid-Body Guidance Mechanism
- 16:30–16:45 161: Xuejing Han, Yongxu Li, Chengyi Duan, Ruixue He, Hui Jin
A Detection Method Based on Improved Mask R-CNN
- 16:45–17:00 240: Qi'ao Zhan, Yinzhen Peng, Junwen Cui, Qingyun Xia, Hongqing Xie, Hong Cheng, Hangyu Zou, Jing Qiu
CMM-Based Cooperative Control Strategy of Supernumerary Robotic Limbs for Human Motion
- 17:00–17:15 441: Shuaibang Wang, Mingjie Dong, Ran Jiao, Shuwen Sun, Jianfeng Li
Design and Analysis of a Four-Finger Three-Joint Underactuated Hand Rehabilitation Mechanism
- 17:15–17:30 464: Minghao Zhou, Ruikang Ge, Xiaotong Cai, Huimin Shen
Human-Computer Interactive Digital-Twin System Driven by Magnetic-Inertia Fusion Data
- 17:30–17:45 547: Qianpeng Wang, Jia Wang, Jinxing Qiu, Mo Yang, Tao Qin
Motion Planning for Pelvis-Assisted Walking Training Robot

Session 29 (Multifunctional Hall B01, 多功能厅B01): Advanced Motion Control Technologies for Mobile Robots

Chair: Zhang Chen (陈章), Zhan Li (李湛), Yang Deng (邓颺), Linqi Ye (叶林奇)

- 16:00–16:15 180: Fulin Song, Zhan Li, Hai Li, Yuan Li, Quman Xu, Bingkai Xiu
To Improve the Energy Efficiency: Modeling and Control for Quadrotor with Tilttable Wing
- 16:15–16:30 296: Hongyu Nie, Jiantan Chen, Guangyu Zhang, Decai Li, Yuqing He
Efficient and Hierarchical Quadrotor Planner for Fast Autonomous Flight
- 16:30–16:45 385: Haotian Zhi, Lin Zhang, Jihao Liu, Jianping Jing, Yanzheng Zhao
Adaptive Attitude Controller for a Six Wheel-Legged Robot Based on Impedance Control
- 16:45–17:00 414: Wenqian Li, Chunyan Zhang
Design and Simulation of a Reconfigurable Multimode Mobile Robot with Folding Platform
- 17:00–17:15 485: Yusheng Yang, Jinghan Zhang, Wei Qian, Hao Geng, Yangmin Xie
Autonomous Exploration for Mobile Robot in Three Dimensional Multi-Layer Space
- 17:15–17:30 533: Zhixin Tu, Wenbing Zhuang, Yuquan Leng, Chenglong Fu
Accelerated Informed RRT: Fast and Asymptotically Path Planning Method Combined with RRT*-Connect and APF*

Session 30 (Multifunctional Hall B02, 多功能厅B02): Intelligent Inspection Robotics

Chair: Laihao Yang (杨来浩), Zhongdong Jiao (焦中栋), Xin Dong (东昕), Yu Sun (孙瑜)

- 16:00–16:15 122: Dongyu Liu, Yu He, Linhou Bai, Wei Wang, Changchun Liang, Pengfei Xin
Design and Practice of Space Station Manipulator Inspecting for Berthing Manned Spacecraft
- 16:15–16:30 177: Hai Li, Zhan Li, Tong Wu, Fulin Song, Jiayu Liu, Zonglin Li
Powerline Detection and Accurate Localization Method Based on the Depth Image
- 16:30–16:45 239: Na Li, Daojing Lin, Junfeng Wu, Quan Gan, Niandong Jiao
Dexterity of Concentric Magnetic Continuum Robot with Multiple Stiffness
- 16:45–17:00 324: Hongfei Zu, Junjun Ma, Cunjun Li, Xianlei Chen, Haolei Shi, Xuwen Chen, Xiang Zhang, Zhangwei Chen
A Novel Radius Measurement Method for Vertical Oil Tank Based on Laser Tracking and Wall-Climbing Robot
- 17:00–17:15 450: Zheshuai Yang, Laihao Yang, Yu Sun, Xuefeng Chen, Guangrong Teng, Miaoqing Yang
Kinostatic and Cable-Hole Friction Modeling for Cable-Driven Continuum Robots
- 17:15–17:30 546: Zijian Zhou, Jie Wang, Yuxin Li, Jia Zhou, Lin Du
Integrated Device for Controllable Droplet Generation and Detection on Open Array Chip

Session 31 (Multifunctional Hall B03, 多功能厅B03): Robotics in Sustainable Manufacturing for Carbon Neutrality

Chair: Bin He (何斌), Long Chen (陈龙), Bai Chen (陈柏)

- 16:00–16:15 86: Kuiliang Liu, Guiqin Li, Yicong Shen, Haoju Song, Xin Xiong, Bin He
Research on Energy Consumption Prediction of Pump Truck Based on LSTM–Transformer
- 16:15–16:30 151: Quanwei Chen, Xin Lai, Junjie Chen, Shuai Yao, Guan Wang, Yi Guo, Xuebing Han, Yuejiu Zheng
Comparative Carbon Footprint and Environmental Impacts of $\text{LiFePO}_4 - \text{LiCo}_x\text{Ni}_y\text{Mn}_{(1-x-y)}\text{O}_2$ Hybrid Batteries Manufacturing
- 16:30–16:45 164: Chaoyue Zhao, Zongxing Lu, Yida Liu
Wiring Simulation of Electric Control Cabinet Based on Industrial Robot
- 16:45–17:00 227: Haoju Song, Guiqin Li, Zijie He, Xin Xiong, Bin He, Peter Mitrouchev
Intelligent Identification Approach of Vibratory Roller Working Stages Based on Multi–Dimensional CNN
- 17:00–17:15 400: Bing Pan, Xin Xiong, Hailiang Hu, Jun He, Shixi Yang
A Novel Transfer Learning Method for Robot Bearing Fault Diagnosis Based on Deep Convolutional Residual Wasserstein Adversarial Network
- 17:15–17:30 491: Chenyue Zhang, Bin He, Guiqin Li
Research on Robotic Extractors Based on Potential Energy Recovery Technology for Low–Carbon Footprint

Session 32 (Multifunctional Hall B05, 多功能厅B05): Innovative Design and Performance Evaluation of Robot Mechanisms (II)

Chair: Duanling Li (李端玲), Yisheng Guan (管贻生), Kaijie Dong (董凯捷)

- 16:00–16:15 198: Hanlin Sun, Dongjie Zhao, Jingshan Zhao
Screw Dynamics of the Upper Limb of a Humanoid Robot
- 16:15–16:30 249: Bo Han, Zhantu Yuan, Yuanzhi Zhou, Feng Liu, Jiantao Yao, Yongsheng Zhao
Design and Analysis of a Novel Ring Truss Deployable Antenna Mechanism
- 16:30–16:45 345: Peng Sun, Yujun Gao, Chentao Wu, Shaojiang Feng, Yunfei Gu, Yanbiao Li
Optimum Design of 3–UPS/S Parallel Humanoid Wrist Joint
- 16:45–17:00 369: Mingxiang Ling, Jie Zhu, Lu Li, Hongchen Gao, Liguo Chen, Lining Sun
Dynamic Compliance Matrix Modeling of Flexure Hinges for Use in Compliant Mechanisms
- 17:00–17:15 417: Chunxu Tian, Luquan Li, Zhihao Xia, Dan Zhang
Graph Synthesis of Generalized Parallel Mechanisms with Coupling Sub–Chains
- 17:15–17:30 497: Ying Zhang, Duanling Li, Jian Li, Shimin Wei, Qizheng Liao
A New Closed–Form Solution to the Five–Precision Points Path Synthesis of Planar Four–Bar Linkages
- 17:30–17:45 517: Lifeng Zhou
Design and Kinematic Analysis of DNA Nanomachines

C 02 (Multifunctional Hall 268, 多功能厅268): Cutting–edge Research in Robotics (II)

Chair: Wei Ye (叶伟)

- 16:00–16:15 165: Yuan Lin, Medhanit Alemu, Peter Shull
Investigation of Soft Acoustic Waveguide Dispersion for Wearable Strain Sensing in Human Motion Monitoring
- 16:15–16:30 185: Nianfeng Wang, Guisheng Shang, Xingyue Liu, Xuewei Zheng, and Xianmin Zhang
Design and Optimization of Compliant Rotational Hinge Based on Curved Beam
- 16:30–16:45 439: Zhihong Wu, Hao An, Boyu Wu, Huaide Wang, Ke Lu
A Visual–Inertial Fusion Mapping and Localization System Using AprilTag in GNSS–Denied Scenes
- 16:45–17:00 524: Zhenya He, Hongying Zheng, Haolun Yuan, Xianmin Zhang
An Orientation Measurement Method for Industry Robot Based on Laser Tracker
- 17:00–17:15 553: Xiaoting Ma, Hanqian Zhang, Ran Chen, Fubing Bao
Programming the Motion of Nanofiber Mat Actuator Through an Area Selective Epoxy Coating Method
- 17:15–17:30 561: Jinghui He, Xianmin Zhang, Jian S. Dai
Design of a Multi–Robot Digital Twin System with Bidirectional Motion Synchronization Capabilities

Plenary Speech 1 Given by Professor Jie Zhao (赵杰) Harbin Institute of Technology

Robotics Progress in China

8:40–9:10, July 6th, 2023, Hangzhou

Biography

Professor Zhao has been engaged in teaching and scientific research at Harbin Institute of Technology for a long time. He is the current director of Institute of Robotics at Harbin Institute of Technology, the Changjiang distinguished professor of the Ministry of Education, the leading talent of scientific and technological innovation under the "National high – level talent special support plan" of the Organization Department of the Central Committee of the CPC, and the member of the State Council Discipline Appraisal Group. Additionally, he is the member of Advanced Manufacturing Department of the Ministry of Education Science and Technology Commission, the leader of expert group on intelligent robot in advanced manufacturing field in the national "12th Five-Year Plan" and "863 Program", and the key specialist of service robot in the national "12th Five-Year Plan". Besides, he is the leader of the expert group for the demonstration of "Key Project of Intelligent Robot" in the national "13th Five-Year Plan", the member of the general demonstration Group of "Intelligent Manufacturing and Robotics Major Project" in the national "13th Five-Year Plan", and the chairman of the Robotics Committee of the Chinese Society of Astronautics. Also, he is the Vice Chairman of the Robotics Committee of the Chinese Association of Automation, and the Vice Chairman of the Intelligent Manufacturing Committee of the Chinese Association for Artificial Intelligence.

Introduction Day 1

Professor Zhao has been facing the major strategic needs of the international academic frontier, national economic development and national defense construction for many years. After decades of unremitting exploration and practice, professor Zhao has gradually formed major research directions such as the basic theory and generic technology of highly adaptable robot, key technology and application of robot in a special service environment, robotic equipment for national economic development and major engineering applications, which are guided by the exploration of cutting-edge scientific issues in international robot research such as bionics and variable configuration, based on the key generic technology breakthrough in robotics applications in aerospace, nuclear industry, and public security areas, and directed by the application and industry requirements of major projects such as manned space engineering and petrochemical equipment automation. In the past five years, he has presided over 19 scientific research projects such as the National Natural Science Foundation of China, the National "863" Program, and the National Science and Technology Major Project, with a total expenditure of 110 million yuan. He has published more than 280 papers cited 788 times, of which over 210 are included in SCI/EI. In the past five years, he has published over 180 papers cited 318 times, including more than 140 SCI/EI papers. He has also published 1 book and applied for 50 invention patents. He has won 4 provincial and ministerial science and technology awards (1 first prize, ranked No.1; 3 second prizes, ranked No.2, 5, 5)



Zhao Jie (赵杰)
Harbin Institute of Technology

Plenary Speech 2 Given by Professor Xianmin Zhang (张宪民) South China University of Technology

Compliant Scanning Mechanisms and Scanning Method of Atomic Force Microscopy

9:10–9:40, July 6th, 2023, Hangzhou

Abstract

Atomic force microscopy (AFM) has been widely used in semiconductor industry, micro/nano operation, life science and other fields due to its sub nanometer resolution and strong environmental adaptability. How to further improve the imaging quality and the scanning speed of AFM while ensuring the imaging quality has become an urgent problem to be solved. This talk focuses on key technologies such as high bandwidth design of nanoscale precision scanning platforms, harmonic probe technology, and new scanning methods of the AFM, and the latest research progress of the team is presented.

Introduction Day 1

Biography

Xianmin Zhang is a professor at South China University of Technology. His research fields involve robotics, mechanism kinematics and dynamics, machine vision, and precision manufacturing equipment. He has published more than 600 papers, of which more than 200 papers were published in important international journals, and the papers were cited more than 9500 times. He also serves as the executive committee member of the International Federation for the Promotion of Mechanism and Machine Science (2019–).



Xianmin Zhang (张宪民)
South China University of Technology

Plenary Speech 3 Given by Professor Xinjun Liu (刘辛军) Tsinghua University

Type Synthesis and Potential Application of Complex Multi-Closed-Loop Space Deployable Mechanisms

9:40–10:10, July 6th, 2023, Hangzhou

Abstract

In the field of aerospace, spacecraft such as space stations and satellites need to ensure communication and energy supply to realize complex space missions. As the content diversity and scale of tasks increase, the deployment area required for related solar energy collection and antenna reception devices is also increasing. However, these devices are generally carried to space by rockets or space shuttles, and there is an outstanding contradiction between small launch space and large deployment areas. Deployable mechanisms have the advantages of small storage space and large deployment area, which are favored in the relevant field and have received increasing attention.

This talk focuses on the type synthesis of complex multi-closed-loop space deployable mechanisms. After introducing the research background and significance, three types of deployable mechanisms with application requirements will be given special attention, i.e., ring truss deployable mechanisms for satellite antennas, deployable trusses for planar antennas of synthetic aperture radar, and deployable polyhedral mechanisms with radially reciprocating motion. The corresponding type synthesis approaches will be proposed for constructing these multi-closed-loop space deployable mechanisms. Then, a class of multi-closed-loop space deployable mechanisms with high deployable performance is designed as candidates. The presented work will not only provide the design and analysis methods but also contribute new types of deployable mechanisms, hoping to promote research and development in related fields.

Introduction Day 1

Biography

Xinjun Liu is a Full Professor with Tenure in Department of Mechanical Engineering at Tsinghua University, Beijing, China. He is the "Cheung Kong" Chair Professor, and the winner of National Outstanding Youth Fund of China. He is currently the MO Chair of International Federation for the Promotion of Mechanism and Machine Science (IFTOMM) China-Beijing and the Director of the Beijing Key Laboratory of Precision and Ultra-precision Manufacturing Equipment and Control. From 2000 to 2001, he worked as a Postdoctoral Researcher at Tsinghua University. He was a Visiting Researcher at Seoul National University, Seoul, Korea in 2002–2003. He was the Alexander von Humboldt (AvH) Research Fellow at University of Stuttgart in Germany from 2004 to 2005. He was the Visiting Professor with Prof. Dr. Reimund Neugebauer at Fraunhofer Institute for Machine Tools and Forming Technology, Germany, in August of 2007. He has published over 210 papers in refereed journals and refereed conference proceedings and has been selected as Elsevier's Most Cited Chinese Researchers for nine consecutive years from 2014 to 2022, more than 90 authorized patents, and three books (including one book in English). His research interests include smart robotics, parallel mechanisms and robots, machining robots, and advanced and smart manufacturing equipment.



Xinjun Liu (刘辛军)
Tsinghua University

Plenary Speech 4 Given by Professor Zhiwu Han (韩志武) Jilin University

Low Energy Consumption in Biological Identification

10:25–10:55, July 6th, 2023, Hangzhou

Abstract

The sensor is an important tool to obtain external information, which has received great attention in the fields of electronic skin, human-computer interaction, precision equipment, and so on. Among numerous sensors, flexible mechanosensors are one of the main research directions. Its working principle is to transform the collected physical signals such as strain or pressure from the external environment into quantifiable, identifiable, and stored electrical signals, such as voltage, current, etc., according to a certain pattern. At present, the problem faced by flexible mechanosensor is that when there is low-frequency noise interference and the useful signal is extremely weak, the useful signal cannot be decoupled. This not only complicates subsequent information processing, but also results in high energy consumption due to the need to process a large amount of irrelevant information. Therefore, it is extremely important to find innovative methods to design and manufacture sensors that can reduce noise interference and energy consumption. After billions of years of evolution, the fusion of organisms and nature has become perfect. Typical organisms in nature have evolved excellent sensillum in order to survive and reproduce in harsh natural environments. Their excellent comprehensive performance is beyond the reach of human sensors and is urgently needed. This will provide a natural blueprint for the development of sensors with excellent comprehensive performance. This report takes the scorpion, which has a highly degraded visual system and relies on slit sensillum for hypersensitive perception and precise recognition of complex mechanical signals around it, as its biological prototype. Through detailed neurobiology and biomechanical experiments, the inherent mechanism of scorpions in eliminating noise interference and achieving low-power recognition of biological related information in complex perceptual environments has been revealed. Based on this, corresponding biomimetic design and manufacturing of sensing components have been carried out.

Introduction Day 1

Biography

Zhiwu Han is currently a professor at Jilin University and dean of the Key Laboratory of Bionic Engineering (Ministry of Education), Jilin University. In September 2001, he was promoted to professor. From 2005 to 2006, he was funded by the National Scholarship Council and worked as a Visiting Scholar at Oxford University. He got the National Natural Science Foundation for Distinguished Young Scholars of China. His research interest focuses on the principles of mechanical biomimetics and functional surface for a long time, systematically studying the excellent functional characteristics of typical biological surfaces, revealing the mechanism, characteristics laws, and principles of their excellent functions, proposing the principle of multiple biomimetic comprehensive designs of functional surfaces, and cross-scale integrated manufacturing technology. He has published high-quality articles in journals like Nature, Advanced Materials, Advanced Functional Materials, Materials Today, Progress in Materials Science, and so on.



Zhiwu Han (韩志武)
Jilin University

Plenary Speech 5 Given by Professor Qinchuan Li (李秦川) Zhejiang Sci-Tech University

Skeleton of Robot—from the Perspective of Mechanism Topology

10:55–11:25, July 6th, 2023, Hangzhou

Abstract

In recent years, robotics has achieved significant progresses in intelligent manufacturing systems and biomimetic field. Skeleton of a robot is a vital gene which determines its function and performance. It intrinsically influences three aspects of a robot, namely, the output motion, capability for bearing load and transferring motion and force. Skeleton can be abstracted as mechanism topology. This talk focuses on the mechanism topologies in robotized manufacturing equipment and biomimetic robots. Three typical topologies, i.e., serial mechanism, parallel mechanism, and hybrid mechanism are emphatically introduced. The features and performance behaviors of those robots, as determined by their mechanism topologies, are analyzed and discussed.

Introduction Day 1

Biography

Qinchuan Li is currently a professor at Zhejiang Sci-Tech University, China. He received his Ph.D. degree on mechanism design and theory from Yanshan University, China, in 2003. His research interests include mechanism theory and application of parallel robots. He received the financial support of the National Science Foundation for Distinguished Young Scholars. He served as an Associate Editor for IEEE Transactions on Robotics and other journals.



Qinchuan Li (李秦川)
Zhejiang Sci-Tech University

Plenary Speech 6 Given by Professor Jouni Mattila Tampere University, Finland

Exploring Advancements and Opportunities of Robotic Automation in Infra Construction

11:25–11:55, July 6th, 2023, Hangzhou

Abstract

Robotic technologies have a strong foothold in a variety of industrial fields, especially in their original intent use of manufacturing. However, the infrastructure construction domain, despite its significant market volume, lags behind in the adoption of robotics and digital technologies.

One of the emerging construction fields to be robotized are earth-moving excavators and front-end loaders. Interestingly, in Northern Europe especially, excavators are commonly equipped with non-spherical 2 DOF wrist attachment called roto-tilt that makes them structurally equivalent to 6 DOF robots. Moreover, the use of Building Information Model (BIM) workflows based on GNSS-RTK and MEMS instrumented excavators are becoming a mandatory requirement for all construction sites. The basic idea is that while a BIM-capable excavator carries out its assigned tasks, it also constructs and continuously updates an as-built-model of the site. Thus, excavators are becoming cloud connected 6DOF field robotic systems managed as part of construction site fleet for reducing the gap between factory automation and construction.

This talk gives an overview of the ongoing challenges in construction site automation, and of the control technology developed to automatize these complex field robotic systems originally made for human operator use. The talk presents a recent proof-of-concept study of a 6 DOF robotic excavator developed for railway maintenance tasks in Shift2Rail EU-project.

Biography

Jouni Mattila received the M.Sc. degree in 1995 and Dr. Tech. degree in 2000, both from TUT, Tampere, Finland. He was a Visiting Researcher at the University of British Columbia, Vancouver, BC, Canada, in years 1998 – 2000. As a Senior Systems Engineering Consultant, he has been involved in numerous industrial research projects with Tamlink Ltd., since 1996. He is currently a Professor in Machine Automation in Automation Technology and Mechanical Engineering Department, Tampere University. He has acted as Principal Investigator in numerous national (such as Academy of Finland, Business Finland) and international research projects funded by EU. During the last 15 years, he has been a Program Manager on global ITER fusion reactor maintenance projects involving research on teleoperated heavy-duty robotic manipulators. He has coordinated an EU-funded Marie Curie ITN-project with 15 Ph.D. students across the EU to develop mobile service robotics for scientific infrastructures, such as CERN. He has authored or co-authored more than 150 papers published in international journals and conference proceedings. His research interests include machine automation, developing nonlinear model-based control systems for robotic mobile manipulators and heavy-duty machinery, and advanced high-performance control systems for actuators. He was a Technical Editor of the IEEE/ASME Transactions of Mechatronics 2015–2020.



Jouni Mattila
Tampere University, Finland

Introduction Day 1

Plenary Speech 7 Given by Professor Guangzhong Yang (杨广中) Shanghai Jiao Tong University

Medical Robotics—the 5th Generation

8:30–9:00, July 7th, 2023, Hangzhou

Abstract

In recent years, the commercial success of surgical robots has inspired many new platforms from both commercial and research organisations, resulting in smaller, safer, and smarter systems. As the founding editor of *Science Robotics*, Professor Yang will look back through the past on how different generations of surgical robotics have evolved, and new opportunities and challenges ahead for developing the next generation (the 5th generation) surgical robots. With improved safety, efficacy and intelligence, the new generation surgical robots will have a greater focus on early intervention and quality of life after treatment, driving the future of precision surgery. The talk will elaborate some of the key technologies including vision, navigation, precision mechatronics, new material and fabrication schemes, as well as the associated clinical, regulatory, and economic challenges that need to be overcome.

Introduction Day 2

Biography

Professor Guang-Zhong Yang (CBE, FREng, FIEEE, FIET, FAIMBE, FIAMBE, FMICCAI, FCGI) is a chair professor and the founder of the Institute of Medical Robotics at Shanghai Jiao Tong University. He was the founder and director of the Hamlyn Centre for Robotic Surgery, Imperial College London, UK. Professor Yang's main research interests are in medical imaging, sensing and robotics. He is a Fellow of the Royal Academy of Engineering, fellow of IEEE, IET, AIMBE, IAMBE, MICCAI, CGI and a recipient of the Royal Society Research Merit Award and listed in *The Times Eureka 'Top 100' in British Science*. Professor Yang is the founding editor of *Science Robotics* (<http://robotics.sciencemag.org/>) – a journal of the Science family dedicated to the latest advances in robotics and how it enables or underpins new scientific discoveries. He was awarded a CBE in the Queen's 2017 New Year Honour for his contribution to biomedical engineering.



Yang (杨广中)
Shanghai Jiao Tong University

Plenary Speech 8 Given by Professor Li Zhang (张立) The Chinese University of Hong Kong

Magnetic Miniature Robots for Endoluminal Interventions

9:00–9:30, July 7th, 2023, Hangzhou

Abstract

Robotics at small scales has attracted considerable research attention both in its fundamental aspects and potential biomedical applications. As the characteristic dimensions of the robots or machines scaling down to the milli-/microscale or even smaller, they are ideally suited to navigating in tiny and tortuous lumens inside the human body which are hard-to-reach by regular medical devices. Although the materials, structural design, and functionalization of micro-/nanorobots have been studied extensively, several key challenges have not yet been adequately investigated for in vivo applications, such as adaptive locomotion in dynamic physiological environments, in vivo localization with clinical imaging modalities, the efficiency of therapeutic intervention, biosafety, and their autonomy for the intervention tasks.

In this talk, I will first present our recent research progress on the development of magnetic miniature robots, from individual, multiple agents to microswarms, for rapid endoluminal delivery. Then the key challenges and perspective of using magnetic miniature robots for targeted delivery and clinically relevant applications with a focus on endoluminal procedures will be discussed.

Biography

Li Zhang is a Professor in the Department of Mechanical and Automation Engineering and a Professor by Courtesy in the Department of Surgery at The Chinese University of Hong Kong (CUHK). He is also a director of the CUHK-SIAT Joint Laboratory of Robotics and Intelligent Systems. Dr. Zhang's main research interests include small-scale robotics and their applications for translational biomedicine. He has authored or co-authored over 300 publications, including Science Robotics and Nature Machine Intelligence. His research work on artificial bacterial flagella was indexed by the Guinness Book of World Records 2012 for the "Most Advanced Mini Robot for Medical Use." And his research work on magnetic slime robot at CUHK was selected as "Top 10 Innovation and Technology News in Hong Kong in 2022". Dr. Zhang has won several awards from IEEE international conferences, and he is a Distinguished Lecturer appointed by IEEE NTC in 2020 and 2021. He currently serves as Editor/Associate Editor/Editorial Board Member of ten international journals, including IEEE TRO, IEEE/ASME T-MECH, IEEE T-ASE, IEEE T-MRB, Advanced Intelligent Systems (Wiley), Biomicrofluidics (AIP), Research (SPJ-AAAS), and Med-X (Springer). Dr. Zhang is an Outstanding Fellow of the Faculty of Engineering at CUHK and elected as a Fellow of IEEE (FIEEE), Royal Society of Chemistry (FRSC), and Asia-Pacific Artificial Intelligence Association (FAAIA).



Li Zhang (张立)
The Chinese University of Hong Kong

Introduction Day 2

Plenary Speech 9 Given by Professor Caihua Xiong (熊蔡华) Huazhong University of Science and Technology

Research on Human Kinesiology and Reconstruction of the Missing Limb

9:30–10:00, July 7th, 2023, Hangzhou

Abstract

How to design an artificial limb so that its motion functions match the ones of the natural system, and forming a human-machine system, is still a challenging. This presentation introduces a methodology of designing human-machine integrated equipment according to the mechanisms of human limb movement. The mechanically replicating method of the human movement is explored with an example of designing a robot hand. The movement mechanisms, including the movement synergic characteristics and the kinesiology of the musculoskeletal system of the human upper extremity, are studied. A design method of an anthropomorphic hand, which endows the designed robotic hand with natural grasping functions, is developed. The experimental results show that the designed hand can replicate not only human grasping activities of daily living but also the natural grasping behaviors of the human hand. Some videos demonstrate the effectiveness of the proposed reconstruction principle of the missing limb.

Biography

Caihua Xiong received the Ph.D. degree in mechanical engineering from Huazhong University of Science and Technology (HUST), Wuhan, China, in 1998. From 1999 to 2003, he was with the City University of Hong Kong, Chinese University of Hong Kong, as a postdoctoral fellow, and Worcester Polytechnic Institute, Worcester, MA, USA, as a Research Scientist. He is the Chang Jiang Professor appointed by the Ministry of Education of China, and the owner of National Science Fund for Distinguished Young Scholars of China. Now he is the Dean of the Institute of Medical Equipment Science and Engineering in HUST. He has published more than 100 papers in some international journals such as *Int. J. of Robotics Research*, *IEEE Trans. on Robotics*, *Proceedings of the Royal Society B*, *J. of Theoretical Biology*, *IEEE/ASME Trans. on Mechatronics*, *IEEE Trans. on Cybernetics*, *IEEE Trans. on Automation Science and Engineering* and etc. He was authorized more than 30 invention patents related to rehabilitation robots and robotic prosthetic hands. His research interests include the natural movement in creatures and its mechanical replication principle, wearable robotics, and rehabilitation robotics.



Caihua Xiong (熊蔡华)
Huazhong University of
Science and Technology

Introduction Day 2

Plenary Speech 10 Given by Professor Jianda Han (韩建达) Nankai University

Active Modeling and Control for Soft Robots

10:15–10:45, July 7th, 2023, Hangzhou

Abstract

One of the major concerns in the field of soft robots is the difficulty of model-based control in handling the compliant and flexible structures. Despite the efforts to gradually reduce the dependence on models, control strategies built upon more precise model will consistently exhibit superior performance. In this presentation, the concept of active modeling technique will be introduced, while using the adaptive UKF or ESMF as the active estimator. Then I would like to discuss the active-model-based controller implemented on the self-developed flexible endoscopic robot and origami robot, to demonstrate its efficiency in rejecting 'unmodeled' uncertainties and achieving high tracking performance. Furthermore, this talk will also address the challenges and future directions in active modeling and relative control for soft robots.

Introduction Day 2

Biography

Jianda Han received his PhD on Electrical Engineering from Harbin Institute of Technology in 1998. Currently he is a distinguished professor of Nankai University and the director of Artificial Intelligent Techniques and Robotic Systems Department of Nankai Shenzhen Institute. His research interests include nonlinear estimation and control for the autonomy of robots, and robotic system integrations and applications, especially on surgery assistant and rehabilitation. At present he is developing the robotic system for minimally invasive spinal surgery and flexible endoscope operation.



Jianda Han (韩建达)
Nankai University

Plenary Speech 11 Given by Professor Shijie Guo (郭士杰) Hebei University of Technology

State of the Art and Future Trend of Nursing–Care Robots: From Single functional Devices to Multifunctional Robots

10:45–11:15, July 7th, 2023, Hangzhou

Abstract

Along with the acceleration of population aging, the expectation to nursing–care robots is increasing. The development of nursing–care robots has become a hot topic in the field of robotics. At the current state of the art, most nursing–care robots are single functional products, each robot can only accomplish a specific task, such as transfer, mobility assistance, meal assistance, bathing, diaper care and so on. This is because the current robotics technology is not yet sufficient to develop multifunctional robots with practical application significance. Even though the robots only have a single function, they are still suffering from poor operability, inadequate service and insufficient safety, making them "promising but cannot be sold". So, currently the practical choice is still to develop single functional robots that are convenient and effective for practical use. On the other hand, the decline in physical function of the elderly often manifests the loss of multiple living abilities. So, in the long run, development of multifunctional nursing–care robots is the trend. This report will first introduce the state of the art of the technologies and applications of single functional nursing–care robots. Then, it discusses the trends and core technologies involved in the development of multifunctional robots, and finally, presents the work of the speaker's team towards multifunction.

Introduction Day 2

Biography

Shijie Guo received his doctor degree in engineering from Tokyo Institute of Technology in 1992. He was selected as a distinguished expert by the National Talent Program (Long–term Innovation) in 2015. He is currently a professor at Hebei University of Technology and a part–time professor at Fudan University. He is the head of the Hebei Key Laboratory of Robot Perception and Human–Robot Interaction and the Director of the Engineering Research Center of the Ministry of Education for Intelligent Rehabilitation Devices and Detection Technologies. He also serves as the deputy director of the Academic Committee of Hebei University of Technology and editor–in–chief of Journal of Hebei University of Technology. His main social positions include Counselor of the Government of Hebei Province and member of the Tianjin Municipal Committee of the Chinese People's Political Consultative Conference. He has long been engaged in the research of key technologies and applications of human–interaction robots, including robotic e–skin, electroactive polymer artificial muscles, nursing–care robots, rehabilitation robots, exoskeleton robots, etc. The intelligent system of robot skin tactile sensing developed by his team was selected as the "Innovation China" pioneer technology by China Association for Science and Technology in 2020. The piggyback transfer robot developed by him won the Gold Medal at the 8th China Entrepreneurial Design & Innovation Competition of Elderly Welfare Equipment in 2021. In 2022, as the principal investigator, he won First Prize for Science and Technology Progress in Hebei Province.



Shijie Guo (郭士杰)
Hebei University of Technology

Plenary Speech 12 Given by Professor Ning Jiang (江宁) West China Hospital, Sichuan University

Bio-Robotics Research for Non-Invasive Myoelectric Neural-Interfaces for Prosthetic Control—a Ten-Year Perspective Review

11:15–11:45, July 7th, 2023, Hangzhou

Abstract

In the early 2010s, in a series of papers, academia and industry researchers came together and identified key challenges that prevented academic research in non-invasive neural interfaces from generating meaningful clinical impact in upper-limb prosthetics. Since then, the landscape of this research area has seen a momentous pivot to addressing these challenges. Here, we summarized the international research efforts focusing on these topics, including realizing more intuitive control schemes, implementing feedback for close-loop control, using sensor fusion to improve usability, and enhancing system robustness in real-world scenarios. We further delved into more recent methodological advances that only appeared in the last ten years, including motor unit decomposition for prosthetic control, deep learning algorithms, brain-computer interfaces, as well as the emergence of open-access databases for a more inclusive research community.

Biography

Dr. Ning Jiang, Ph.D., is a professor at the National Clinical Research Center for Geriatrics, West China Hospital Sichuan University. Dr. Jiang's research leverages signal processing methods and artificial intelligence algorithms for biological signals, such as Electroencephalogram (EEG) and Electromyography (EMG), for neurorehabilitation engineering applications. In particular, his research focuses on new human-machine interfacing (HMI) technologies, including brain-computer interfaces (BCI) and muscle-man-interfaces (MMI). His innovations have resulted in new, more effective upper limb prosthetic control technologies and accelerated rehabilitation of motor functions for patients suffering from disorders such as stroke. His research has also been applied more broadly to HMI for applications in kinesiology, neural plasticity (cortical and peripheral), ergonomics, and other related areas. These contributions have not only advanced the scientific knowledge of the field but have also achieved direct impacts on the biomedical industry.



Ning Jiang (江宁)
West China Hospital, Sichuan University

Introduction Day 2

Poster Schedule

14:00–17:45, July 6th–7th, 2023 (2F Corridor, 二楼走廊)

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[Air–Ground Robots' Cooperation–Based Mountain Glaciers Thickness Continuous Detection: Systems and Applications](#)
- 10 : Yuping Ning, Ruiqi Fan, Xian Guo
[Aircraft Control Based on Probabilistic Model and Rolling Optimization](#)
- 12 : Jinwei Liu, Wang Yao, Xiao Zhang
[An MFG Online Path Planning Algorithm Based on Upper and Lower Structure](#)
- 22 : Jingjing Xu, Long Tao, Zhifeng Liu, Qiang Cheng, Jianzhou Chen, Yanhong Cheng
[Obstacle–Avoidance State Characterization Models Based on Hybrid Geometric Descriptions for Mobile Manipulators](#)
- 26 : Yezheng Kang, Jianhuan Chen, Lingyu Kong, Hao Wang, Genliang Chen
[Kinematic and Static Analysis of Flexible Link Tensegrity Robots](#)
- 29 : Yujun Ji, Gangqiang Tang, Chun Zhao, Yifan Pan, Denglin Zhu, Yanjie Wang
[Study on Design and Performance of a Bionic Fish Driven by Four IPMC Fins](#)
- 30 : Zhihong Zhu, Kejian Wang, Xing Zhou, Qian Sun, Ran Ju, Meng Gao, Shifeng Huang
[Improved Notch Filter Method for Vibration Suppression of Flexible Joint Robots with Harmonic Reducers](#)
- 31 : Yujia Liao, Quan Liu, Jie Zuo, Wei Meng, Qingsong Ai
[Adaptive Assessment via Wearable Inertial Sensors Using Hybrid Dynamic Recurrent Fuzzy Neural Network](#)
- 35 : Mubang Xiao, Xiao Luo, Ye Ding
[Contact Force and Material Removal Simulation for a Virtual Robotic Polishing Platform](#)
- 36 : Wenxiong Wu, Jian Wu, Ziyang Shen, Lei Yin, Qikong Liu
[Research on an Embedded System of Cotton Field Patrol Robot based on AI Depth Camera](#)
- 44 : Weipeng Tang, Yan Pan, Haojie Xu, Yisu Ge
[Quantum Genetic Algorithm with Fuzzy Control Based on Clustering Analysis](#)

- 46 : Fang Li, Yujie Huang, Jiaqi Sun, Xiaodong Zhao, Yingchao He
[A High–Temperature Resistant Robot for Fixed–Point Firefighting](#)
- 49 : Tianyu Zhang, Hongguang Wang, Peng Lv, Fanxu Kong, Daqian Wang, Xin'an Pan
[Optimization–Based Motion Planning Method for a Robot Manipulator under the Conditions of Confined Space and Heavy Load](#)
- 52 : Hailong Zhang, Ran Shi, Kaiwen Cheng, Yunjiang Lou, Zezheng Qi, Shibing Hao, Qianqian Zhang, Danyang Bao
[Design and Research of a Snake–Like Robot Based on Orthogonal Joint and Wheel Modules](#)
- 53 : Pengyu Zhao, Yukang Mu, Siyuan Chen, Menglong Ding, Lan Zhang, Bingshan Jiang, Lingyu Kong, Anhuan Xie
[Walking Stability Analysis of Biped Robot Based on Actuator Response Characteristics](#)
- 54 : Zhijie Hua, Haobin Ruan, Dawei Tu, Xu Zhang, Kaiwei Zhang
[Research on Motion Control of Underwater Robot Based on Improved Active Disturbance Rejection Control](#)
- 55 : Jinwei Guo, Jianliang He, Guoxing Zhang
[A Single–DOF Quadrilateral Pyramid Deployable Unit and Its Networking Mechanism](#)
- 56 : Mengjie Qin, Rong Yang, Minhong Wan, Chunlong Zhang, Te Li
[Accelerated Unfolding Network for Medical Image Reconstruction with Efficient Information Flow](#)
- 59 : Huiru Duan, Shenglong Xie, Zijing Liu, Yanjian Wan
[Research on Fuzzy Iterative Learning Control of Pneumatic Artificial Muscle](#)
- 60 : Xuewen Wang, Yang Yu, Zhenbang Xu, Yu Zhang
[Performance Analysis and Configuration Optimization of a Hexapod Platform with Flexure Hinges](#)
- 61 : Chenyu Li, Cong Zhang, Lun Shi, Renlei Zheng, Qiongxia Shen
[Hard Disk Posture Recognition and Grasping Based on Depth Vision](#)
- 66 : Yongzun Yang, Zhiyuan Feng, Cheng Jin, Lingqi Tang, Songsong Ma, Yao Li
[A Locust–Inspired Energy Storage Joint for Variable Jumping Trajectory Control](#)
- 68 : Xuewen Zhu
[Safety Control Strategy of Autonomous Underwater Vehicle Based on Two–Person Zero–Sum Game Theory](#)
- 72 : Xin Liu, Jianfeng Lin, Dongjin Li, Chenkun Qi, Feng Gao
[Multi–Input Multi–Output Sliding Mode Control with High Precision and Robustness for a 6–PSU Parallel Robot](#)
- 81 : Ji Liang, Shuo Yan, Guangbin Sun, Ge Yu, Lili Guo
[Robot Trajectory Optimization with Reinforcement Learning Based on Local Dynamic Fitting](#)

- 83 : Weilong Zuo, Junyao Gao, Jingwei Cao, Tian Mu, Yuanzhen Bi
[Structure Design and Fall Trajectory Planning of an Electrically Driven Humanoid Robot](#)
- 84 : Zelin Wang, Limin Yang, Xu Liu, Tenghui Wang, Feng Gao
[HexGuide: A Hexapod Robot for Autonomous Blind Guidance in Challenging Environments](#)
- 88 : Yunpeng Yin, Feng Gao, Yuguang Xiao, Limin Yang, Zehua Fan
[Force-Sensing Based Interaction of Legged Robots through Whole-Body Dynamics](#)
- 92 : Can Qiu, Yu Wang, Jiabin Wu, Xiaoyu He, Xuejian Ma, Yundou Xu, Yongsheng Zhao
[Kinematics Analysis of a New Parallel Mechanism with Complete Separation of Constraints and Drives](#)
- 96 : Gong Cheng, Yanjiang Huang, Xianmin Zhang
[A Method for Identifying Knee Joint Stiffness During Human Standing](#)
- 97 : Yin Chen, Genliang Chen, Yuchen Chai, Hao Wang, Lingyu Kong
[Design of a Force-Controlled End-Effector with Slender Flexible Beams](#)
- 98 : Yifan Tang, Jiayi Wang, Peiji Chen, Wenyang Li, Haokang Xu, Shunta Togo, Hiroshi Yokoi, Yinlai Jiang
[A Strain Gauge Based FMG Sensor for sEMG-FMG Dual Modal Measurement of Muscle Activity Associated with Hand Gestures](#)
- 101 : Daming Nie, Anhuan Xie, Yu Zhang, Jason Gu
[Lightweight Design and Property Analysis of Humanoid Robot Thigh Integrated Structure with Appearance](#)
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- 106 : Jianing Li, Bowen Chen, Zhiyong Wang, Honghai Liu
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- 564 : Hui Chang, Ruikai Cao, Yixuan Sheng, Zhiyong Wang, Pu Wang, Rong Xin, Xianxian Yu, Honghai Liu
Post-Stroke Motor Function Assessment Based on Brain-Muscle Coupling Analysis

About Hangzhou (杭州)

The conference will be held in Hangzhou. Hangzhou is one of the seven ancient capitals of China. When Marco Polo came to Hangzhou in the 13th century, he declared it “the most beautiful and elegant city in the world”. With the picturesque scenery of the West Lake located right in the heart of the city, which is also a UNESCO’s World



Heritage site, Hangzhou has always been the most attractive tourist city in China. Here, G20 was successfully held at 2016 and the Asian Games will be held at 2023.



Climate

Hangzhou has a subtropical monsoon climate, with distinct four seasons. The summer is hot and humid, while the winter is cold and moist. The spring and autumn seasons are mild and pleasant. Rainfall is abundant, particularly during the plum rain season in June and July.

Climate data for Hangzhou (1981–2010 normals, extremes 1951–present)													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Record high °C (°F)	25.4 (77.7)	28.5 (83.3)	32.8 (91.0)	34.8 (94.6)	37.6 (99.7)	39.7 (103.5)	41.3 (106.3)	41.6 (106.9)	38.7 (101.7)	35.0 (95.0)	31.2 (88.2)	26.5 (79.7)	41.6 (106.9)
Mean maximum °C (°F)	17.4 (63.3)	21.3 (70.3)	25.7 (78.3)	30.6 (87.1)	33.8 (92.8)	35.3 (95.5)	37.9 (100.2)	37.3 (99.1)	34.4 (93.9)	30.3 (86.5)	25.1 (77.2)	19.5 (67.1)	38.2 (100.8)
Average high °C (°F)	8.3 (46.9)	10.3 (50.5)	14.8 (58.6)	21.1 (70.0)	26.3 (79.3)	29.1 (84.4)	33.6 (92.5)	32.8 (91.0)	28.2 (82.8)	23.2 (73.8)	17.3 (63.1)	11.3 (52.3)	21.4 (70.4)
Daily mean °C (°F)	4.6 (40.3)	6.4 (43.5)	10.3 (50.5)	16.2 (61.2)	21.4 (70.5)	24.7 (76.5)	28.9 (84.0)	28.2 (82.8)	24.0 (75.2)	18.8 (65.8)	12.9 (55.2)	7.0 (44.6)	17.0 (62.5)
Average low °C (°F)	1.8 (35.2)	3.5 (38.3)	7.0 (44.6)	12.4 (54.3)	17.5 (63.5)	21.4 (70.5)	25.2 (77.4)	24.9 (76.8)	20.9 (69.6)	15.4 (59.7)	9.3 (48.7)	3.7 (38.7)	13.6 (56.4)
Mean minimum °C (°F)	-3.9 (25.0)	-2.3 (27.9)	0.8 (33.4)	5.8 (42.4)	12.1 (53.8)	16.9 (62.4)	21.5 (70.7)	21.4 (70.5)	16.0 (60.8)	9.0 (48.2)	2.5 (36.5)	-2.8 (27.0)	-4.6 (23.7)
Record low °C (°F)	-8.6 (16.5)	-9.6 (14.7)	-3.5 (25.7)	0.2 (32.4)	7.3 (45.1)	12.8 (55.0)	17.3 (63.1)	18.2 (64.8)	12.0 (53.6)	1.0 (33.8)	-3.6 (25.5)	-8.4 (16.9)	-9.6 (14.7)
Average precipitation mm (inches)	79.8 (3.14)	86.1 (3.39)	143.7 (5.66)	122.5 (4.82)	128.2 (5.05)	211.8 (8.34)	180.3 (7.10)	156.1 (6.15)	130.1 (5.12)	78.6 (3.09)	72.3 (2.85)	48.6 (1.91)	1,438.1 (56.62)
Average precipitation days (≥ 0.1 mm)	12.4	12.1	15.3	14.5	13.8	14.6	12.4	13.8	11.7	9.0	9.3	8.5	147.4
Average relative humidity (%)	75	75	75	74	74	80	76	78	79	76	74	72	76
Mean monthly sunshine hours	102.0	97.2	116.4	140.6	164.7	136.6	212.7	193.0	143.9	144.6	129.0	128.7	1,709.4

Electricity Standard

The standard electrical supply in China is 220Volts at 50Hz. Conference attendees from foreign countries may demand a transformer for the appliance or electrical device.

Attractions

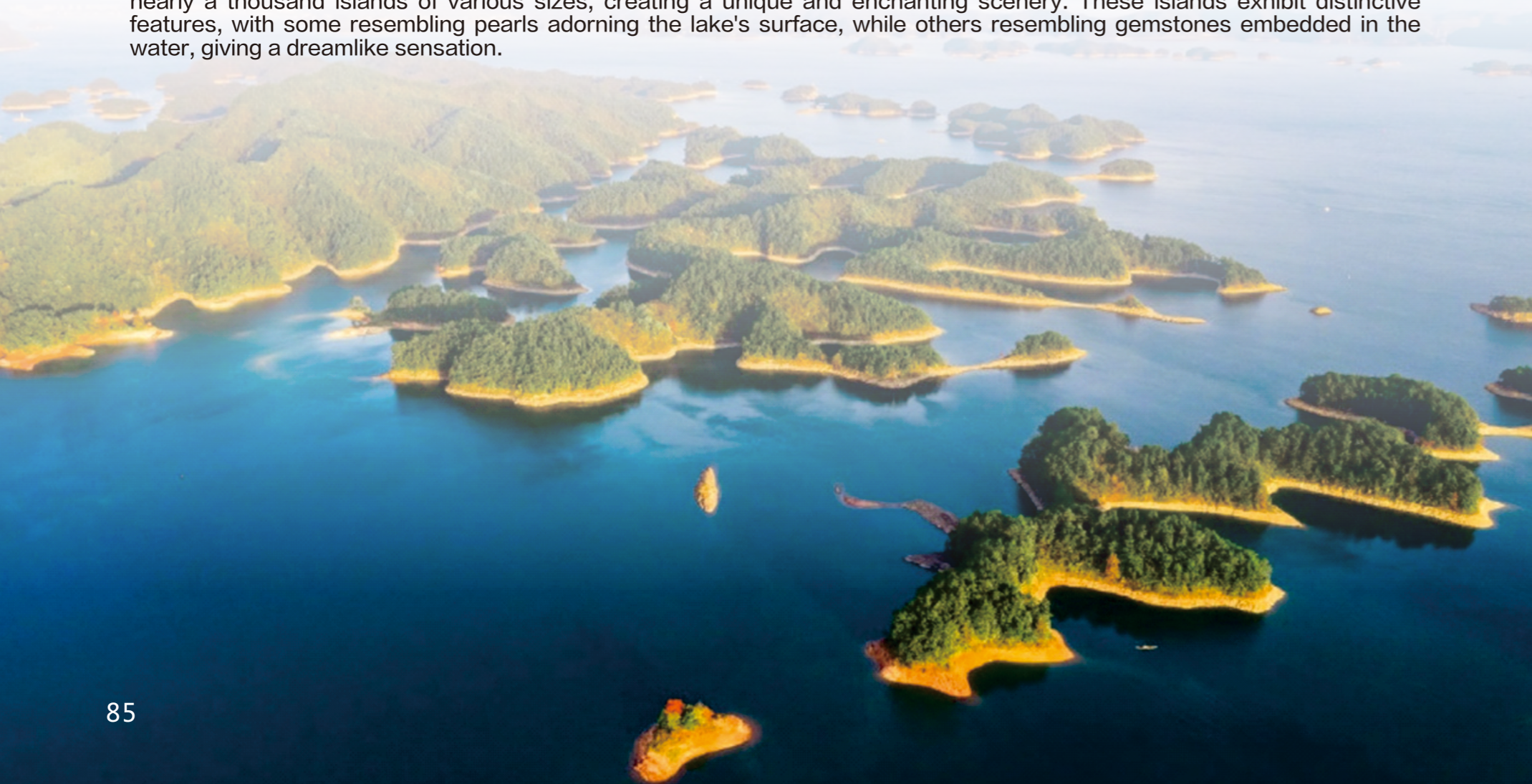
West Lake (西湖)

West Lake in Hangzhou, Zhejiang Province, China, is a renowned scenic spot and one of the most beautiful lakes in China. With its clear waters, lush trees, and ancient architecture, it presents a picturesque landscape. As a UNESCO World Heritage site, West Lake features prominent attractions such as the Broken Bridge, Sudi Causeway, Bai Causeway, and Leifeng Pagoda. Visitors can enjoy boat rides on the lake or leisurely strolls along its shores. West Lake also possesses rich historical and cultural significance, attracting numerous literati who have left behind remarkable literary works.



Qiandao Lake (千岛湖)

Qiandao Lake is located in Chun'an County, southwestern part of Hangzhou. It is one of the largest artificial lakes in China. Renowned for its beautiful lake, picturesque landscapes, and rich historical and cultural heritage, Qiandao Lake boasts nearly a thousand islands of various sizes, creating a unique and enchanting scenery. These islands exhibit distinctive features, with some resembling pearls adorning the lake's surface, while others resembling gemstones embedded in the water, giving a dreamlike sensation.

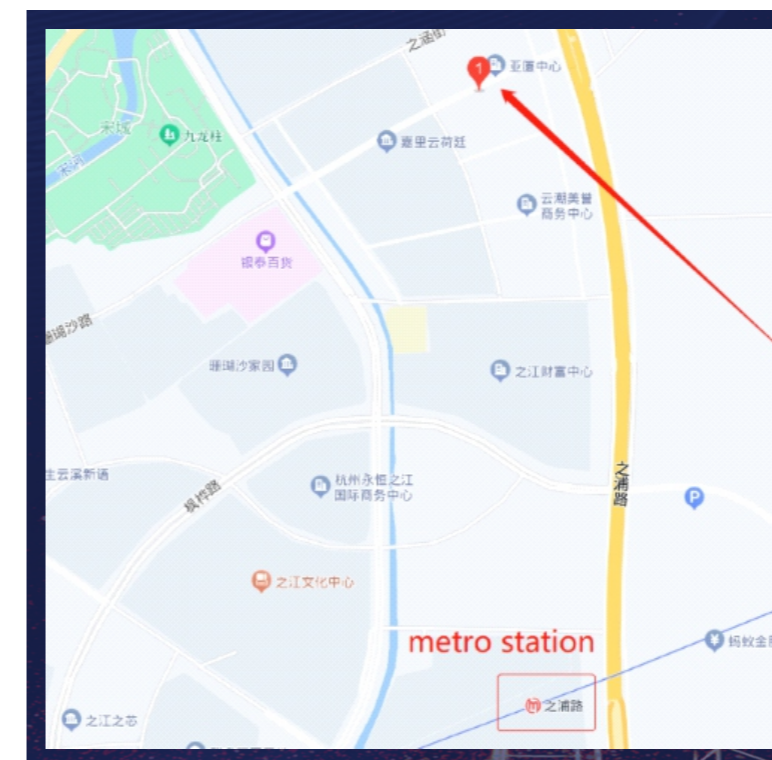


Accommodation and Conference Venue

Hangzhou Platinum Hanjue Hotel (杭州白金汉爵大酒店)

Address: No.9 East Shanhusha Road, Xihu District, Hangzhou, Zhejiang Province, China

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SMART ROBOTICS FOR SUSTAINABLE SOCIETY