

IWACIII2025

The 9th International Workshop on Advanced
Computational Intelligence and Intelligent Information
*Bilateral Conference and Annual Conference of
Beijing Association of Automation*
Oct. 28-30, 2025, Beijing, China

PROGRAMME

Sponsors



Organizers



Co-organizers



国际计算智能学会
International Association for Computational
Intelligence

Official Website: <https://iwaciii.bit.edu.cn>

Chinese Website: <https://conferences.koushare.com/iwaciii2025>

Welcome to IWACIII 2025

The 9th International Workshop on Advanced Computational Intelligence and Intelligent Information Bilateral Conference and Annual Conference of Beijing Association of Automation will be held from Oct. 28 to 30, 2025 in Beijing, China. On behalf of the organizing committee of IWACIII, we would like to express our warmest welcome to the all participants.

During the past years, supported by the researchers and scientists all over the world, IWACIII has been actively developing their domestic and international scientific and technical exchanges, which is influential and considerable especially in the Asia area.

With the support and concerted efforts of many parties, we are pleased to organize the IWACIII 2025 bilateral meetings this year in Beijing, and the IWACIII 2025 will be extended to Zhuhai from Oct. 31 to Nov. 4, which has become one impactful conference. It is time for us to get together at IWACIII 2025. With the great support of many researchers and scholars, and Springer, the world-leading academic publisher, IWACIII 2025 continuously contributes to the development of advanced computational intelligence and information technology as well as their various applications. It has no suspicion that the exchanges about Computational Intelligence, Information Technology, and their applications are quite favorable not only for the Universities but also for the close relationship between Industry and Academy.

Dear Friends, IWACIII 2025 closely relies on your support, while the development of Computational Intelligence also ties up our participation. IWACIII 2025 is an important occasion that could give a general comment of the recent years' global science and technology, and we can also expect to see that IWACIII 2025 will indicate us the future development directions. May we join together to contribute more to develop Computational Intelligence, Information Technology and their applications, to advance both the theory and application for endeavor to create the brilliant future.

Thanks again for your attendance to IWACIII 2025.

From



Kaoru Hirota
Founding Chair



Xiaoyan Zhao
Organized



Takenori Obo
Session



Kewei Chen



Fangyan Dong
Chairs



Yuan Xu
Publication Chair



Yaping Dai
Local Affairs



Rongli Li
Secretary

and all other organizing committee members.

Greetings from Beijing Association of Automation



Qunxiong Zhu



Yuan Xu

On behalf of Beijing Association of Automation, we are pleased to organize the 9th International Workshop on Advanced Computational Intelligence and Intelligent Informatics (IWACIII 2025) Bilateral Conference and Annual Conference of Beijing Association of Automation with Beijing Institute of Technology. We need to express our sincere welcome to all attendees of IWACIII 2025 and we hope our collaboration can make you enjoy a pleasant trip to Beijing.

First of all, we would like to express our sincere gratitude to everyone who made contributions and various support to this workshop, especially the team of BIT who has done hard work which makes this great event possible. We would provide our continuous support with the growth of this event as well as the growth of our association.

As a sponsor of this great event, we would also like to thank all parties. Your support to this workshop adds the value of this workshop and help to promote this event as a platform for academic exchange.

Besides, we would also like to give our special thanks to Springer Press, which helps to improve the impact of our workshop. And sincere thanks to Fuji Technology Press for their continuous great support to our past conferences.

And we welcome the members of Beijing Association of Automation, for your attendance and continuous support to this workshop.

We hope that this workshop will be successful and fruitful with all your great efforts and time.

Thank you again for your cooperation and participation for IWACIII 2025 Bilateral Conference and Annual Conference of Beijing Association of Automation.

Greetings from International Association for Computational Intelligence



Kaoru Hirota



Yaping Dai

The International Association for Computational Intelligence takes great pleasure in extending our warmest congratulations on the convening of the 9th International Workshop on Advanced Computational Intelligence and Intelligent Informatics (IWACIII 2025). As a professional international organization in the field of computational intelligence, we have consistently recognized and supported this high-quality platform for disciplinary innovation and collaboration.

This year's workshop, with its focus on intelligent computing, informatics, and interdisciplinary frontiers, strongly aligns with our mission to advance intelligent technologies globally. We commend the organizing committee for their outstanding efforts in fostering industry-academia-research integration and nurturing young scholars. We are confident that participants will benefit greatly from the keynote speeches, technical discussions, and roadshow presentations.

We wish the workshop a complete success and look forward to the in-depth exchanges among experts and scholars, which will collectively propel computational intelligence toward more open, integrated, and impactful development.

Greetings from Beijing Institute of Technology



Fang Deng



Duanduan Chen



Jian Sun

As the proud host of the 9th International Workshop on Advanced Computational Intelligence and Intelligent Informatics (IWACIII 2025), Beijing Institute of Technology extends a warm welcome to all participants, speakers, and distinguished guests.

Our university has long been committed to advancing research and innovation in computational intelligence and related fields. Hosting this prestigious event provides a valuable platform for scholars and practitioners worldwide to exchange ideas, share cutting-edge research results, and foster collaborations that will shape the future of intelligent informatics.

We extend our sincere appreciation to the organizing committees, technical program committees, and all partners who have contributed to making this event possible. We are confident that IWACIII 2025 will inspire meaningful discussions, create new networking opportunities, and stimulate further breakthroughs in our field.

BIT looks forward to providing a stimulating environment for productive dialogue and looks forward to welcoming you all to this exciting gathering of minds.

Greetings from General Chairs



Hongbin Ma



Shinichi Yoshida



Xingguang Duan

We would like to thank the honorary chair, Prof. Kaoru Hirota, for his continuous great support of BIT to organize the workshop. On behalf of the Beijing Institute of Technology, Beijing Association of Automation, and International Association for Computational Intelligence, it is our great pleasure to welcome you to the 9th International Workshop on Advanced Computational Intelligence and Intelligent Informatics (IWACIII 2025) Bilateral Conference and Annual Conference of Beijing Association of Automation, which will be held from Oct. 28 to 30, 2025 in Beijing, China.

The highlights of the conference include 6 keynotes by oversea top-notch researchers – Yang Shi, Kang-Zhi Liu, Jinhua She, Minyi Huang, Jun Liu, and Yaodong Pan; 4 keynotes by Chinese top-notch researchers – Zhaohui Zhang, Long Cheng, Zhongjing Ma, and Yang Zhang. And we also invite Professor Han Liquan, who is our reputable alumna and leading expert in artificial intelligence.

Apart from the technical programs, participants are also cordially invited to attend various social events, such as welcome reception, banquet, round table discussion, etc. As the workshop will be held in late October, the weather in the duration will be very nice and you can enjoy beautiful scenes of Beijing comfortably.

We sincerely thank all keynote speakers, members of the organizing committee, and volunteers for your great support of IWACIII 2025 Bilateral Conference and Annual Conference of Beijing Association of Automation. Wish every participant enjoy a lot from IWACIII 2025 Bilateral Conference and Annual Conference of Beijing Association of Automation.

Greetings from Advisory Board



Fuchun Sun



Weidong Hu



Toshio Fukuda



Naoyuki Kubota

The great success of IWACIII has been witnessed by the previous eight times of successful holding. IWACIII provides a very good opportunity to exchange ideas among researchers and scholars who are dedicated to computational intelligence, intelligent informatics and their applications. They are getting more and more influential and considerable especially in the Asia area.

We believe that this time, the 9th IWACIII, with the great effort of the organizing committee and the contribution of all authors and presenters, would be an excellent occasion for exchanging academic ideas and developing and promoting friendships. Thank you for your contribution to IWACIII 2025. We hope that IWACIII 2025 would be a wonderful memory to you.

Greetings from Program Committee Chairs



Bin Xin



Jinhua She

On behalf of the program committee of the 9th International Workshop on Advanced Computational Intelligence and Intelligent Informatics (IWACIII 2025), we would like to express our gratitude to all those who submitted research papers and to volunteer reviewers who took on hard reviewing work for the workshop. Undoubtedly, their great efforts and contributions are critical for the success of the workshop.

We received full submissions from over 110 research institutions. Each submitted paper has been reviewed by at least two reviewers in terms of originality, importance, presentation, English usage, and overall quality. According to suggestions of Springer, the program committee has finally accepted 226 papers from 393 submissions. The Springer press will be in charge of later work of EI indexing. The technical program includes 42 sessions, which are arranged in Zhuhai from Nov. 1 to 3, that cover a broad range of topics related to computational intelligence and intelligent informatics.

We hope that the workshop will provide a great opportunity for exchanging research activities and fostering research collaboration in the future.

Thank you again for your cooperation and participation for IWACIII 2025 Bilateral Conference and Annual Conference of Beijing Association of Automation.

Organizing Committee

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Meiling Wang (BITZH, China)

Liqun Han (CSEDS, BTBU, China)

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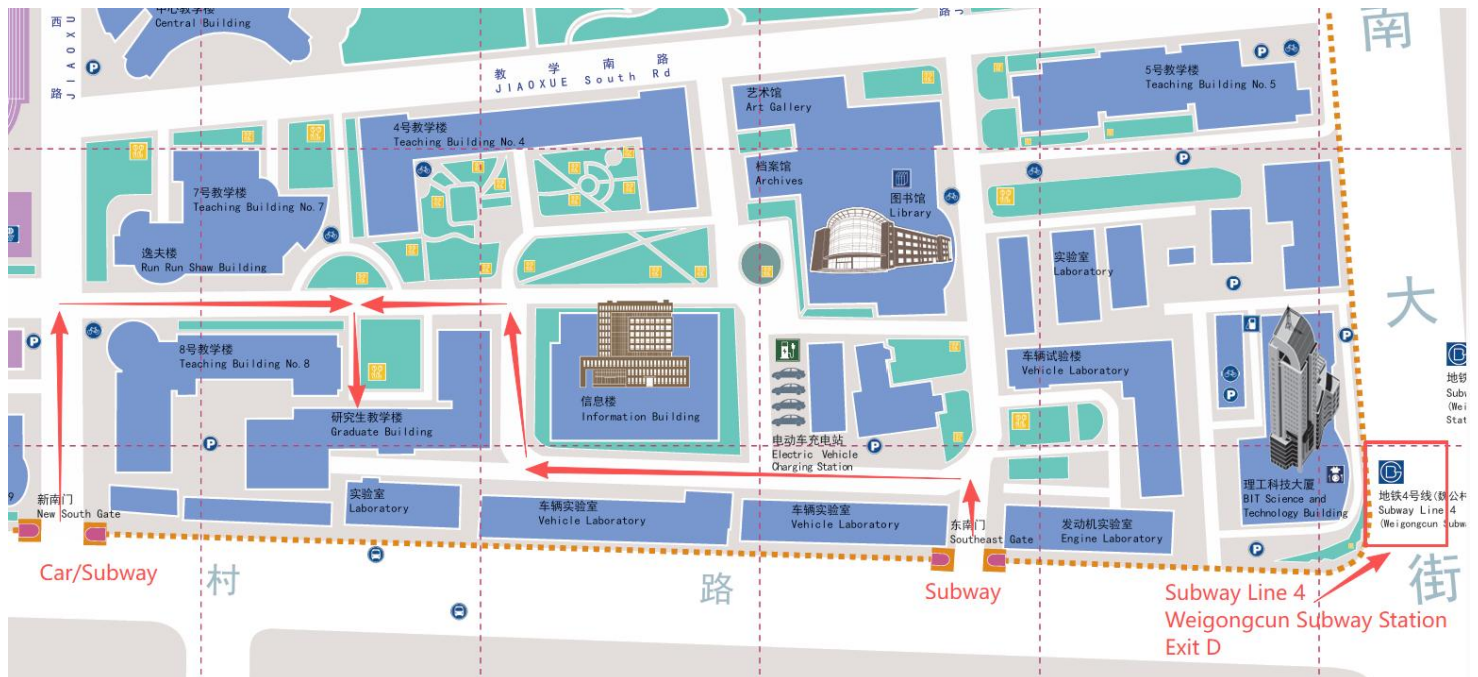
Conference Venue

Dear IWACIII 2025 Participants:

First of all, thank you very much for your contribution to IWACIII 2025. For the convenience of some keynote speakers, IWACIII 2025 Bilateral Conference and Annual Conference of Beijing Association of Automation will be held in hybrid form, i.e. online (mainly by Zoom) and offline at Beijing Institute of Technology (Room 101, Graduate Building) in Beijing during Oct. 28–30. The details are posted on the official website of this workshop (<https://iwaciii.bit.edu.cn/> or <https://conferences.koushare.com/iwaciii2025>), please pay close attention.

IWACIII 2025 Organizing Committee

Route



Program at a glance

Oct. 28	Registration	Room 101, Graduate Building, Beijing Institute of Technology (Zhongguancun Campus)
Oct. 29	Day 1	Room 101, Graduate Building, Beijing Institute of Technology (Zhongguancun Campus)
08:30 – 09:00	Opening Ceremony	Chair: Hongbin Ma
09:00 – 09:40	Keynote Speech 1: Compensation for periodic disturbances beyond control bandwidth: A phase-compensated machine learning approach	Chair: Liquan Han
09:40 – 10:20	Keynote Speech 2: Mean field games and their large network limits	Chair: Liquan Han
10:20 – 10:30	Tea Break	
10:30 – 11:10	Keynote Speech 3: Physics-Informed Neural Network Lyapunov Functions	Chair: Yuan Xu
11:10 – 11:50	Keynote Speech 4: Design of a Lobster Tail-Inspired Soft Robot for Rapid Traction	Chair: Yuan Xu
11:50 – 13:30	Launch	
13:30 – 14:10	Keynote Speech 5: Design of Cabin Temperature Control Systems	Chair: Hongbin Ma
14:10 – 14:50	Keynote Speech 6: A methodology for improving tracking precision in servo systems: The equivalent-input-disturbance approach	Chair: Hongbin Ma
14:50 – 15:00	Tea Break	
15:00 – 15:40	Keynote Speech 7: Magnetic Quantum Detection Technology of Near-Earth Targets	Chair: Bin Xin
15:40 – 16:20	Keynote Speech 8: Research on Design and Control Decision-Making of Bionic Robotic Fish Systems	Chair: Bin Xin
16:20 – 17:00	Keynote Speech 9: Collaborative Modeling and Application Practice of Intelligent Agents in the Energy Domain	Chair: Bin Xin
17:00 – 17:20	Parallel Discussion	Chair: Hongbin Ma
17:20 – 17:30	Closing Session: Liquan Han	Chair: Hongbin Ma
Oct. 30	Roundtable Discussion	

Conference Chair

29 October



Liqun Han (AETDEW/IAIS/AAET/CAAI Fellow)

Liqun Han is a professor and Ph.D. Supervisor at Beijing Technology and Business University, a former dean of the School of Information Engineering, and a visiting professor at University of Science and Technology Beijing, Beijing University of Posts and Telecommunications, and Army Armored Force Academy.

She has long been engaged in teaching and scientific research in the field of artificial intelligence. Focusing on technical challenges in industries such as industry, aerospace, transportation, and agriculture, he has completed a number of key scientific and technological research projects. She has published over 150 academic papers, many of which have been indexed by renowned international academic databases; published 27 academic works and teaching materials of various types; presided over and participated in more than 40 scientific research and teaching research projects; obtained 8 national invention patents; and won 1 Wu Wenjun Artificial Intelligence Science and Technology Award (Second Class).

She holds the following academic positions: Vice President of the 5th/6th Councils of the Chinese Association for Artificial Intelligence (CAAI); Honorary Director of the Intelligent Products and Industry Working Committee; Vice Chairman of the Robotics Working Committee of the National School Sports Federation under the Ministry of Education; Standing Director of the Chinese Society of Educational Development Strategy; and Honorary Chairman of the Professional Committee on Artificial Intelligence and Robotics Education.

She is also a Fellow of the Academy of Engineering and Technology for the Developing World (AETDEW), a Fellow of the International Academy of Information and Systems (IAIS), a Foreign Fellow of the ASEAN Academy of Engineering and Technology (AAET), and one of the first batch of Fellows of the Chinese Association for Artificial Intelligence (CAAI).



Bin Xin

Xin Bin is a professor and doctoral supervisor at the School of Automation, Beijing Institute of Technology. He has long been engaged in research on collaborative decision-making and control theories for multi-agent systems, having published over 100 academic papers and authored five monographs. He was awarded the National Natural Science Foundation of China (NSFC) Distinguished Young Scholar Fund in 2024 and has received two provincial/ministerial-level first prizes.

He serves as an associate editor or editorial board member for journals such as Unmanned Systems. Over the years, he has taught courses including "Fundamentals of Intelligent Control," "Multi-Agent Collaboration and Control," and "Frontiers in Artificial Intelligence." Under his guidance, students have won more than 10 national/municipal-level academic competition awards, three graduates have been recognized as Outstanding Graduates by the Beijing Association of Automation, and eight papers have received Best Paper Awards at international academic conferences. Notably, his doctoral student Li Ruocheng was honored with the 2024 "Guan Zhao-Zhi Award," the highest academic award for young scholars presented by the Chinese Association of Automation's Technical Committee on Control Theory.



Hongbin Ma

Hongbin Ma has been a Professor at the School of Automation, Beijing Institute of Technology since he joined Beijing Institute of Technology in 2009. He received his bachelor degree from Zhengzhou University in 2001 and doctoral degree from the Academy of Mathematics and Systems Science, Chinese Academy of Sciences in 2006. He joined Bell Labs Research Center at Beijing in March of 2006 and later joined Temasek Laboratories, National University of Singapore in August 2006 as a Research Scientist.

His research focuses on adaptation, learning and recognition, especially adaptive estimation and control, as well as their applications in robots, smart cars, and UAVs. He is also a senior member of IEEE and Automation Society of China. Dr. Ma is the principle investigator of several scientific projects supported by National Natural Science Foundation (NSFC), the programme of New Century Excellent Talents in University by Ministry of Education, the programme of Beijing Outstanding Talents Project, and so on. He also won several awards, such as Beijing Natural Science Award, Wu Wenjun Artificial Intelligence Award, Outstanding Research Work Award, etc. Dr. Ma has published more than 100 academic papers in reputable journals or conferences. And under his supervision, a dozen of students have performed well in scientific research, innovation contests, and are establishing themselves.

Invited Keynotes

29 October

Talk: Compensation for periodic disturbances beyond control bandwidth: A phase-compensated machine learning approach

Time: 9:00-9:40

Invited Speaker: Kang-Zhi Liu



Abstract

Control of periodic disturbances is a classic, long-lasting issue in control engineering. Up to date, the fundamental principle for this issue is the celebrated internal model principle. However, the phase-lag inherent in internal model hinders the enhancement of control bandwidth, making it extremely involved and difficult to strike a balance in control design. This issue is even more severe in the face of model uncertainty. There is a consensus that it is impossible to cancel a periodic disturbance when its frequency is higher than the system bandwidth. But in reality, such as power electronics and high-speed trains, there is a quite high need to suppress disturbances beyond bandwidth.

This talk will outline the recent advances in this direction made by the authors. The key is to introduce a phase-lead compensation mechanism into the machine learning algorithm. This algorithm is extremely robust to model uncertainty and its design is almost independent of the feedback loop. Applications to high-speed trains and inverters will also be touched on.

Biography

Kang-Zhi Liu graduated from Northwestern Polytechnical University in 1984 and obtained a Ph.D. from Chiba University in 1991. Since then, he joined Chiba University and is now a full professor at the Department of Electrical and Electronic Engineering. His research interests include robust control, machine learning and their applications to industrial systems. Dr. Liu was awarded four academic awards by SICE and is a Fellow of SICE.

Talk: Mean field games and their large network limits

Time: 9:40-10:20

Invited Speaker: Minyi Huang



Abstract

Mean field game (MFG) theory provides a powerful tool to tackle large-population non-cooperative dynamic games, and has found applications in many areas including economics and finance, engineering, and public health.

This talk describes how to extend MFG theory to models with subpopulations distributed over large scale networks, addressing a new form of agent heterogeneity. The dense case can be treated using graphon networks. For the sparse case, we apply appropriate scaling to obtain a meaningful limit, allowing to capture influence of neighboring subpopulations in the large sparse network limit.

Based on joint work with Prof Peter Caines and Dr Tian Chen.

Biography

Minyi Huang received the B.Sc. degree from Shandong University, Jinan, Shandong, China, in 1995, the M.Sc. degree from the Institute of Systems Science, Chinese Academy of Sciences, Beijing, in 1998, and the Ph.D. degree from the Department of Electrical and Computer Engineering, McGill University, Montreal, QC, Canada, in 2003, all in systems and control. He was a Research Fellow first at the University of Melbourne, Australia, from February 2004 to March 2006, and then at the Australian National University, Canberra, from April 2006 to June 2007. He joined the School of Mathematics and Statistics, Carleton University, Ottawa, ON, Canada in 2007, where he is now a Professor. His research interests include mean field stochastic control and dynamic games, multi-agent control and computation in distributed networks with applications. He is a Fellow of IEEE and a member of SIAM.

Talk: Physics-Informed Neural Network Lyapunov Functions

Time: 10:30-11:10

Invited Speaker: Jun Liu



Abstract

One of the longstanding challenges in systems and control is the effective construction of Lyapunov functions for formal system analysis and control. In this talk, we discuss a machine learning framework for learning Lyapunov certificates to address stability and safety problems in systems and control using physics-informed neural networks. Specifically, we obtain neural Lyapunov functions by solving characteristic partial differential equations (PDEs) for these problems with neural networks and derive sufficient conditions for the efficient verification of the learned certificates using satisfiability modulo theories (SMT) solvers. We address approximation error bounds, convergence guarantees of neural approximations, and the formal correctness of neural Lyapunov certificates. The framework is illustrated with examples from nonlinear systems and control, ranging from low- to high-dimensional systems, and shown to outperform traditional sum-of-squares (SOS) approaches in semidefinite programming.

Biography

Jun Liu is a Professor of Applied Mathematics and a Canada Research Chair at the University of Waterloo, where he directs the Hybrid Systems Lab. He received his B.S. in Applied Mathematics from Shanghai Jiao-Tong University, M.S. in Mathematics from Peking University, and Ph.D. in Applied Mathematics from the University of Waterloo. After a Postdoctoral Fellowship at Caltech, he was a Lecturer at the University of Sheffield before joining Waterloo in 2015. His research focuses on hybrid systems, control theory, optimization, and machine learning, with applications in robotics and cyber-physical systems. He has received a Marie-Curie Career Integration Grant, a Canada Research Chair (2017–2027), an Ontario Early Researcher Award, and the CAIMS/PIMS Early Career Award. His best paper awards include the Zhang Si-Ying Outstanding Youth Paper Award, the IFAC Nonlinear Analysis: Hybrid Systems (NAHS) Paper Prize, and the Oded Maler Prize (FORMATS Best Paper). Dr. Liu is a senior member of IEEE, a member of SIAM, and a lifetime member of CAIMS, and has served on editorial boards and program committees of several journals and conferences in control and systems theory.

Talk: Design of a Lobster Tail-Inspired Soft Robot for Rapid Traction

Time: 11:10-11:50

Invited Speaker: Long Cheng



Abstract

This study primarily focuses on developing a lobster tail-inspired soft actuator with high output force. Based on this actuator, a soft hand rapid traction robot that meets the personalized needs of hand spasticity is further developed, providing a new technical means for spasticity relief. Meanwhile, the study explores the variation patterns of sensorimotor cortex activity in healthy individuals and patients with hand spasticity under the action of different traction parameters. Additionally, a clinical experimental protocol for hand rapid traction is formulated based on the maximum activation of the sensorimotor cortex, aiming to investigate the effectiveness of the hand rapid traction method in relieving spasticity.

Biography

Long Cheng is a Research Fellow and Doctoral Supervisor at the Institute of Automation, Chinese Academy of Sciences (CAS), and a Position Professor at the University of Chinese Academy of Sciences. He is an IEEE/IET/CAA Fellow.

Currently, he serves as the Chair of the IEEE Computational Intelligence Society (CIS) Beijing Chapter, and is an Associate Editor for domestic and international journals including *IEEE Transactions on Cybernetics*, *IEEE Transactions on Automation Science and Engineering*, *Science China Technological Sciences*, and *Acta Automatica Sinica*.

He has been awarded funding from the National Science Fund for Distinguished Young Scholars and the Beijing Municipal Science Fund for Distinguished Young Scholars. He also received the Second Class Award of the National Natural Science Award in 2017. His research interests include robotics and intelligent control.

Talk: Design of Cabin Temperature Control Systems

Time: 13:30-14:10

Invited Speaker: Yaodong Pan



Abstract

The cabin temperature control system of a passenger aircraft comprises multiple subsystems, including the hot air pressure control subsystem, mixer temperature control subsystem, air duct temperature control subsystem, and temperature control subsystems for different cabin areas (such as the cockpit, crew rest compartment, and cargo hold).

This presentation focuses on such a control system with multiple subsystems and various nonlinear factors, and introduces how to design a stable, reliable controller that meets customer requirements.

Biography

Dr. Yaodong Pan is a Researcher at Tokyo University of Technology, Japan. He previously served as a Lecturer at the National University of Defense Technology (Changsha, China), an Associate Professor at Tokyo Denki University (Japan), and a Senior Staff Engineer at Honeywell Inc. (Canada).

His main research areas include control theory and its applications, variable structure control, and robotics. He has published over 100 academic papers in conferences and journals.

Talk: A methodology for improving tracking precision in servo systems: The equivalent-input-disturbance approach

Time: 14:10-14:50

Invited Speaker: Jinhua She



Abstract

In mechatronic systems, various interferences, nonlinearities, and characteristic variations exist. To suppress their impact on system control performance and achieve high system performance, we propose the concept of equivalent input disturbance (EID), which equates these performance-influencing factors to a disturbance at the control input end. Furthermore, a servo system structure is proposed for active compensation of this disturbance, enabling the attainment of high precision and performance that cannot be achieved by traditional mechatronic control systems. This report systematically introduces the design and verification results of control systems based on the EID method through practical examples.

Biography

Jinhua She is a professor at Tokyo University of Technology (Japan) and a distinguished Expert at China University of Geosciences (Wuhan, China). His main research areas include Control theory and its applications, repetitive control, active disturbance rejection, high-precision control of mechatronic systems, and rehabilitation robots. His contributions to the field have been recognized with several accolades, most notably as a co-recipient of the IFAC Outstanding Paper Award in Control Engineering Practice in 1999, which he shared with Professor Min Wu and Professor Michio Nakano. Furthermore, he has a prolific publication record, authoring 5 monographs, 5 textbooks, and 1 translated work, in addition to publishing over 500 academic papers and holding 16 authorized invention patents.

He is an IEEE Fellow and a Senior Member of the Institute of Electrical Engineers of Japan (IEEJ). He also holds memberships in several other prestigious professional societies, including the Society of Instrument and Control Engineers (SICE, Japan), the Japan Society of Mechanical Engineers (JSME), and the Asian Control Association (ACA).

Talk: Magnetic Quantum Detection Technology of Near-Earth Targets

Time: 15:00-15:40

Invited Speaker: Zhaohui Zhang



Abstract

It is of great significance to detect, perceive, and evaluate the morphology of steel components in non-line-of-sight (NLOS) ranges such as vegetation-covered areas, underwater, underground, and across shores, whether they are moving or fixed targets. For example, the positioning of underground oil and gas pipelines is crucial for detecting pipeline drift and ensuring transportation safety. Although the covering above the target blocks the line of sight, since the magnetic permeability of the covering is very close to that of air, the local geomagnetic anomalies caused by the target's magnetism are fully exposed—this is the advantage of magnetic detection. We have designed and developed a superconducting quantum interference device (SQUID) magnetometer, which, as an ultra-high-sensitivity vector magnetometer, can construct the complete magnetic tensor describing the magnetic field as needed. Further inversion of the magnetic tensor data enables the recovery of the target's position and morphology. This paper will introduce our theoretical and experimental work in this field.

Biography

Zhaohui Zhang is a professor at the School of Automation, University of Science and Technology Beijing, a Beijing Distinguished Teaching Master, and the director of the Beijing Engineering and Technology Research Center for Industrial Spectroscopic Imaging. He also serves as the vice chairman of the Beijing Automation Society. His research focuses on terahertz wave detection, extremely weak magnetic quantum detection, and the development of industrial measurement equipment. Addressing the information perception needs of multiple industries, he has undertaken six National Key R&D Programs and National Natural Science Foundation projects, as well as numerous corporate R&D projects. He has obtained more than 30 invention patents and received five provincial and ministerial level awards. He has published over a hundred papers and has been selected multiple times as a Highly Cited Scholar in China by Elsevier.

Talk: Research on Design and Control Decision-Making of Bionic Robotic Fish Systems

Time: 15:40-16:20

Invited Speaker: Zhongjing Ma



Abstract

Bionic robotic fish, as an autonomous underwater vehicle (AUV) that mimics the behavior and morphology of biological fish in nature, possesses prominent advantages in underwater concealment and maneuverability. This presentation will cover the design, dynamic model, control strategy, and perception technology of bionic robotic fish, aiming to demonstrate the latest research progress and broad application potential of robotic fish technology.

Starting with the mechanical structure design of bionic robotic fish, the presentation will introduce multi-sensor fusion technology based on optics, inertia, and other sensors, as well as methods for establishing kinematic and dynamic models based on bionic analysis, data-driven approaches, and fluid mechanics theory. In the section on control strategies, it will present the control technologies developed for the characteristics of robotic fish, and analyze the comprehensive performance in achieving autonomous control and completing complex tasks.

Biography

Zhongjing Ma is a professor and Doctoral Supervisor at the School of Automation, Beijing Institute of Technology (BIT).

His current research focuses on intelligent control, optimization, game theory, and their applications in fields such as intelligent unmanned systems and integrated energy systems. In recent years, he has undertaken a number of scientific research projects, including those funded by the National Natural Science Foundation of China (NSFC), the International Cooperation Special Project of the Ministry of Science and Technology, the Beijing Natural Science Foundation, and the State Grid Corporation of China. He leads his team in developing intelligent unmanned aerial vehicle (UAV), unmanned underwater vehicle (UUV), and bionic robotic fish platform systems based on multi-sensory information fusion. These systems enable path planning, target recognition, and formation coordination of heterogeneous groups in complex scenarios, and have been applied to autonomous line inspection, fault diagnosis, and other tasks in the power industry and other sectors. He has published more than 80 academic papers in IEEE Transactions and other prestigious journals.

Talk: Collaborative Modeling and Application Practice of Intelligent Agents in the Energy Domain

Time: 16:20-17:00

Invited Speaker: Yang Zhang



Abstract

The new energy sector is evolving from digitalization to intelligentization, driven by integrated advances in sensing, communication, and computing technologies. These developments enable real-time monitoring and analysis of equipment status, environmental conditions, and production processes at energy facilities—laying the foundation for data-driven and intelligent operations. Central to this transformation is the growing role of data correlation modeling and knowledge accumulation. These capabilities allow energy systems to identify patterns, assess risks, and dynamically optimize performance. By integrating sensing, analysis, and execution, management systems are shifting from static operation to closed-loop adaptive control. A multi-tiered coordination architecture further enhances decision-making: the base layer handles condition monitoring and anomaly detection; the middle layer focuses on operational analysis and dispatch optimization; and the top layer integrates knowledge and experience for comprehensive judgment—improving both consistency and interpretability of system decisions. Intelligent agent-based modeling and management mechanisms have already been piloted in applications such as wind power and mining, demonstrating a viable path toward more efficient and reliable new energy systems and contributing to the ongoing evolution of a smart energy ecosystem.

Biography

Yang Zhang is an associate professor and master's degree supervisor at Beijing University of Chemical Technology. He graduated with a bachelor's degree from the School of Computer Science at Beihang University in 2014 and obtained his Ph.D. from the same school in 2020, where he was awarded the title of Outstanding Doctoral Graduate. He has long been engaged in theoretical and methodological research as well as application system development in the fields of smart cities, artificial intelligence, and machine vision. He has published more than 20 papers in top journals and conferences in these fields. He currently serves as a director of the Beijing Automation Society and as a reviewer for top journals such as IEEE TIP, IEEE TCSVT, IEEE TII, IEEE JIOT, IEEE PR, and IJCV. He has been selected for the Beijing Municipal Science and Technology Association's Youth Talent Support Program for 2021-2023 and was recognized as a Young Reserve Talent at Beijing University of Chemical Technology in 2020. He has presided over one National Natural Science Foundation of China (NSFC) Youth Science Fund and one sub-project of the National Key R&D Program. He has also participated in two NSFC key projects and three topics of the National Key R&D Program.

**The 9th IWACIII Bilateral Conference and
Annual Conference of Beijing Association of Automation
Programme**

28-30 October 2025

Beijing, China

