



The Sixteenth International Workshop on Information Technology and Control Applications

Yichang, China, 24-27 October, 2025

Conference Program



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China University of Geosciences

Beijing Institution of Technology, China

Tokyo University of Technology, Japan

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China University of Geosciences

China Three Gorges University

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Advanced Control and Intelligent Automation for Complex Systems

Overseas Expertise Introduction Center for Discipline Innovation

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ITCA 2025 Program at a Glance

Oct. 24 (Friday)	Conference Registration
Oct. 25 (Saturday)	Conference in Crowne Plaza Yichang R&F
8:30 ~ 9:00	Opening Ceremony
9:00 ~ 9:20	Group Photo
9:20 ~ 9:55	Plenary Lecture: Wearable Biosensors and Volatile Biomarker Imaging System: Toward Real-Time, Non-Invasive Monitoring of Human Health
9:55 ~ 10:30	Plenary Lecture: Inverse Optimal Control from Expert Demonstrations
10:30 ~ 10:50	Tea Break
10:50 ~ 11:25	Plenary Lecture: When Is A Nonlinear System Semiglobally Asymptotically Stabilizable by Sampled-Data Feedback?
11:25 ~ 12:00	Plenary Lecture: Intelligent Modeling of Carbon Efficiency in the Sintering Process
12:00 ~ 14:00	Lunch
14:00 ~ 15:45	Session 1:Robotics
14:00 ~ 15:45	Session 2:Optimization & Control
14:00 ~ 15:45	Session 3:Machine Learning
15:45 ~ 16:05	Tea Break
16:00 ~ 18:05	Session 4:Sustainable Engineering
16:00 ~ 18:05	Session 5:Image, Acoustic, Speech & Signal Processing
16:00 ~ 18:05	Session 6:Intelligent Control and Distributed Systems
18:30 ~ 19:00	Closing Ceremony
19:00 ~ 21:00	Banquet
Oct. 26 (Sunday) to Oct. 27 (Monday) Research and study activity	

ITCA 2025 Program (Oct.25, Saturday)

08:30 ~ 09:00 **Opening Ceremony**
Chairperson: Jundong WU

Crowne Hall, 3F

09:00 ~ 09:20 **Group Photo**

09:20 ~ 10:30 **Plenary Lecture**
Chairperson: Hiroaki KUROKAWA

Crowne Hall, 3F

09:20 ~ 09:55

Wearable Biosensors and Volatile Biomarker Imaging System: Toward Real-Time, Non-Invasive Monitoring of Human Health

Takahiro ARAKAWA

Chairperson: Luefeng CHEN

09:55 ~ 10:30

Inverse Optimal Control from Expert Demonstrations

Chengpu YU

10:30 ~ 10:50 **Tea Break**

10:50 ~ 12:00 **Plenary Lecture**
Chairperson: Jinhua SHE

Crowne Hall, 3F

10:50 ~ 11:25

When Is A Nonlinear System Semiglobally Asymptotically Stabilizable by Sampled-Data Feedback?

Wei LIN

Chairperson: Wenkai HU

11:25 ~ 12:00

Intelligent Modeling of Carbon Efficiency in the Sintering Process

Jie HU

12:00 ~ 14:00 **Lunch**

14:00 ~ 15:45

Session 1: Robotics

Fuli 1 Hall, 3F

Chairperson: Jinseok WOO

Co-Chairperson: Zhiyang JIA

14:00 ~ 14:15

Design of Differential Drive Steering Active Caster Using Hypoid Gear

Tetta HIRAOKA, Yuki UENO

14:15 ~ 14:30

Development of a Nonverbal Information Analysis System

Jinseok WOO, Yuka SONE, Chifuyu MATSUMOTO, Yasuhiro OHYAMA

14:30 ~ 14:45

Development of a Smart Home System Based on Nonverbal Information

Yutaro YOSHIGUCHI , Yuka SONE, Jinseok WOO

14:45 ~ 15:00

Design of Low-Noise Drone propellers with Spanwise Gurney Flap Distribution

Hayato KIKUCHI, Ryusuke NODA

15:00 ~ 15:15

Multi-Connection Bidirectional RRT with Connection Suppression for Multi-Path Planning

Enliang LIU, Bin XIN

15:15 ~ 15:30

A Large Language Model-Driven Natural Language Instructions Control System for Robotic Arm

Zongyang WU, Zhiyang JIA, Zhiyuan ZENG

15:30 ~ 15:45

Joint Scheduling for Multiload AGVs and Parallel Production Lines Considering Bernoulli Machines

Zhiyuan ZENG, Zhiyang JIA, Zongyang WU

14:00 ~ 15:45

Session2:Optimization & Control

Fuli 2 Hall, 3F

Chairperson: Xianlin ZENG

Co-Chairperson: Daisuke TSUBAKINO

14:00 ~ 14:15

Offload Instruction Optimization for Reconfigurable RISC-V/CGRA Processors

Kentaro NAKAYA, Shoma OHARA, Kurokawa HIROAKI, Hiroaki KUROKAWA

14:15 ~ 14:30

Development of Feedback Control Methods for Dynamic Temperature Distribution Control in Selective Laser Thermoregulation Systems

Yusaku KAWARAZAKI, Tomomasa OHKUBO, Shota UI, Ryota YAMADA, Ei-ichi MATSUNAGA, Yuki UENO

14:30 ~ 14:45

An Improved NSGA-II Algorithm for Multi-UAV Task Assignment in Post-Disaster Scenarios

Zijian ZHOU, Jia ZHANG, Mingchang CHEN

14:45 ~ 15:00

Learn to Cooperate: Reinforced Ant Colony Algorithm for Multi-Agent Rescue Missions

Zixu LI, Bin XIN, Qier MU, Yuhui HUANG

15:00 ~ 15:15

Distributed Gradient-Free Algorithm for Nonconvex Nonsmooth Optimization with Non-Asymptotic Convergence

Jie HOU, Xianlin ZENG

15:15 ~ 15:30

Learning Approximate Nash Equilibrium in Zero-Sum Extensive-Form Games with Noisy Feedback

Kui ZHU, Xianlin ZENG

15:30 ~ 15:45

Construction of a pedaling force estimation model incorporating a bandpass filter and improvement of estimation accuracy

Kyohei IWASAWA, Jinhua SHE, Sumio OHNO, Daisuke CHUGO

14:00 ~ 15:45

Session3: Machine Learning

Fuli 5 Hall, 3F

Chairperson: Chengda LU

Co-Chairperson: Hiroaki KUROKAWA

14:00 ~ 14:15

An Improved Lightweight μ -Forward-Forward Neural Network Based on Hash Mapping

Chenglong WANG, Yuga SATO, Shoma OHARA, Hiroaki KUROKAWA

14:15 ~ 14:30

Consideration of Reinforcement Learning AI using Neural Networks to Suggest Scan Paths for Selective Laser Thermoregulation

Shota UI, Tomomasa OHKUBO, Yusaku KAWARAZAKI, Ryota YAMADA, Ei-ichi MATSUNAGA, Yuki UENO

14:30 ~ 14:45

Design of Intelligent Monitoring System for Geological Hazards Based on Multi-source Information Fusion

Sijing CHEN, Yunyan SHAO, Zikang WU, Chengda LU, Min WU

14:45 ~ 15:00

Fault Detection of Tunnel Drilling Rig in Underground Coal Mine Based on Sparse Autoencoder

Haitao SONG, Shatie ZUO, Naiwen ZHANG, Aoxue YANG, Chengda LU, Min WU

15:00 ~ 15:15

Degradation Trend Analysis For Electro-Hydraulic Drive System of Tunnel Drilling Rig in Underground Coal Mine Based on PCA and Z-Score Unsupervised Evaluation

Naiwen ZHANG, Haitao SONG, Aoxue YANG, Chengda LU, Haipeng FAN, Min WU

15:15 ~ 15:30

An Intelligent Classification Method for Bipolar Disorder Based on Graph Convolutional Neural Networks

Qifan SHEN, Yue ZHANG, Yujun GAO, Yawu WANG

15:30 ~ 15:45

Relational Graph Neural Network with Self-Distillation for Multi-Modal Emotion Recognition in Conversation

Dan CHEN, Zhentao LIU, Ruoyan WU

15:45 ~ 16:05

Tea Break

16:05 ~ 17:50

Session 4: Sustainable Engineering

Fuli 1 Hall, 3F

Chairperson: Takahiro ARAKAWA

Co-Chairperson: NING LI

16:05 ~ 16:20

Comparison of Muscle Coordination Patterns Between Passive Pedaling and Gait Using Muscle Synergy Analysis

Yuta TAKAHASHI, Akinori SEKIGUCHI

16:20 ~ 16:35

Vibration Damping of AZ31 Magnesium Alloy Through Acoustic Pressure Measurement

Keishi IIZUKA, Yoshiki MIURA, Ryusei NAGANUMA, Saneyuki ABE, Bando KOKI, Tomoki HAYAKAWA, Taro KATO, Mitsuki FURUI

16:35 ~ 16:50

Development of Paper-Based Wearable Pressure Sensors for Evaluation of Swallowing Function

Jiahui HUANG, Baokang ZHANG, Ryuichi YASHIMA, Suzuki KAZUYA, Takahiro ARAKAWA

16:50 ~ 17:05

Glucose Biosensing Using Electrospun Conductive Carbon Nanofibers with a Biocompatible Polymer

Ryuichi YASHIMA, Kazuya SUZUKI, Keiichiro AMI, Takahiro ARAKAWA

17:05 ~ 17:20

Frequency Characteristics of a High-Voltage Power Semiconductor Gate-Drive Circuit Using Resonant Inductive Wireless Power Transfer

Ning LI, Takeshi SHINKAI

17:20 ~ 17:35

A Study on the Application of Bayesian Optimization to the Secondary Focusing System Shape in Solar-pumped Lasers

Ryota YAMADA, Tomomasa OHKUBO, Shota Ui, Yusaku KAWARAZAKI, Yuji SATO, Ei-ichi MATSUNAGA

17:35 ~ 17:50

Numerical Study on Melt Pool Volume Variation of SUS304 under Different Laser Beam Shapes

Houmin ZHENG, Tomomasa OHKUBO, Ryota YAMADA, Yusaku KAWARAZAKI, Shota UI

16:05 ~ 17:50

Session 5: Image, Acoustic, Speech & Signal Processing

Fuli 2 Hall, 3F

Chairperson: AKINORI SEKIGUCHI

Co-Chairperson: Yawu WANG

16:05 ~ 16:20

Design of Train Static Weighing Positioning System Based on Computer Image Processing

Zhenmin CHEN, Lingfeng ZUO, Yiheng CHEN, Jun CHEN, Jundong WU, Yawu WANG

16:20 ~ 16:35

Camera Control Using Rider Gaze and Head Pose Estimation for Bicycle Collision Prevention System

Reiya YAMAGISHI, Akinori SEKIGUCHI

16:35 ~ 16:50

Fusing Point and Line Features for 3D Point Cloud Tracking and Registration

Ruyi HUANG, Xinpeng LIU, Yingshun LI, Xinyu YI, Zhannan GUO, Yang LIU

16:50 ~ 17:05

A Comparative Study of Sensor-level Data Fusion Methods for Inertial Measurement Unit Signals

Qin PENG, Juan ZHAO, Jinhua SHE, Feng WANG, Seiichi KAWATA

17:05 ~ 17:20

Enhanced OC-SORT for UAV Swarm Tracking via Direction Consistency and Trajectory Memory

Tianyang LI, Zhihong PENG, Yukun LI, Guanghong LIU, Wenzhong ZHA

17:20 ~ 17:35

An Improved Multi-Scale Parallel Framework Incorporating UNet Branches for EEG Artifact Suppression

Kaiyi TANG, Jinhua SHE, Juan ZHAO, Seiichi KAWATA

17:35 ~ 17:50

Joint Networks for Speech Depression Detection

Xinheng LI, Yujie ZOU, Dan CHEN, Zhentao LIU

16:05 ~ 18:05

Session 6: Intelligent Control and Distributed Systems

Fuli 5 Hall, 3F

Chairperson: Xiang WU

Co-Chairperson: Fan YIN

16:05 ~ 16:20

A Distributed Coverage Control Framework via Spatio-Temporal Graph Attention Network and Control Barrier Functions

Mingcong ZHANG, Haoran CHANG, Xin CHEN

16:20 ~ 16:35

Adaptive Finite-Time Fault-Tolerant Control for Quadrotor UAV

Junzhe CHENG, Qing WANG, Bin XIN

16:35 ~ 16:50

An Automated Weekly Report Analysis Framework for Project-Based Learning: An Exploration from a Natural Language Processing Perspective

Zhenxuan LU, Seiichi KAWATA, Juan ZHAO, Feng WANG, Jinhua SHE

16:50 ~ 17:05

Development of a Gamified Online Language Learning System Based on Adventure Games

Longhai QIN, Jinhua SHE, Shumei CHEN, Sumio OHNO, Hiroyuki KAMEDA

17:05 ~ 17:20

Event-Triggered and Proportional-Integral Equivalent Input Disturbance Based Control for Networked Systems

Meiliu LI, Jintao YANG, Lan ZHOU, Wenbin XIAO

17:20 ~ 17:35

A Deep-Reinforcement-Learning-Based Position Synchronization Control for Multi-Axis Systems

Ke XU, Wensheng CHEN, Yuanyuan SHAN, Yumeng ZHANG, Xiang WU, Hui DONG

17:35 ~ 17:50

Intelligent Control Strategy for Power Generation Load in Boiler Combustion Process Based on Control of Three Process Variables

Xinjian ZHANG, Fan YIN, Fusheng PENG, Jie HU, Jundong WU

17:50 ~ 18:05

Integrated Spatiotemporal Feature Modeling for Temperature Forecasting in Blast Furnace Hearth Linings

Qifu CHEN, Jiabin CHENG, Jianqi AN, Jinhua SHE

18:30 ~ 19:00

Closing Ceremony

Crowne Hall, 3F

Chairperson: Jie HU

19:00 ~ 21:00

Banquet

Crowne Hall, 3F



Wearable Biosensors and Volatile Biomarker Imaging System: Toward Real-Time, Non-Invasive Monitoring of Human Health

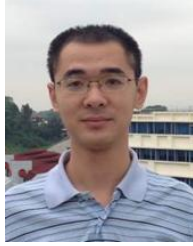
Takahiro Arakawa*

* Tokyo University of Technology, Japan

Abstract: The measurement of biophysical quantities of the human body has garnered significant attention in the medical and healthcare fields. Wearable sensors have emerged as promising tools for monitoring relevant parameters in healthcare, sports, and medical applications. Leveraging biophysical information with these systems is expected to enable proactive health management, thereby improving public health and reducing medical expenditure. This paper discusses two types of wearable biosensors: tear and saliva glucose biosensors. Our group has developed soft contact lens biosensors for tear chemicals and oral cavity biosensors, such as mouthguard biosensors for salivary analysis. Challenges related to integrating biosensors into monitoring biological information and daily medicine are also addressed. Moreover, recent advancements in analytical devices have facilitated the measurement of minute amounts of odorous materials and volatile chemical compounds. Human breath and skin volatiles, including gases from halitosis and body odor, contain compounds indicative of metabolic processes and specific ailments. Measurement of these volatile biological compounds holds promise for simplifying metabolic capacity evaluation, medical diagnostics, and disease screening. We have developed a novel two-dimensional fluorometric imaging system for detecting ethanol vapor released from human breath and palm skin. This imaging system measures ethanol vapor concentrations by analyzing the fluorescence intensity of nicotinamide adenine dinucleotide (NADH) through an enzymatic reaction induced by alcohol dehydrogenase. The NADH fluorometric imaging system enables

real-time, two-dimensional imaging of ethanol vapor distribution at ppb concentration levels. We applied this imaging system to measure breath ethanol vapor and skin ethanol vapor from a human palm, demonstrating rapid and accurate responses with visible measurements. This technology holds promise for real-time analysis of metabolism function in the near future.

Dr. Takahiro Arakawa is currently a Professor at the Department of Electric and Electronic Engineering, Tokyo University of Technology, since 2025. He had served as an Associate Professor at the same department since 2021. He received his BS and MS degrees from Waseda University in 2002 and 2004, respectively. He completed the Ph.D. program in Nanoscience and Nanoengineering and received his Ph.D. degree for research on “Microfluidic system for single cell analysis” from Waseda University in 2007. In 2008, he joined the Laboratory of Bioanalytical Chemistry at the University of Tokyo as a Postdoctoral Research Fellow of the Japan Society for the Promotion of Science (JSPS, PD). Since 2009, he served as an Assistant Professor at Tokyo Medical and Dental University in the Department of Biomedical Devices and Instrumentation, and was promoted to Junior Associate Professor in 2014. From 2017 to 2018, he was a visiting researcher at the Departments of Electrical Engineering and Bioengineering at the University of California, Los Angeles (UCLA). His research interests include microfluidics, bio micro-electro-mechanical systems (Bio-MEMS), biosensors, optical systems, and bio-microsystems for medical applications.



Inverse Optimal Control from Expert Demonstrations

Chengpu Yu*

* Beijing Institute of Technology, China

Abstract: Inverse optimal control aims to recover the cost functions associated with control problems from expert demonstrations, which can be specially applied for the intention identification in a non-cooperative game setting. In this talk, according to different types of dynamical system models and optimal control settings, three inverse optimal control problems are discussed, including inverse linear quadratic optimal control using partial and noisy trajectory data, inverse model predictive control with time-varying or nonlinear systems, and inverse non-cooperative game with heterogeneous multi-agent interactions. These results represent a step toward efficient, reliable, and interpretable behavioral modeling for dynamic systems, providing an alternative to the inverse reinforcement learning.

Chengpu Yu received the B. E. and M. E. degrees from the University of Electronic

Science and Technology of China, in 2006 and 2009, respectively, and the Ph.D. degree from Nanyang Technological University, Singapore, in 2014. From June 2014 to August 2017, he has been a PostDoc at Delft Center for Systems and Control, The Netherlands. He is currently a professor with School of Automation, Beijing Institute of Technology, China. His research interests include system identification and reinforcement learning. He has authored/co-authored more than 60 journal articles, and two research monographs on system identification. He has received the First Prize in Natural Science from the Chinese Association of Automation and the First Prize in Natural Science from the Ministry of Education in 2022. He is currently serving as associate editors of Control Theory and Technology, Journal of Systems Science and Complexity, and IEEE CSS Conference Editorial Board.



When Is A Nonlinear System Semiglobally Asymptotically Stabilizable by Sampled-Data Feedback?

Wei Lin*

* Case Western Reserve University, USA

Abstract: Most of the existing results in the literature were devoted to practical stabilization of nonlinear systems by sampled-data feedback and very few results are available on asymptotic stabilization, due to the nature of "sample and hold" and the hybrid closed-loop system. In this talk, we present recent breakthrough in semiglobal asymptotic control of general nonlinear systems by sampled-data feedback. For MIMO nonlinear systems, we prove that while global asymptotic stabilizability (GAS) may not ensure global or semiglobal asymptotic stabilizability (SGAS) by sampled-data state feedback, either global or semiglobal asymptotic stabilizability does imply the existence of a SGAS. Main contribution of this talk: GATES and uniform observability imply semiglobal asymptotic stabilizability by sampled-data output feedback, which is indeed a hybrid version of the "separation principle" for nonlinear systems. The development of the "digital separation principle" is made possible by employing a subtle Lyapunov argument that makes the estimation of domains of attraction and semiglobal asymptotic analysis intuitive and simple, without involving intricate Lyapunov functions and the corresponding level sets. Examples and results on SGAS by sampled-data feedback for representative classes of nonlinear systems are also given as illustrations.

Wei Lin received the D.Sc. and M.S. degrees in Systems Science and Mathematics from Washington University, St. Louis, in 1993 and 1991. He also received the B.S. and M.S. degrees in Electrical Engineering from Dalian University of Technology (1983) and Huazhong University of Science and Technology (1986),

respectively. During 1986 to 1989, he was a Lecturer in the Dept. of Mathematics at Fudan University, Shanghai, China. From 1994 to 1995, he was a post-doctor and Visiting Assistant Professor in Washington University. Since spring of 1996, he has been a Professor in the Dept. of Electrical, Computer, and Systems Engineering at Case Western Reserve University, Cleveland, Ohio. Dr. Lin's research interests include nonlinear control, dynamic systems with time-delay, homogeneous systems theory with applications, estimation and adaptive control, stochastic control and stochastic stability, control of under-actuated mechanical systems and nonholonomic systems, power systems, renewable energy and smart grids. In these areas, he has published a number of papers in peer-refereed journals and conferences. Dr. Lin was a recipient of the U.S. NSF CAREER Award, the Warren E. Rupp Endowed Professor, the Robert Herbold Faculty Fellow Award, the JSPS Fellow and IEEE Fellow. He served as an Associate Editor of the IEEE Trans. on Automatic Control (1999-2002), an Associate Editor of Automatica (2003-2005), a Guest Editor of IJC Special Issue on "New Directions in Nonlinear Control" (2003), a Subject Editor of J. of Robust and Nonlinear Control (2005-2010), an Associate Editor of Journal of Control Theory and Applications (2005-2008), Board of Governors of IEEE Control Systems Society (2003-2005), and Vice Program Chair of 2001 IEEE CDC (Short Papers) and 2002 IEEE CDC (Invited Papers). He has also been a Plenary Speaker in several IFAC and IEEE conferences including the IFAC NOLCOS'04 at Stuttgart, Germany, and the 7th IFAC Symposium on Nonlinear Control, Perugia, 2007.



Intelligent Modeling of Carbon Efficiency in the Sintering Process

Jie Hu*

* China University of Geosciences, China

Abstract: The sintering process represents a typical industrial process. This process involves numerous complex characteristics, such as multiple parameters, nonlinearity, and multiple operating conditions, etc. In order to effectively enhance the energy utilization rate of this process, it is necessary to conduct an effective prediction of carbon efficiency. Therefore, a series of carbon efficiency intelligent prediction models based on artificial intelligence algorithms have been proposed. It laid the foundation for achieving energy conservation and emission reduction in the sintering process.

Jie Hu received the B.S. degree in automation and the Ph.D. degree in control science and engineering from China University of Geosciences, Wuhan, China, in 2015 and 2020, respectively. He was a joint Ph.D. student with the Department of Electrical and Computer Engineering, University of Alberta, Edmonton, AB, Canada, from 2018 to 2020. He was a Post-Doctoral Fellow of control science and engineering, China University of Geosciences, from 2020 to 2022, where he is currently a Professor with the School of Automation. His current research interests include process control, intelligent control, and computational intelligence. He was recipient of the Best Paper Award of the IEEE International Conference on Industrial Technology in 2025 and the Young Researcher Award of the 13th China-Japan International Workshop on Information Technology and Control Applications in 2020.

Proceedings



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