

CONFERENCE PROCEEDINGS



*2019 International Conference on
Advanced Mechatronic Systems
August 26 - 28, 2019, Kusatsu, Shiga, Japan*



2019 ICAMechS

International Conference on Advanced Mechatronic Systems

August 26 – 28, 2019

Kusatsu, Shiga, Japan

PROGRAM

Organizers:

International Journal of Advanced Mechatronic Systems
Ritsumeikan University
IEEE Systems, Man, and Cybernetics Society
Tokyo University of Agriculture and Technology

Sponsors:

International Journal of Modelling, Identification and Control
The Institute of Complex Medical Engineering
Agricultural Robotics and Automation Technical Committee, IEEE Robotics & Automation Society

Cooperation with:

The Society of Instrument and Control Engineers
The Institute of Systems, Control and Information Engineers
Zhongshan Institute
VLSI Center of Ritsumeikan University

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GREETINGS FROM THE GENERAL CHAIRS AND PROGRAM CHAIRS

On behalf of ICAMechS 2019 Organizing Committee, it is our great pleasure and honor to welcome you all to the 2019 International Conference on Advanced Mechatronic Systems. The conference is held on August 26 - 28, 2019 in Kusatsu, Japan, organized by International Journal of Advanced Mechatronic Systems (IJAMechS), Ritsumeikan University, Tokyo University of Agriculture and Technology, and IEEE Systems, Man, and Cybernetics Society, sponsored by International Journal of Modelling, Identification and Control, The Institute of Complex Medical Engineering, Agricultural Robotics and Automation Technical Committee, IEEE Robotics & Automation Society. The Society of Instrument and Control Engineers, The Institute of Systems, Control and Information Engineers, Zhongshan Institute and VLSI Center of Ritsumeikan University are patrons of the conference.

ICAMechS 2019 is an all-volunteer conference, and it provides an international forum for professionals, academics, and researchers to present latest developments from interdisciplinary theoretical studies, computational algorithm development and applications of mechatronic systems. It particularly welcomes those emerging methodologies and techniques which bridge theoretical studies and applications in all mechatronic systems. Novel quantitative engineering and science studies may be considered as well. The accepted papers will be submitted for inclusion into IEEE Xplore as well as other Abstracting and Indexing (A&I) databases.

Kusatsu city is located in northeast of Kyoto, southwest of Shiga prefecture. In history, Kusatsu flourished as the "Shukuba" (Post town) during the Edo period. Shukuba was officially founded on the highway as the transportation base for travelers' lodging, goods and mail. Kusatsu city is a beautiful place with a magnificent nature including Lake Biwa, which is the largest freshwater lake in Japan. Lake Biwa frequently appears in Japanese literature, particularly in Japanese ancient poetry and so on. We hope that you all are able to be satisfied with pleasant scenery as well as traditional foods in Kusatsu.

Three distinguished speakers, Prof. Zhihong Man (Swinburne University of Technology, Australia), Prof. Jinglong Wu (Okayama University, Japan) and Prof. Shiro Masuda (Tokyo Metropolitan University, Japan) are invited to give plenary presentations. We would like to present our sincere thanks to the plenary speakers.

We would like to present our special thanks to authors and participants of this conference, and the members of Advisory Committee, Program Committee and Organizing Committee.

We hope that you all enjoy the conference and beautiful Kusatsu.

Best regards,

CONFERENCE HIGHLIGHTS

Under three reviews for each paper by Program Committees and Organizing Committees, a total of 75 papers from different parts of the world were accepted and included into the final program of ICAMechS 2019. Among which 57 are the oral papers and 18 are poster papers. There are three plenary speeches, one plenary panel discussion. Each oral session consists of 3-5 papers, where we have one poster session and 14 regular sessions. Papers were assigned with the sole purpose of forming coherent sessions.

CONFERENCE REGISTRATION

The conference registration desk, located at the 1st Floor of Prism House P106, Ritsumeikan University BKC Campus, will be opened during the following time:

13:00-17:00, Aug. 26, 2019 (Monday)

09:00-17:00, Aug. 27, 2019 (Tuesday)

09:00-17:00, Aug. 28, 2019 (Wednesday)

The full registration includes Welcome Reception, Cruising Banquet and USB Conference Proceedings.

SOCIAL EVENTS

Welcome Reception (The 2nd floor of UNION SQUARE, Ritsumeikan University BKC Campus, 17:30 - 19:30, Aug. 26, 2019)

Cruising Banquet (Michigan Biwako Cruise, 5-1-1 Hamaotsu, Otsu City, Shiga Prefecture, 18:30 - 20:30, Aug. 27, 2019)

CONFERENCE LOCATION

ICAMechS 2019 will be held at Ritsumeikan University BKC Campus, Kusatsu. The venue will be held on 1st floor and 2nd floor of Prism House. The Opening Remarks and Plenary Speech are conducted at the Main Conference Hall (プリズムホール) in Prism House Ritsumeikan University BKC Campus, the regular sessions are in Room No. P106, P107, P108 (1st floor) and P112 (2nd floor) in Prism House Ritsumeikan University BKC Campus. Ritsumeikan University provides excellent facilities and environment for ICAMechS 2019.

Ritsumeikan University BKC Campus

Conference site: Ritsumeikan University BKC Campus

Building: Prism House (1-1-1 Noji-higashi, Kusatsu-shi, Shiga, 525-8577, Japan)

Webpage of Ritsumeikan at Kusatsu here. (The detailed maps are available here)

Tel: +81-77-561-3946

<http://en.ritsumei.ac.jp/access/>

HOTEL RESERVATIONS

1. Hotel Information in Minami Kusatsu Station:

- Hotel Tokoyo-INN (Minami-Kusatsu)

<https://www.toyoko-inn.com>

Address: 1-4-12 Minami-Kusatsu, Kusatsu city, Shiga 525-0050 Japan

TEL: +81-(0)77-561-1045 FAX: +81-(0)77-561-1046

Access from the station (train): 3 min walk from Minami-Kusatsu station West Exit on JR Biwako-Line

2. Hotel Information in Kusatsu Station:

- Hotel Boston Plaza Kusatsu

<http://www.hotel-bp.co.jp/en/>

Address: Boston Square, Kusatsu-eki Nishi, Kusatsu-city, Shiga ([Map](#)) 525-0037 Japan

TEL: +81-077-561-3311 FAX: +81-077-561-3322

- Kusatsu Estopia Hotel

<https://www.estopia.jp>

Address: 4-32, Nishi Oji-Cho, Kusatsu-City, Shiga, 525-0037, Japan

TEL: +81-77-566-3333 FAX: +81-77-565-7775

Access to hotel: 20min from Kyoto Shinkansen Sta. 3min walk from JR Kusatsu Sta.

3. Hotel Information in Otsu:

- Prince Hotel Lake Biwa Otsu

<http://www.princehotels.com/otsu/>

Address: 4-7-7, Nionohama, Otsu City Siga, 520-8520 Japan

TEL: +81-(0)77-521-1111

PLENARY SPEAKERS

Prof. Zhihong Man, Swinburne University of Technology, Australia



Zhihong Man received his B.E. degree from Shanghai Jiaotong University, China, M.Sc. degree from Chinese Academy of Sciences, and Ph.D. degree from the University of Melbourne, Australia. From 1994 to 1996, he was the Lecturer of Edith Cowan University, Australia. From 1996 to 2001, he was the Lecturer and then the Senior Lecturer of The University of Tasmania, Australia. From 2002 to 2007, he was the Associate Professor of Computer Engineering at Nanyang Technological University, Singapore. From 2007 to 2008,

he was the Professor and Head of Electrical and Computer Systems Engineering at Monash University Sunway Campus. Since 2009, he has been with Swinburne University of Technology, Australia, as the Professor of Engineering. Zhihong's research interests are in sliding mode control systems, complex system modelling, industrial robotic control systems, neural network-based artificial intelligence and vehicle dynamics & control. Zhihong has published more than 230 research papers in these areas and his research results have been cited by researchers more than 9500 times. Since 1994, Zhihong has served as the general chair, program chair and committee members for more than 60 international research conferences, the guest editor for 7 SCI journal special issues/sections, and presented keynotes and talks for more than 100 international conferences and universities.

Title:

[Some Issues on Sliding Mode Observers](#)

Abstract:

In this talk, some issues on the sign rule and learning concept in sliding mode observer systems are discussed. It has been noted that, when the error dynamics of a high-order sliding mode observer reaches the sliding surface, all of state estimation errors have the same sign. Such a finding can well explain why the sign function of the measurable output error can be used in each observer subsystem as the input component. Another finding is that, from the viewpoint of learning, the error dynamics of a high-order sliding mode observer can be considered as a leader with a group of followers. The first subsystem with the measurable state estimation error (the output estimation error) can be treated as the leader, and the well-designed error dynamics of the leader with finite time convergence can be used as the desired error dynamics for all followers to learn. Because the sign function of the output estimation error is used as the input component of all subsystems. After the observer gains are designed in the sense that the signs of the first-order error derivatives of all subsystems are opposite to the one of the output estimation error, all of followers are guaranteed to follow the leader and achieve the finite error convergence. The convergence analysis of the error dynamics of the followers are also discussed in detail. A few simulation results are presented to show the good learning and convergence properties of sliding mode observer systems.

Prof. Jinglong Wu, Okayama University, Japan



Jinglong WU, Ph.D., Professor at Cognitive Neuroscience Lab., Okayama University and School of Mechanical Engineering, Beijing Institute of Technology. He interested in human brain mapping, particularly in the multi-sensory brain mechanisms and clinical equipment research. He proposed a two-handed tactile brain characterization model, and to achieve a wide field and created the latest visual brain map. He has presided over in many national projects and the national R&D programs, and has published more than 150 papers. He has won

the Gennai Award from the Osaki Foundation of Japan and the Best Paper Award of IEEE International Conference.

Title:

Human Brain Mapping and Neuromodulation Technology for Alzheimer's Disease

Abstract:

Facing the human needs for the development of medical services and the huge medical expenses brought about by the treatment of Alzheimer's disease (AD), the early diagnosis of AD is urgently needed. In view of the current important technological opportunities to explore the mystery of the brain to promote the development of artificial intelligence and intelligent manufacturing industry, our team is committed to propose a new method for early diagnosis of Alzheimer's disease and develop a wearable intelligent cognitive therapy system through brain functional imaging technology and neuromodulation technology. Provide theoretical and technical support to promote the development of brain science and open up the field of early diagnosis of clinical neurodegenerative diseases. Moreover, promote the development of brain science research and artificial intelligence, intelligent manufacturing related industries. In the aspect of brain function imaging, creating a somatotopic map based on the new principle of tactile perception brain function measurement and the key technology of high-precision 3D conformal tactile stimulator. To reveal new rules between tactile stimulation and somatosensory cortical activation, acquire new data for tactile brain function research to fill the world gap of somatotopic map and apply to the early diagnosis of AD. In terms of neuromodulation, combined cognitive behavioral, electroencephalogram (EEG), and functional magnetic resonance imaging (fMRI) techniques reveal the multi-sensory cognitive memory brain mechanism and deep into the cognitive pathology of AD; Constructing a wearable early intervention experiment system, which provides visual, auditory, tactile or multi-sensory feedback and real-time feedback brain neural signal characteristics to regulate abnormal brain activity of patients. To improve patient's memory-based cognitive function and delay the development of AD disease, providing potential effective methods for clinical treatment of early AD patients.

Prof. Shiro Masuda, Tokyo Metropolitan University, Japan



Shiro Masuda received his B.E, M.E. and Dr. Eng. degrees from Kyoto University, in 1987, 1989 and 2003. In 1989, he joined Okayama University as a Research Associate, where he became a Lecturer and an Associate Professor, in 1993 and 1998. In 2000, he joined Tokyo Metropolitan Institute of Technology as an Associate Professor. In 2005, he became an Associate Professor, Tokyo Metropolitan University. In 2013, he became a Professor, Tokyo Metropolitan University. His main major is the system control engineering, and its application

to industrial processes. Especially, he interests in data-driven controller design, adaptive control, and model predictive control. He is a member of IEEE, SICE, ISCIE, IEEJ, IEICE.

Title:

[Data-driven Controller Parameter Tuning Toward a Standard Controller Design](#)

Abstract:

The data-driven controller parameter tuning has attracted much attention from controller design theorists as well as practitioners over two decades since the IFT (Iterative Feedback Tuning) has been presented. Subsequently, The VRFT (Virtual Reference Feedback Tuning), the FRIT (Fictitious Reference Iterative Tuning), and the NCbT (Non-iterative Correlation Based Tuning) were proposed, and several extensions of these approaches have been studied. These approaches allow us to obtain desirable controller parameters from one-shot process experimental input and output data. In the context of the researches, our research project has tackled disturbance attenuation problems and an optimal pre-filter design method in order to improve the performance of the resulting closed-loop system. The lecture reviews our recent research results on these topics, and discusses essential advantages of the data-driven approaches over other standard controller design methods. One of the final objective is that a large number of practitioners would employ the data-driven controller parameter tuning approaches, and recognize it as a standard controller design approach. Finally, the lecture will show the future direction of the research project.

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