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SICE

SICE Annual Conference 2019

Higashi-Senda Innovative Research Center
of Hiroshima University, Hiroshima, Japan
September 10-13, 2019

Final Program

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Annual Conference 2019

September 10-13, 2019

Higashi-Senda Innovative Research Center of Hiroshima University,
Hiroshima, Japan

http://www.sice.jp/siceac/sice2019/

Final Program

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SICE Administration Office:
4F.Kaneko Bldg., 1-11-9 Kandaogawamachi, Chiyoda-ku, Tokyo 101-0052 Japan
TEL: +81-3-3292-0314 FAX: +81-3-3292-3145
E-mail: sice2019-secretariat@sice.or.jp
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Greetings from SICE 2019 Conference Chairs

It is our pleasure to welcome you to the SICE (Society of Instrument and Control Engineers) Annual Conference 2019 (SICE 2019) held in Hiroshima, Japan. SICE 2019 is being held on September 10th(Tuesday) to September13th(Friday) at the Higashi-Senda Innovative Research Center of Hiroshima University. As you all know, Hiroshima was the first place in the world to be bombed by an atomic bomb on August 6, 1945, and 74 years have passed since then. Now, Hiroshima has revived wonderfully, becoming a major city representing Japan. It is very significant to hold an international conference related to science and technology in Hiroshima which continues to convey the message of peace towards the world.

The conference this year has 440 papers submitted from 16 countries and regions, and around 400 papers will be presented. The acceptance rate of regular papers is 65.6%, and these papers will be included in the IEEE Xplore Digital Library. 4 plenaries, 3 keynotes, special sessions to compete for awards, and a special panel session as the International Symposium on Smart Manufacturing and Industrial Network 2019 are planned. This conference will also include 2 tutorials and 2 workshops. In addition, social events, technical visits and exhibition are provided daily.

Many companies have provided financial support for holding this SICE 2019. Moreover, it was not possible to hold this meeting without the cooperation of Hiroshima Prefecture, Hiroshima City, Hiroshima University and many volunteers. And above all, the contributions of Organized Committee Members, Technical Program Committee Members, and Editorial Board Members were the driving force behind this conference. We deeply appreciate everyone involved.

Finally, we sincerely hope that all attendees of this conference will be satisfied with the conference program and enjoy staying in Hiroshima.

Toru Yamamoto
General Chair
(Hiroshima University)

Hideyuki Tanaka
Program Co-Chairs
(Hiroshima University)

Yuichi Kurita
Program Co-Chairs
(Hiroshima University)

Welcome to SICE Annual Conference 2019 (SICE2019) in Hiroshima

Delegates and Attendees to the SICE2019 and distinguished guests:

On behalf of the SICE (Society of Instrument and Control Engineers), I am delighted to welcome all of you to the SICE2019 in Hiroshima.

The SICE provides a forum for researchers to develop their field or to conduct interdisciplinary research on Control, Measurement, and System Integration. From a longer-term perspective, the world is nearing a critical turning point. Cities and the people living there have come to think about the effects of global warming, globalization of the market economy, etc. as their problems and work towards solutions. Besides, with the coming of an aging society, it is necessary to construct a socio-economic system that preserves nature and can effectively exert human kindness and creativity naturally in various situations. Towards this future society, the SICE is aiming to foster the people, who can create new values, explore new data, describe and model a phenomenon, and then control it, achieving the desired function to realize the Society 5.0.

The pillar of our society's operations is the staging of academic conferences and symposiums. The Conference has started internationalization, as SICE Annual Conference, in Osaka Japan since 2002, and has held in major cities including overseas such as Busan Korea 2006, Taipei Taiwan 2010 and Hangzhou China 2015.

In 2019, we hold 18th SICE Annual Conference in Hiroshima. The SICE decided to hold SICE2019 in Hiroshima for the following reasons.

In the latter half of the 20th century, in Hiroshima, the shipbuilding, the steel, and then the automobile industries have continued to be the driving force of the regional economy and development. The technology accumulation, networking, and industrialization spirit of the manufacturing industry cultivated in that process are the foundation that supports the existence of Hiroshima. The challenge of manufacturing innovation is ongoing, and "smart manufacturing" is also conducted, which is making Hiroshima a distinguished manufacturing base in West Japan.

Additionally, Hiroshima has made efforts to create a high-quality urban environment with a safe, comfortable, and beautiful urban landscape, making use of the natural environment. It is a city with rich culture and humanity, and the citizens are with a sense of well-being and freedom and liveliness. Hiroshima has also promoted active international exchange and international cooperation in various fields and is aiming at a vibrant city open to the world.

In SICE2019, more than 400 papers are to be presented, and four plenary talks, two workshops, and two tutorials are offered. In addition to those technical sessions, a variety of the social programs of Welcome Reception, Banquet, and Farewell Reception, as well as daily Technical Tours, are organized.

During SICE2019, I expect, all the participants from various countries will have many opportunities for discussion and the exchange of ideas regarding social issues and academic topics based on Control, Measurement, and System Integration.

In closing, I would like to thank various people. First of all, the General Chair, Prof. Toru Yamamoto of Hiroshima University Japan, the Program Co-Chairs, Prof. Hideyuki Tanaka and Prof. Yuichi Kurita of Hiroshima University Japan and all the members of the Organizing Committee and Technical Program Committee for the firm and efficient way in which they handled the Conference. Second, the speakers of the plenary sessions, session chairs, and all speakers for their excellent presentations. Last but not least, I would like to thank many companies for support and cooperation we received in SICE2019.

I wish all of you enjoy SICE2019 and Hiroshima staying.

Tetsuo Sawaragi
President of SICE
(Kyoto University)

THE CITY OF
HIROSHIMA
1-6-34 Kokutaiji-machi, Naka-ku, Hiroshima 730-8586 Japan
Tel: 81-82-504-2602 Fax: 81-82-504-2253 E-mail: mice@city.hiroshima.lg.jp

September 10, 2019

To all the SICE Annual Conference 2019 participants,

I would like to express my sincere gratitude on the occasion of the SICE Annual Conference 2019, and offer a heartfelt welcome to each and every participant who has come to Hiroshima.

As you may know, Hiroshima City is familiar worldwide as a place of peace. Peace Memorial Park–home of Hiroshima's symbol, the UNESCO world heritage site of the Atomic Bomb Dome–draws many visitors from around the world, and there is no end in sight to the offerings of flowers and paper cranes at the Cenotaph for the A-bomb Victims and the Children's Peace Monument. Holding this conference in such a city will undoubtedly help the event to deliver a strong impression to the world, in terms of the transmission of the conference's outcome and more.

Hiroshima originated around 400 years ago as a castle town, and has developed as one of the pivotal cities for industry, economics, and administration in western Japan. Six rivers flow through the city, which is blessed with a warm climate and rich nature. The riverside scenery, seen from tour boats and open cafes, changes with the four seasons, and the beautiful waterfront views of the "City of Water, Hiroshima" delight citizens and tourists alike.

I do hope every one of you will take the time to experience Hiroshima's rich natural sites and cityscape, food culture, and traditional arts, so that you may feel the full satisfaction inspired by Hiroshima's particular type of hospitality. Furthermore, it is my sincere wish for participants to share in Hiroshima's enduring desire and hope for peace, which former U.S. President Barack Obama also partook of during his historic visit to our city on May 27, 2016.

In closing, I extend my best wishes for the success of this conference, as well as for everyone's health and good luck in their endeavors.

Sincerely yours,

松井一實

HIROSHIMA,JAPAN
Meeting Resolutions

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Plenary Talk I

Wednesday September 11, 9:20-10:20, M401, M402

Digital Industrial Automation Control Systems Towards Smart Society

Professor David Banjerdpongchai
Dept. of Electrical Engineering, Faculty of Engineering, Chulalongkorn University, Thailand

Abstract:
Thailand 4.0 is a strategic driving force that aims to restructure national economy toward value-based economy. The important mechanism is to transform traditional agriculture to smart agriculture, traditional SME to smart enterprises, to accomplish high value, knowledgeable, specialized and highly skilled labor. The ultimate goal is to lessen economic and social imbalance, and to achieve stability, prosperity and sustainability.

This talk presents recent trends in energy intensity and energy demand in ASEAN and addresses key energy policies. We will give an overview of digital transformation toward Thailand 4.0. In particular, we will present design framework of digital industrial automation control systems (IACS) which are applied to energy management systems (EMS), followed by the demonstrated case studies. Lastly, we will share the establishment of Control System Society of Thailand and IEC TC65 Thailand National Committee and their activities related to standardization of IACS in Thailand.

Biography:
David Banjerdpongchai has been with the department of Electrical Engineering, Faculty of Engineering, Chulalongkorn University. Currently, he is a professor of Electrical Engineering, head of Intelligent Control Automation of Process Systems Research Unit, and deputy director of International School of Engineering. He is a senior member of IEEE, a founding chair of IEEE Control Systems Society Thailand Chapter, an executive board member of ECTI Association, and a chair of IEC TC65 Thailand National Committee. In the past, he served as a chair of Systems and Control Technical Committee of ECTI Association and a member of Steering Committee of Asian Control Association. He was a general co-chair of ECTI-CON 2013, a TPC chair of ECTI-CON 2014, and a general chair of ICA-SYMP 2019. He will be a TPC co-chair of SICE 2020 in Thailand. He has published over 150 articles in journal and conference proceedings and a textbook on Dynamical Control Systems. His research interests are energy management systems, advanced process control, iterative learning control, and robust control applications.

Plenary Talk II

Wednesday September 11, 13:05-14:05, M401, M402

Alarm Analytics Tools for Industrial Monitoring Systems

Professor Tongwen Chen
Department of Electrical and Computer Engineering,
University of Alberta, Canada

Abstract:

In operating industrial facilities, alarm systems are configured to notify operators about any abnormal situation. The industrial standards (EEMUA and ISA) suggest that on average an operator should not receive more than six alarms per hour. This is, however, rarely the case in practice as the number of alarms each operator receives is far more than the standard.

There exist strong industrial needs and economic benefits for better interpreting and managing the alarms, and redesigning the alarm systems to reduce false and nuisance alarms, and increase the alarm accuracy. In this talk, we plan to summarize our recent work in this new area, targeting a quantitative and data based approach, called “alarm analytics,” and presenting a new set of tools for alarm visualization, performance evaluation and analysis, and rationalization design, thereby to help industrial processes to comply with the new standards. Topics to be discussed include

- How to present alarm information from a unit/plant/area?
- How to quantify and improve alarm accuracy and alarm chattering?
- How to study and cluster historical alarm floods?
- How to capture connectivity and causality from process and alarm data?
- What is recent development on advanced alarm monitoring?

The tools have been tested with real industrial data and used by process engineers in Canada and elsewhere.

Biography:

Tongwen Chen is currently a Professor and Tier 1 Canada Research Chair in Intelligent Monitoring and Control at the University of Alberta, Canada. He received the BEng degree in Automation and Instrumentation from Tsinghua University (Beijing) in 1984, and the MASc and PhD degrees in Electrical Engineering from the University of Toronto in 1988 and 1991, respectively. His research interests include computer and network based control systems, event triggered control, process safety and alarm systems, and their applications to the process and power industries. He is a Fellow of IEEE, IFAC, as well as Canadian Academy of Engineering.

Plenary Talk III

Thursday September 12, 9:00-10:00, M401, M402

Observability in stochastic systems: qualms for data science

Professor Bob Bitmead
Department of Mechanical & Aerospace Engineering, University of California, San Diego, USA

Abstract:
Observability, and related concepts of constructibility and detectability, are familiar notions from linear time-invariant state-estimate feedback control. However, their definitions are seemingly detached from stochastic problem formulations. Why, for example, is observability needed for the Kalman filter? A suitable definition of stochastic observability will be advanced and shown to subsume the linear deterministic condition, but also to expose for nonlinear systems the role of the control signal in defining and achieving observability. An example from network congestion control will be provided and then extended to quantitative measures in wireless communications, cost detectability and constraint management in stochastic Model Predictive Control. Broader connections to dual aspects of online learning and decision making will then be drawn with the deliberate intention of raising questions of data quality analysis in modern systems focused on artificial intelligence.

Biography:
Bob Bitmead occupies the Cymer Corporation Endowed Chair in Mechanical & Aerospace Engineering at the University of California, San Diego. He holds degrees in Applied Mathematics and Electrical Engineering from Sydney University and Newcastle University, both in Australia. He has held faculty positions at the Australian National University and James Cook University of North Queensland. He is a control theorist with a long experience in control applications in many industrial sectors. His theoretical work is strongly informed and guided by these applications. He was the recipient of the 2014 ASME Rufus Oldenburger Medal and of the 2015 IEEE Controls Systems Transition to Practice Award. Bob is President of the IEEE Control Systems Society for 2019. He was a member of the IFAC Council from 1996 to 2002 and is Editor-in-Chief of the IFAC Journal of Systems & Control. He is Fellow of IEEE, IFAC and the Australian Academy of Technological Sciences and Engineering. Bob brews his own beer and is an accredited and active Australian Rules Football umpire.

Plenary Talk IV

Thursday September 12, 13:05-14:05, M401, M402

KANSEI innovation based on Brain Science: Visualization of KANSEI and approach toward social implementation

Project Leader Takahide Nozawa
Center of KANSEI Innovation, Hiroshima University, Hiroshima, Japan
(Mazda Technical Research Center, Hiroshima, Japan)

Abstract:
At the Center of KANSEI Innovation, we develop the Brain Emotion Interfaces that enriches inter-human and object-human relations connected by KANSEI (emotions) visualization based on state-of-the-art brain sciences and information communication technology.

By Brain Emotion Interfaces, our mission is to develop products and services in various fields such as clothing, food, housing, vehicles, education, and medical care that nurture its mental values as their usage. Leading to innovation in the inter-human and object-human relations, we aim to create a society full of happiness where “objects” are in harmony with our “minds”.

The real-time visualization of KANSEI (emotions), visions and perceptions will support the future manufacturing and services with the classification of the variety of psychological information.
In this presentation, the basic study and practices will be discussed.

Biography:
Takahide Nozawa received the B.E degree in chemical engineering and the M.E and D.Eng. degrees in transport phenomena Engineering from Hiroshima University, Hiroshima, Japan, in 1978, 1980, and 1994, respectively. He is currently a Technical Fellow in Mazda Technical Research Center and a Visiting Professor of graduate School of Biomedical & Health Science in Hiroshima University. He is also a project leader of the national project “Center of Innovation” at the center of KANSI Innovation in Hiroshima University. His current research is interested in human machine interface, KANSEI brain science and aerodynamics of vehicle. He is a Fellow of JSME (Japan Society of Mechanical Engineers) and JSAE (Society of Automotive Engineers of Japan).

Tutorial I

Tuesday September 10, 13:00 – 17:00, Meeting room 3-1, 3-2, 3-3

Introduction to Haptics – Sensing, Feedback, and Sensory Evaluation

Main Organizer:
Yuichi Kurita, Hiroshima University, Japan
Co-organizers:
Taku Hachisu, University of Tsukuba, Japan
Yasutoshi Makino, The University of Tokyo, Japan
Masashi Nakatani, Keio University, Japan
Shogo Okamoto, Nagoya University, Japan
Toshiaki Tsuji, Saitama University, Japan
Shunsuke Yoshimoto, The University of Tokyo, Japan

Statement of Objectives:
This tutorial aims at introducing haptics technology to the community and encouraging audience to employ haptic technology in their research. Our tutorial is dedicated to haptics, which is multidisciplinary research field including electrical, mechanical and system engineering and sensory evaluation of human. We selected representative invited speakers who are working on different research methodologies in Haptics. We plan to provide the overview of the state of art in haptics research and possible applications using force feedback and touch devices. Besides, we will provide introductory knowledge on how to evaluate subjective sensory evaluation in human.

Intended Audience:
Audience who are interested in multidisciplinary research field including electrical, mechanical, system engineering and sensory evaluation of human users.

Speakers:
Dr. Yuichi Kurita, Hiroshima University, Japan

Yuichi Kurita received a Ph.D. degree in information science from Nara Institute of Science and Technology (NAIST), Japan in 2004. From 2005 to 2007, he was a Research Associate with the Graduate School of Engineering at Hiroshima University, Japan. From 2007 to 2011, he was an Assistant Professor with the Graduate School of Information Science at NAIST. During 2010-2011, he was a visiting scholar in the School of Mechanical Engineering at the Georgia Institute of Technology, USA. Since 2011, he has joined the Graduate School of Engineering at Hiroshima University as an Associate Professor, and is a Professor from 2018. He is also appointed to the Assistant to President by Special Appointment, and Special Assistant to the Dean (International Collaborative Research) from 2018. He has also worked as a researcher in JST PRESTO from 2011.
http://www.bsys.hiroshima-u.ac.jp/~kurita/index_e.html

Dr. Taku Hachisu, University of Tsukuba, Japan

Taku Hachisu received his PhD degree in engineering from the University of Electro-Communications, Tokyo, Japan in 2015. Since 2015, He is a Researcher of University of Tsukuba. His research interests include augmented/virtual reality, haptics, human-computer interactions, and wearable devices.
http://hachisu.net/

Dr. Yasutoshi Makino, The University of Tokyo, Japan

Yasutoshi Makino received his Ph.D. in Information Science and Technology from the Univ. of Tokyo in 2007. He worked as a researcher for two years in the Univ. of Tokyo and an assistant professor at Keio University from 2009 to 2013. From 2013 he moved to the Univ. of Tokyo as a lecturer, and he is an associate professor in the Department of Complexity Science and Engineering in the University of Tokyo from 2017. His research interest includes haptic interactive systems.
http://www.hapis.k.u-tokyo.ac.jp/

Dr. Masashi Nakatani, Keio University, Japan

After receiving his Ph.D. from the University of Tokyo, Masashi Nakatani worked for four years in the cosmetic industry and returned to academic research and started neuroscience study of touch at Keio University and at Columbia University Medical Center. He is currently conducting research on haptics science and the human body's perception of touch, while pursuing to make a connection between haptic research outcomes in academia and industrial applications.
http://touchlab.sfc.keio.ac.jp/
http://www.merkel.jp/

Dr. Shogo Okamoto, Nagoya University, Japan

Shogo Okamoto received a Ph.D. in information sciences from Tohoku University in 2010. Since then, he has been with Nagoya University. Currently, he is an associate professor at the Department of Mechanical Systems Engineering. His research interest includes haptics and assistive robotics.
http://www.mech.nagoya-u.ac.jp/asi/ja/member/shogo_okamoto/
https://researchmap.jp/read0153218/?lang=english

Dr. Toshiaki Tsuji, Saitama University, Japan

Toshiaki Tsuji received his Ph. D degree in integrated design engineering from Keio University, Yokohama, Japan, in 2006. He is currently an Associate Professor in Department of Electrical and Electronic Systems, Saitama University. His research interests include motion control, haptics and rehabilitation robots.
http://robotics.ees.saitama-u.ac.jp/index.html

Dr. Shunsuke Yoshimoto, The University of Tokyo, Japan

Shunsuke Yoshimoto received the Ph.D. degree in engineering from Osaka University, Osaka, Japan, in 2012. From 2012 to 2019, he was an Assistant Professor with the Graduate School of Engineering Science, Osaka University. Since 2019, he has been a lecturer with the School of Engineering, the University of Tokyo. His research interests include haptic engineering and biomedical instrumentation.
http://www.aml.t.u-tokyo.ac.jp/~yoshimoto

List of Topics:
Haptics
Tactile/force sensation
Human factors in human-machine interface and interaction
Human-computer interaction

Wearable devices
Assistive robotics
Rehabilitation robots
Biomedical instrumentation
Motion control
Augmented/virtual reality

Program:

- 13:00
  Introduction
- 13:10-13:40
  Haptics Technologies for Human-Computer and Human-Human Interactions
  Taku Hachisu (University of Tsukuba, Japan)
- 13:40-14:10
  Sensory Evaluation in Haptics
  Masashi Nakatani (Keio University, Japan)
- 14:10-14:40
  Haptic Information in Human Behavior
  Yasutoshi Makino (The University of Tokyo, Japan)
- 14:40-15:00 Coffee Break
- 15:00-15:30
  Introduction to Vibrotactile Stimuli. Easy-to-Use and Instrumental Technique
  Shogo Okamoto (Nagoya University, Japan)
  15:30-16:00
  Smart Sensing Technologies for Human Touch
  Shunsuke Yoshimoto (The University of Tokyo, Japan)
- 16:00-16:30
  Evaluation of Force Feeling and Its Applications
  Yuichi Kurita (Hiroshima University, Japan)
- 16:30-17:00
  High Dynamic Range Force/torque Sensing for Motion Skill Analysis
  Toshiaki Tsuji (Saitama University, Japan)
- 17:00-
  Closing

Tutorial II

Tuesday September 10, 9:00 – 17:30, M303

Process Data Analytics

Main Organizer:

Sirish L. Shah, University of Alberta, Canada

Co-organizers:

Bhushan Gopaluni, University of British Columbia, Canada

Biao Huang, University of Alberta, Canada

Manabu Kano, Kyoto University, Japan

Statement of Objectives:

We are currently at the cusp of the fourth industrial revolution (4IR) or Industry 4.0 that is poised to reshape all the sectors of economy and society with an unprecedented depth and breadth. Emerging technologies including complex organization and systems, smart sensing, industrial robotics, industrial wireless communications, industrial Internet-of-Things (IIoT), Internet-of-Moving-Things (IoMT), industrial cloud, industrial big data and cyber-physical systems (CPS) have become hotspots of research and innovation globally. Industry 4.0 is driven by the advancements in digitalization, artificial intelligence and advanced analytics, massive computing power, inexpensive memory and the enormous volumes of data that are being collected.

The process industries are in a unique position to benefit from Industry 4.0, as they have the right infrastructure, and are in possession of massive amounts of heterogeneous industrial data. Industry 4.0 is poised to provide economic and competitive advantages in the face of ever-increasing demands on energy, environment and quality by providing a level of automation and efficiency never seen before. Process industries have been using data analytics in various forms for more than three decades. In particular, statistical techniques, such as principal components analysis (PCA), partial least squares (PLS), canonical variate analysis (CVA); and time-series methods for modelling, such as maximum-likelihood and prediction-error methods have been successfully applied on industrial data. Recent developments in artificial intelligence, machine learning and advanced analytics provide a new opening for leveraging industrial data for solving complex systems engineering problems.

The emphasis in this tutorial workshop will be on tools and techniques that help in the process of understanding data and discovering information that will lead to predictive monitoring and diagnosis of process faults, design of soft-sensors, process performance monitoring and on-line modeling methods.

Highly interconnected process plants are now common and monitoring and analysis of root causes of process abnormality including predictive risk analysis is non-trivial. It is the extraction of information from the fusion of process data, alarm and event data and process connectivity that should form the backbone of a viable process data analytics strategy and this will be the main focus of this tutorial workshop.

Intended Audience:

The tutorial is specially addressed to researchers and PhD students interested in the practical approach to PID control. With emphasis on the ones that aim at process control applications and to develop practical approaches for PID controller tuning and design.

Speakers:

Dr. Bhushan Gopaluni, University of British Columbia, Canada

Bhushan Gopaluni is a professor in the Department of Chemical and Biological Engineering and an Associate Dean for Education and Professional Development in the Faculty of Applied Science at the University of British Columbia. He is also an associate faculty in the Institute of Applied Mathematics, the Institute for Computing, Information and Cognitive Systems, Pulp and Paper Center and the Clean Energy Research Center. He was the Elizabeth and Leslie Gould Teaching Professor from 2014 to 2017. He is currently an associate editor for Journal of Process Control, The Journal of Franklin Institute. He received a Ph.D. from the University of Alberta in 2003 and a Bachelor of Technology from the Indian Institute of Technology, Madras in 1997 both in the field of chemical engineering. From 2003 to 2005 he worked as an engineering consultant at Matrikon Inc. (now Honeywell Process Solutions) during which he designed and commissioned multivariable controllers in British Columbia's pulp and paper industry, and implemented numerous controller performance monitoring projects in the Oil & Gas and other chemical industries. He is the recipient of several awards that include Province of Alberta Graduate Fellowship, Captain Thomas Farell Graduate Memorial Scholarship from the University of Alberta and the prestigious Killam Teaching Prize and the Dean's service medal from the University of British Columbia.

Dr. Biao Huang, University of Alberta, Canada

Biao Huang received the B.Sc. and M.Sc. degrees in automatic control from the Beijing University of Aeronautics and Astronautics, Beijing, China, in 1983 and 1986, respectively, and the Ph.D. degree in process control from the University of Alberta, Edmonton, AB, Canada, in 1997. He joined the University of Alberta, in 1997, as an Assistant Professor with the Department of Chemical and Materials Engineering, where he is currently a Professor. He is the Industrial Research Chair in Control of Oil Sands Processes with Natural Sciences and Engineering Research Council of Canada. He has applied his expertise extensively in industrial practice particularly in oil sands industry. His current research interests include process control, system identification, control performance assessment, Bayesian methods, and state estimation. He is a fellow of the Canadian Academy of Engineering and the Chemical Institute of Canada. He is currently Editor-in-Chief for IFAC journal Control Engineering Practice.

Dr. Manabu Kano, Kyoto University, Japan

Manabu Kano received bachelor's, master's, and Ph.D. degrees from the Department of Chemical Engineering, Kyoto University, in 1992, 1994, and 1999, respectively. He was an Instructor with Kyoto University since 1994. From 1999 to 2000, he was a visiting scholar with Ohio State University, U.S. Since 2012, he has been a Professor of Systems Science, Kyoto University. His research interest has covered process, medical, and agricultural systems engineering, particularly real-world data analysis. He was a recipient of many awards, including the Best Paper Award and the Technology Award from the Society of Instrument and Control Engineers (SICE), the Instrumentation, Control and System Engineering Research Award from the Iron and Steel Institute of Japan (ISIJ), and the Outstanding Paper Award and the Research Award for Young Investigators from the Society of Chemical Engineers, Japan (SCEJ).

Dr. Sirish L. Shah, University of Alberta, Canada

Sirish L. Shah is Emeritus Professor at the University of Alberta where he held the NSERC-Matrikon-Suncor-iCORE Senior Industrial Research Chair in Computer Process Control from 2000 to 2012. The main area of his current research is process and performance monitoring, system identification and design, analysis and rationalization of alarm systems. He has co-authored three books, the first titled “Performance Assessment of Control Loops: Theory and Applications”, a second titled “Diagnosis of Process Nonlinearities and Valve Stiction: Data Driven Approaches” and a more recent brief monograph titled, “Capturing Connectivity and Causality in Complex Industrial Processes”. He is a fellow of the Canadian Academy of Engineering and the Chemical Institute of Canada.

List of Topics:

The following topics will be discussed in this workshop. Each topic will be accompanied by one or more industrial case study to convey the utilitarian value of the learning, discovery and diagnosis from process data.

1. Overview of the broad analytics area with emphasis on its use in the process industry.
2. Basic definitions and introduction to supervised and unsupervised learning: simple regression, classification and clustering.
3. Data visualization methods; examination and analysis of data in a multivariate framework (in the temporal as well as the spectral domains).
4. Multivariate methods for data analysis and soft-sensor design: PCA and PLS.
5. Elements of statistical inference, soft-sensor design, adaptive modeling.
6. A brief overview of latest developments in machine learning and their impact on the process industry.
7. Future areas to explore in the use of statistical learning, data science and analytics for improved process operation.

Program:

- 9:00-11:00
  Introduction to Process Data Analytics, Visual Analytics and Information-Theory based Approaches for Causality Analysis
  Sirish L. Shah (University of Alberta, Canada)
- 11:00-11:15 Coffee Break
- 11:15-12:45
  Process Data Analytics: Algorithms, Tools and Case Studies
  Biao Huang (University of Alberta, Canada)
- 12:45-13:30 Lunch Break
- 13:30-15:00
  Virtual Sensing Technology (Soft-Sensor) and Just-In-Time (Adaptive) Modeling
  Manabu Kano (Kyoto University, Japan)
- 15:00-15:15 Coffee Break
- 15:15-17:00
  Advanced Learning Algorithms: Artificial Neural Networks, Deep Learning and Deep Reinforcement Learning
  Bhushan Gopaluni (University of British Columbia, Canada)
- 17:00-17:30
  More Industrial Case Studies, General Discussion and Q & A Session
  All

Workshop I

Tuesday September 10, 13:00 – 17:30, M301

Advanced Alarm Management and Design for Complex Industrial Facilities

Main Organizers:

Wenkai Hu, China University of Geosciences, China
Sirish L. Shah, University of Alberta, Canada
Tongwen Chen, University of Alberta, Canada

Co-organizers:

Jiandong Wang, Shandong University of Science and Technology, China
Fan Yang, Tsinghua University, China
Masaru Noda, Fukuoka University, Japan

Statement of Objectives:

The objective of this workshop is to introduce participants to ideas and solutions for improved alarm management based on seamless integration of information from process and alarm databases complemented with process connectivity information. Process-data based alarm system design aims at obtaining optimal alarm parameters for filters, deadbands, delay timers, and alarm limits, based on evaluation metrics, including alarm detection delay and false and missed alarm rates. The advanced alarm analytics tools that will be presented at this workshop are able to detect nuisance alarms and discover hidden patterns from alarm and event historian using statistical learning and data mining approaches. Historical datasets combined with process topology information make it possible to capture propagation paths of abnormalities and thus can help with root cause analysis.

The focus of this workshop is to present recent advances and new techniques of industrial alarm management using sensor and alarm data analytics. The emphasis in this workshop will be on how to conduct advanced data analytics to extract useful information from data to help in designing optimal alarm systems, finding out problems, and discovering hidden patterns. Interesting topics covered in this workshop include correlated alarms, alarm floods, alarm system design, causality inference, root cause analysis, and visualization.

Intended Audience:

The intended audience for this workshop would be industrial practitioners working on real alarm managing problems, vendors designing alarm systems, researchers studying advanced alarm management solutions, graduate students with interests in data science and its application to solve industrial problems.

Speakers:

Dr. Sirish L. Shah, University of Alberta, Canada

Sirish L. Shah has been with the University of Alberta since 1978, where he held the NSERC-Matrikon-Suncor-iCORE Senior Industrial Research Chair in Computer Process Control from 2000 to 2012. He is the recipient of the Albright & Wilson Americas Award of the Canadian Society for Chemical Engineering (CSChE) in 1989, the Killam Professor in 2003, the D.G. Fisher Award of the CSChE for significant contributions in the field of systems and control, the ASTECH award in 2011 and the 2015-IEEE Transition to Practice award. The main areas of his current research are process and performance monitoring, analysis and rationalization of alarm systems. He has co-authored three books, the first titled, Performance Assessment of Control Loops: Theory and Applications, a second titled Diagnosis of Process Nonlinearities and Valve Stiction: Data Driven Approaches, and a more recent monograph on Capturing Connectivity and

Causality in Complex Industrial Processes. He is Emeritus Professor at the University of Alberta, a Fellow of the Canadian Academy of Engineering and the Chemical Institute of Canada.

Dr. Tongwen Chen, University of Alberta, Canada

Tongwen Chen is presently a Professor and Tier 1 Canada Research Chair in Intelligent Monitoring and Control in the Department of Electrical and Computer Engineering at the University of Alberta, Edmonton, Canada. He received the B.Eng. degree in Automation and Instrumentation from Tsinghua University (Beijing) in 1984, and the M.A.Sc. and Ph.D. degrees in Electrical Engineering from the University of Toronto in 19 88 and 1991, respectively. His research interests include computer and network based control systems, process safety and alarm systems, and their applications to the process and power industries. He has served as an Associate Editor for several international journals, including IEEE Transactions on Automatic Control and Automatica. He is a Fellow of IEEE, IFAC, as well as the Canadian Academy of Engineering.

Dr. Masaru Noda, Fukuoka University, Japan

Masaru Noda is a professor in Department of Chemical Engineering at Fukuoka University, Japan. He received the B.Eng., M.Eng., and Ph.D. degrees in Chemical Engineering from Kyoto University in 1994, 1996 and 2000, respectively. His main research focus is on plant operational data analysis for safe process operation.

Dr. Jiandong Wang, Shandong University of Science and Technology, China

Jiandong Wang is presently a full professor of College of Electrical Engineering and Automation at the Shandong University of Science and Technology, Qingdao, Shandong Province, China. He received a B.E. in automatic control from Beijing University of Chemical Technology, Beijing, China, in 1997, and an M.Sc and Ph.D. in Electrical and Computer Engineering from the University of Alberta, Canada, in 2003 and 2007, respectively. From 1997 to 2001, he was a Control Engineer with the Beijing Tsinghua Energy Simulation Company, Beijing, China. From February 2006 to August 2006, he was a Visiting Scholar at the Department of System Design Engineering at the Keio University, Japan. From December 2006 to October 2016, he was an assistant/associate/full Professor with the College of Engineering, Peking University, China.

Dr. Fan Yang, Tsinghua University, China

Fan Yang received the B.Eng. degree in Automation and the Ph.D. degree in Control Science and Engineering from Tsinghua University, Beijing, China, in 2002 and 2008, respectively. After working as a Postdoctoral Fellow with Tsinghua University and the University of Alberta, he joined the Department of Automation, Tsinghua University in 2011, where he is currently an Associate Professor. His research interests include topology modeling of large-scale processes, abnormal events monitoring, process hazard analysis, and smart alarm management. He was a recipient of the Young Research Paper Award from the IEEE Control Systems Society Beijing Chapter in 2006, the Outstanding Graduate Award from Tsinghua University in 2008, the Science and Technology Progress Award from the Chinese Association of Automation in 2018, and the Teaching Achievement Awards from Tsinghua University in 2012, 2014, and, 2016 and from the Chinese Association of Automation in 2016.

Dr. Wenkai Hu, China University of Geosciences, China

Wenkai Hu received the B.Eng. and M.Sc. degrees in Power and Mechanical Engineering from Wuhan University, Wuhan, Hubei, China, in 2010 and 2012, respectively, and the Ph.D. degree in Electrical and Computer Engineering from the University of Alberta in 2016. He worked as a Post-Doctoral Fellow from Oct. 2016 to Sep. 2018, and a Research Associate from Nov. 2018 to Feb. 2019 in the University of Alberta. He is currently a Professor with China University of Geosciences, Wuhan, China. His research interests include advanced alarm monitoring, process control, and data mining for complex industrial processes.

List of Topics:

The following topics will be discussed in this workshop. Each topic will be accompanied by one or more industrial case studies to convey the practical value of advanced alarm management techniques.

- **Sensor and Alarm Data Tools for Process Analytics**
  The process industry is awash with all types of data archived over many years: sensor data, alarm data with operator actions to 'navigate' the process to operate safely at desired conditions and process models that are used for advanced control. The fusion of information from such disparate sources of process data is the key step in devising strategies for a smart analytics platform for safe and autonomous process operation. The purpose of this talk is to present results and strategies that will ultimately lead to safe and optimal autonomous or semi-autonomous process operation.

- **Evaluation Methods of Plant Alarm Systems**
  This presentation will introduce two evaluation methods for plant alarm systems. The first method is for identifying sequential alarms hidden in plant operational data using dot matrix analysis. Dot matrix analysis is one of the sequence alignment methods for identifying similar regions in a pair of DNA or RNA sequences. The second evaluation method uses an operator model that mimics humans' fault detection and identification (FDI) behavior. The operator model automatically produces an FDI track in an emergency after a malfunction occurs. By analyzing the FDI tracks after causing all the assumed malfunctions in the plant, we can evaluate the performances of the alarm system. The results of the case studies demonstrate the usefulness of those evaluation methods.

- **Advanced Alarm Data Analytics**
  This presentation will show the applicability and effectiveness of statistical approaches and data mining techniques in discovering meaningful patterns from historical alarm data, such as mode-based alarms, frequent alarm flood patterns, and alarm response workflow models. Design of alarm data visualization will also be discussed.

- **Design of Alarm Systems and Root-Cause Analysis of Alarms**
  This presentation will introduce design of univariate alarm systems including alarm delay times and deadbands, operating-zone-based multivariate alarm systems, and root-cause analysis of alarms based on the clusters of similar data segments in historical databases.

- **Multivariate Alarm Strategies and Analysis Methods**
  This presentation will introduce advanced alarms based on process data analytics and correlation/causality analysis based on process and alarm data mining in combination with process connectivity knowledge, with applications to root cause analysis of propagated or even plant-wide abnormalities.

Program:

- 13:00-13:15
  Opening Remarks and Introduction
  Tongwen Chen, (University of Alberta, Canada)
- 13:15-14:00
  Sensor and Alarm Data Tools for Process Analytics
  Sirish L. Shah (University of Alberta, Canada)
- 14:00-14:45
  Evaluation Methods of Plant Alarm Systems
  Masaru Noda (Fukuoka University, Japan)
- 14:45-15:00 Coffee Break
- 15:00-15:45
  Advanced Alarm Data Analytics
  Wenkai Hu (China University of Geosciences, China)
- 15:45-16:30
  Design of Alarm Systems and Root-Cause Analysis of Alarms
  Jiandong Wang (Shandong University of Science and Technology, China)
- 16:30-17:15
  Multivariate Alarm Strategies and Analysis Methods
  Fan Yang (Tsinghua University, China)
- 17:15-17:30
  General Questions and Answers, and Discussions
  Moderated by Tongwen Chen

Workshop II

Tuesday September 10, 13:00-17:25, M302

Recent Advances and Future Trends in Basics and Applications of Gaussian Processes

Main Organizer:

Takamitsu Matsubara, Nara Institute of Science and Technology, Japan

Co-organizers

Satoshi Satoh, Osaka University, Japan

Statement of Objectives:

The Gaussian processes that appeared in the machine learning field since around 2000 are extensively utilized in various application fields because of their mathematical simplicity and ease of handling in Bayesian reasoning. They have also been recently drawing much attention in the field of control engineering such as control theory and system identification in particular for stochastic systems. In this workshop, we will have four invited speakers from such various fields as modeling, robotics, reinforcement learning, and control theory, to discuss the recent advances and future trends in basics and applications of Gaussian processes.

Intended Audience:

Engineers, researchers, and graduate students who are interested in AI, machine learning, robotics, modeling, stochastic systems, and control engineering.

Speakers:

Dr. Daichi Mochihashi, The Institute of Statistical Mathematics, Japan

Daichi Mochihashi received BS from the University of Tokyo, MS and PhD from Nara Institute of Science and Technology in 1998, 2000, and 2005, respectively. After working at ATR Spoken language research laboratories and NTT CS labs, he has been an associate professor at the Institute of Statistical Mathematics, Tokyo, Japan since 2011. His research mainly focuses on statistical natural language processing, but is also interested in Bayesian machine learning and robotics related to languages.

Dr. Jaime Valls Miro, University of Technology, Sydney, Australia

Jaime Valls Miro received his B.Eng. and M.Eng. in Computer Science (Systems Engineering) from the Valencia Polytechnic University (UPV, Spain), in 1990 and 1993 respectively. He received his Ph.D. in robotics and control systems from Middlesex University (UK) in 1998, and worked in the underwater robotics industry as a software and control systems analyst until 2003. In 2004 he joined the Centre for Autonomous Systems in UTS (Australia), where he is currently an Associate Professor. His areas of interest span across the field of robotics, most notably modelling sensor behaviours for perception and action, computational Intelligence in human-robot interaction – particularly advocating for the use of machine learning tools such as Bayesian Networks, Gaussian Processes etc and with a special focus on Assistive Robotics, and mapping and planning in unstructured environments. In the last few years he has devoted this combined interest in pursuing a better understating of condition assessment sensing for critical water mains in close collaboration with the water industry. He is a Committee Member and regular reviewer at the top robotics conferences (ICRA, IROS …) and journals (AURO, FSR, Robotica, etc).

Dr. Takamitsu Matsubara, Nara Institute of Science and Technology, Japan

Takamitsu Matsubara received his B.E. in electrical and electronic systems engineering from Osaka Prefecture University, Osaka, Japan, in 2003, an M.E. in information science from the Nara Institute of Science and Technology, Nara, Japan, in 2005, and a Ph.D. in information science from the Nara Institute of Science and Technology, Nara, Japan, in 2007. From 2005 to 2007, he was a research fellow (DC1) of the Japan Society for the Promotion of Science. From 2013 to 2014, he was a visiting researcher of the Donders Institute for Brain Cognition and Behaviour, Radboud University Nijmegen, Nijmegen, The Netherlands. He is currently an associate professor at the Nara Institute of Science and Technology and a visiting researcher at the ATR Computational Neuroscience Laboratories, Kyoto, and AIST, Tokyo, Japan His research interests are machine learning and control theory for robotics.

Dr. Yuji Ito, Toyota Central R&D Labs, Japan

Yuji Ito received his B.S., M.S., and Ph.D. degrees from Nagoya University, Japan, in 2009, 2011, and 2014, respectively. Since 2011, he has been with TOYOTA CENTRAL R&D LABS., INC., Japan. His research interests include data-driven control, stochastic control, optimal control, and tactile sensors. He is a member of SICE and IEEE.

List of Topics:

- **Gaussian Processes for Recognizing Motions in Robotics**
  Gaussian process (GP) is a mathematically elegant paradigm for dealing with stochastic trajectories and their fluctuations inherent to robotics. In this talk, I will briefly introduce the machinery of Gaussian processes from a viewpoint of extended linear regression, and describe our work on recognizing motions (running, walking, grasping, throwing, ..) only from the observed time series of the angles of joints of a robot. Using a dynamic programming and MCMC, our model can recognize motions and the number of such motions in a completely unsupervised way, also leveraging the hierarchical Dirichlet processes.

- **Exploiting GPs for Information-Theoretic Robotic Mapping**
  The talk will describe a framework for autonomous robotic mapping that uses Gaussian Processes (GPs) to model high-dimensional dense maps. Robotic mapping is traditionally implemented using occupancy grid representations. The occupancy grid representation relies on the assumption of independence between grid cells and ignores structural correlations present in the environment. An incremental GP occupancy mapping technique that is computationally tractable for online map building and represents a continuous model of uncertainty over the map spatial coordinates will be described. This representation is particularly suited for robotic exploration with imperfect stated information. The standard way to represent geometric frontiers extracted from occupancy maps is to assign binary values to each grid cell. This notion can be now extended to novel probabilistic frontier maps computed efficiently using the gradient of the GP occupancy map. The intuition behind a mutual information-based greedy exploration technique built on that representation will be provided. A primary motivation is the fact that high-dimensional map inference requires fewer observations, leading to faster map entropy reduction during exploration for map building scenarios.

- **Multimodal Gaussian Process Policy Search for Robot Control**
  Policy search reinforcement learning using non-parametric policy models is a promising approach for learning of continuous robot control from data with high-dimensional, non-linear and redundant sensory inputs as observations. However, previous methods cannot capture the multimodality in control policies, which is often required for various robotics tasks. In this talk, we will discuss a novel policy search reinforcement learning algorithm that can deal with multimodality in control policies based on Overlapping

Sparse Pseudo-input Mixtures of Gaussian Processes (OMSGPs). Its application to several robot control problems will be also discussed.

- **Design of Feedback Controllers Based on Gaussian Process Regression**
  Gaussian process (GP) regression is a promising method for identifying uncertain systems as data-driven GP models using a training data set of the systems. The GP models avoid overfitting to the data, need little knowledge of the systems, and obtain the uncertainty. Recently, various methods focus on controlling the GP models and designing flexible controllers using the GP regression. This talk will introduce approaches to design feedback controllers based on the GPs.

Program:

- 13:00
  Opening Remarks
  Takamitsu Matsubara (Nara Institute of Science and Technology, Japan)
- 13:05-14:00
  Gaussian Processes for Recognizing Motions in Robotic
  Daichi Mochihashi (The institute of Statistical Mathematics, Japan)
- 14:00-14:55
  Exploiting GPs for Information-Theoretic Robotic Mapping
  Jaime Valls Miro (University of Technology, Sydney, Australia)
- 14:55-15:30 Coffee Break
- 15:30-16:25
  Multimodal Gaussian Process Policy Search for Robot Control
  Takamitsu Matsubara (Nara Institute of Science and Technology, Japan)
- 16:25-17:20
  Design of Feedback Controllers Based on Gaussian Process Regression
  Yuji Ito (Toyota Central R&D Labs, Japan)
- 17:20-17:25
  Concluding Remarks
  Satoshi Satoh (Osaka University, Japan)

SICE 2019 Special Sessions and Poster Session

SICE Annual Conference Awards

Description

To recognize excellent presenters who submit high quality papers and present them at the SICE Annual Conference.

Categories

1. SICE Annual Conference International Award (no restriction on age, Sub Category: Basic technology/Application)
2. SICE Annual Conference Young Author's Award (under 35 years of age)
3. SICE Annual Conference Poster Presentation Award (no restriction on age)

The presenters of International Awards and Young Author Awards Candidate present at the following sessions.

WeB05: SICE AC Young Author's Award Candidates (Meeting Room 3-1, 3-2, 3-3)
WeC05: SICE AC International Award Candidates (Meeting Room 3-1, 3-2, 3-3)

The poster presentations are the followings.

ThAPo01-ThAPo06: Poster Session (Meeting Room 3-1, 3-2, 3-3)

SICE2019 Special Panel Session: International Symposium on Smart Manufacturing and Industrial Network 2019 (I & II)

Planned by Technical Committee on Instrument and Control Networks in Technical Division on Industrial Applications
Co-planned by Committee on International Affairs and Committee on International Standardization

Date & time:
10:40-12:10/14:25-15:55, Sep.11 (Wed), 2019
Place:
WeA11/WeB11 (S206), Higashi-Senda School Main Building S of Hiroshima University
Program:
10:40-12:10 International Symposium on Smart Manufacturing and Industrial Network 2019 (I)
14:25-15:55 International Symposium on Smart Manufacturing and Industrial Network 2019 (II)

Abstract:

Technical Committee on Instrument and Control Networks plans SICE2019 Special Session: International Symposium on Smart Manufacturing and Industrial Network 2019. The theme is “Industrial IoT: System Architecture for Smart Manufacturing and Next-Generation Industrial Network”. The special panel session is held to follow up, drill deep into and expand plenary talk and following two organized session themes in collaboration with international guest speakers.

Anyone is encouraged to participate these sessions. Participants will argue fruitful discussion, create friendship relation and obtain expertise through on-going activities regarding latest trend of smart manufacturing standardization and industrial network.

Plenary talk related with the special panel session (Sponsored by JEMIMA)

Title: Digital Industrial Automation Control Systems Towards Smart Society
Speaker: Professor David Banjerdpongchai
Affiliation: Dept. of Electrical Engineering, Faculty of Engineering, Chulalongkorn University, Thailand
Date & time: 9:20-10:20, Sep.11 (Wed), 2019
Place: M401,M402

Two Organized Sessions held after the special panel session

(1) “International Standardization for "System"” planned by Committee on International

Standardization

ThA09 (Conference Room M203): Time / Date 10:20 – 11:20 / Sep.12 (Thu)

(2) “Innovation for New Value Creation in Manufacturing I and II” planned by Technical Committee on Instrument and Control Networks

ThB09 (Conference Room M203): Time / Date 14:35 – 15:55 /Sep.12 (Thu)

FrC09 (Conference Room M203): Time / Date 13:15 – 14:30 /Sep.13(Fri)

SICE WEEK 2019

SICE WEEK is an open event to introduce SICE for the general public. This is a parallel event of SICE annual conference 2019 in Hiroshima. In SICE WEEK 2019, technologies constructing Society 5.0 (Super-smart society) will be exhibited.

Schedule: September 10 13:00 – 17:00, 11 and 12 10:00 - 17:00

Exhibitors List

Exhibitors	Contents
Mazda Motor Corporation	Engine model (SKYACTIV-X)
Toyota Motor Corporation	MONET (New mobility service) MIRAI (Fuel cell vehicle)
Honda Motor Co., Ltd.	Automated Driving, ADAS (Advanced Driver Assistance System) and in-vehicle infotainment technologies
Hiroshima University - KOBELCO Construction Machinery Dream-Driven Co-Creation Research Center	Virtual Training System of a Hydraulic Excavator
Luce Search Inc.	Drone

Poster presentations

Robot competitions	Embedded Technology Software Design Robot Contest
	RoboCup
Educations	SICE WEEK2019 in Higashihiroshima (August 10, 2019)
	Programing class for primary school students
Research reports	Research reports by high school students from the Global Science Campus (It will be held on September 12)

Tours [Free (No extra charge)]
Meeting time: September 11, 10:30 AM, 2:15 PM, 4:05 PM
September 12, 10:10 AM, 2:25 PM, 4:30 PM
Meeting point: Registration desk, Duration: 1.25 hours

Venue: CLiP HIROSHIMA (See the access map on p.45)

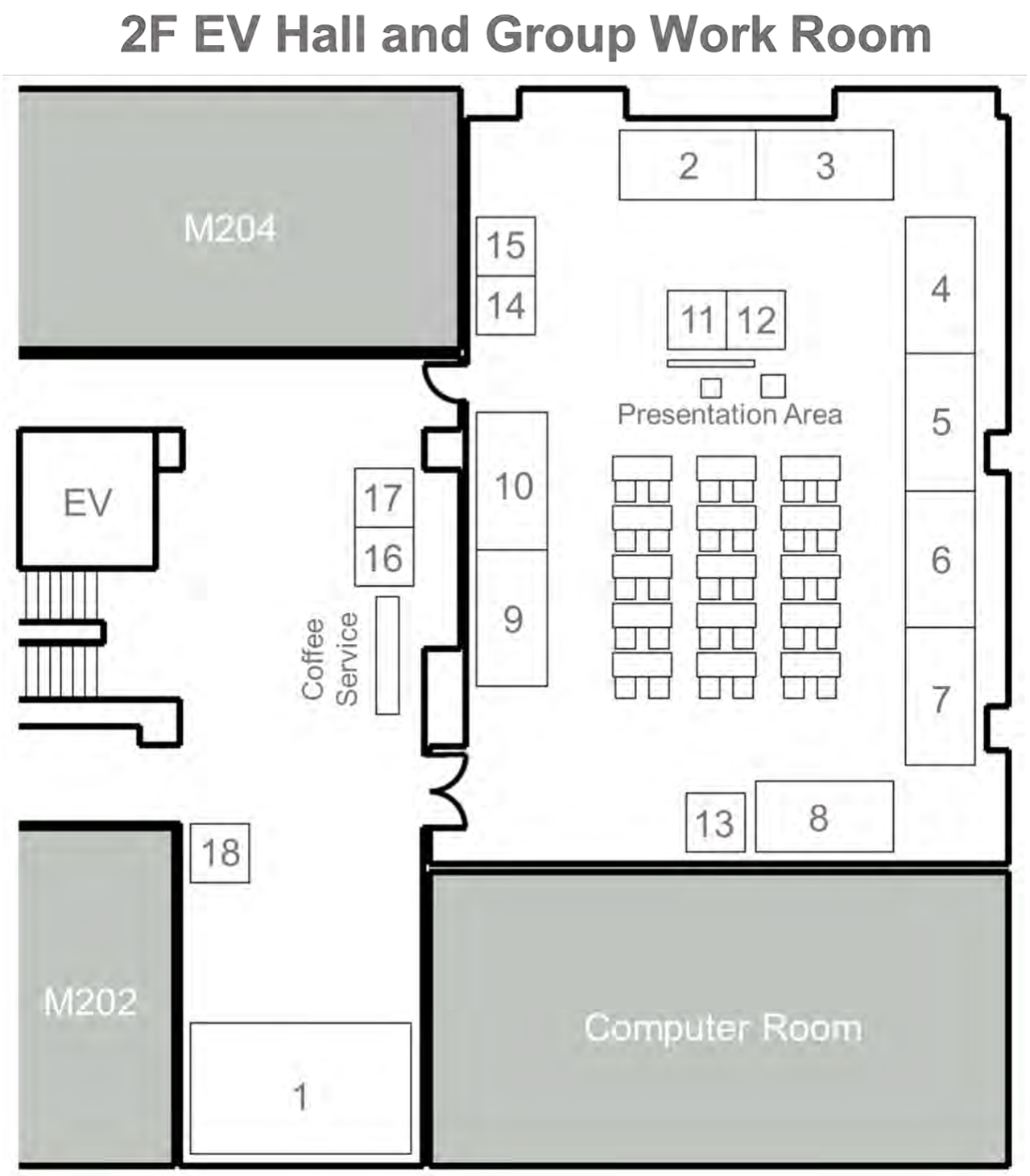
Organizer & Sponsor: The Society of Instrument and Control Engineers (SICE)
In Association with HIROJIREN (Hiroshima Council for the Promotion of Collaboration between Government, Academia and the Automobile Industry)

Exhibition and Technical Seminars

Exhibition and Technical Seminars by exhibitors will be held during September 11 to 13 at 2F EV Hall and Group Work Room.

Exhibitors (in alphabetical order)	Exhibition Area	Seminar
Applied Co., Ltd.	(16)	N/A
ARC Advisory Group Inc.	(18)	N/A
Asahi Kokusai Techneion Co., Ltd.	(15)	N/A
Azbil Corporation	(9)	12th：14:30～15:00
CYBERNET SYSTEMS CO., LTD.	(6)	N/A
dSPACE Japan KK	(4)	12th：11:30～12:00
Fuji Electric Co., Ltd.	(7)	N/A
HIROSHIMA PREFECTURAL GOVERNMENT	(2)	N/A
HIROSHIMA UNIVERSITY	(3)	N/A
HIROSHIMA UNIVERSITY - KOBELCO Construction Machinery Dream-Driven Co-Creation Research Center	(1)	N/A
Honda R&D Co., Ltd.	(8)	11th：11:30～12:00
i-NEAT Co., Ltd.	(14)	N/A
Japan Electric Measuring Instruments Manufacturers' Association (JEMIMA)	(17)	N/A
Japan Electrics and Information Technology Industries Association (JEITA)	(12)	N/A
Quanser Inc. / ALTEX Corporation	(5)	11th：14:30～15:00
SenseTime Japan Ltd.	(13)	11th：11:00～11:30
YDC Corporation	(11)	11th：14:00～14:30 12th：15:00～15:30
Yokogawa Solution Service Corporation	(10)	N/A

Layout of Exhibitions



Sponsored Session & Keynote Speech I

Recent Trends on Process Control and Monitoring (I & II)
Sponsored by ADAPTEX Co., LTD.

Wednesday September 11, 10:40-11:25, M401

Integrated Set-Point Learning for Iterative Learning Control

Professor Arun K. Tangirala
Department of Chemical Engineering
IIT Madras, India

Abstract:
Iterative Learning Control (ILC) has risen to prominence in applications where a control operation is performed repeatedly. ILC capitalizes on the repetitive nature of the operation and aims at closely tracking the user defined set-point by exploiting information from preceding trials. This information is then used to update the control input for the upcoming one. However, in systems that employ ILC, the set-point value required to achieve the desired output is not always known. In this paper we propose Integrated Set-Point Learning on top of a Linear Quadratic Direct ILC(LQ-ILC) to determine the optimal set-point profile. This is done by iteratively updating the set-point profile using gradient based algorithms upon completion of an entire control sequence. The approach is demonstrated on two systems taken from different engineering domains. In the first example of the Constant Velocity Differential Drive Robot (CVDDR) the method optimizes the robot's set-point trajectory iteratively whilst also improving tracking over the course of runs. In the second example the method is implemented on the Cott-Batch Reactor (CBR) to achieve user desired end product quality. The inter run stability of the system is investigated numerically and simulation results obtained demonstrate the efficacy of the method.

Biography:
Dr. Arun K. Tangirala is a Professor at the Department of Chemical Engineering, IIT Madras. His research interests span the fields of process control and monitoring, system identification, data sciences and renewable energy systems. His research group has been actively involved in solving cutting edge and multi-disciplinary problems of causality analysis, network reconstruction, control loop performance monitoring, multiscale identification, sparse optimization (compressive sensing)-based identification, systems biology and modern applications of data science that includes national and international collaborations. He obtained his BE degree from IIT Madras in 1996 and his PhD degree from University of Alberta, Canada in 2001. He joined the Department of Chemical Engineering, IIT Madras in Dec. 2004. He is a recipient of prestigious teaching & research awards and international fellowships. He has recently authored a comprehensive classroom text on data-driven modelling, titled "Principles of System Identification: Theory and Practice", published by CRC Press.

Sponsored Session & Keynote Speech II

Revitalize Industry through Model Based Development
Sponsored by HIROJIREN (Hiroshima Council for the Promotion of Collaboration between Government, Academia and the Automobile Industry)

Thursday September 12, 10:20-11:05, M401

New System Design Approach to Realize New Society by Integrating Multi-Discipline

Professor Seiko Shirasaka
Graduate School of System Design and Management
Keio University, Japan

Abstract:
The difficulty of system development has been increasing in recent years. In this position paper, we propose a system design approach based on system thinking as one of the solutions, and specifically show the design of non-technical systems, the design of social and industrial systems, and the design of thinking processes as an example.

Biography:
Dr.Seiko Shirasaka earned a Master's degree in Astronautics from University of Tokyo and Doctoral degree in Systems Engineering from KEIO university. He worked for Mitsubishi Electric Corporation as a space systems engineer for 15 years. One of the projects which he worked for is HTV, H-II transfer vehicle, from ground to the international space station. His final position in HTV project was a technical lead in Mitsubishi Electric Corporation. He had been an Associate Professor at Graduate School of System Design and Management at KEIO university since 2008 and he has been a Professor since 2017. His main research topics are System development methodology especially systems architecture. He was a program manager on ImPACT (Impulsing Paradigm Change through Disruptive Technologies Program) lead by Cabinet Office of Japan from 2015 through 2019, and developed Small Synthetic Aperture Radar(SAR) Satellite System for On-Demand Observation.

Sponsored Session & Keynote Speech III

SICE-ECTI Organized Session on Advances on Control Engineering and Applications (I & II)
Sponsored by KOBELCO Construction Machinery Co., Ltd.

Friday September 13, 10:35-11:20, M401

Minimal Modelling Characterization of Agricultural Mobile Robot Body Vibration

Senior Lecture Sungwan Boksuwan
Department of Mechatronics Engineering
King Mongkut's Institute of Technology Ladkrabang, Thailand

Senior Lecture Napasool Wongvanich
Department of Instrumentation and Control Engineering
King Mongkut's Institute of Technology Ladkrabang, Thailand

Abstract:
This paper presents the application of integral based method for characterization of the vibration in the four-wheel agricultural mobile robot, which is designed for use in applications such as spraying and harvesting. Vibration occurs when one of the wheels does not touch the ground, thereby reducing the effect of the end effector. A second order differential equation with constant time delay is assumed, whereby an integral based identification method is applied on the model. This formulation turns a nonlinear optimization problem into a simple linear least square problem which can be implemented on-the-fly. Results show that the proposed method can simplify the system identification procedure, while yielding an excellent NRMSE match of 99.1%.

Biography:
Sungwan Boksuwan received his M.Eng. Degree in Electrical Engineering from Chulalongkorn University, Thailand in 2005, and his Ph.D. In Mechanical and Intelligent Systems from the University of Electro-Communications, Japan in 2015. He is currently a Senior Lecturer in Mechatronics Engineering at King Mongkut's Institute of Technology Ladkrabang (KMITL) in Thailand. His main research interests are in Autonomous agricultural and aquacultural systems.

Napasool Wongvanich received his B.Eng. (Hons. I) in Electrical and Electronics Engineering from the University of Canterbury in 2008. He then received his Ph.D., also in Electrical and Electronics Engineering, in 2016. He is currently a Senior Lecturer in Instrumentation and Control Engineering at King Mongkut's Institute of Technology Ladkrabang (KMITL) in Thailand. His research interests include system identification and control for industrial, biomedical, and autonomous applications, with special focus on agricultural systems.

Social Events and Local Information

Registration Desk
Location: The entrance hall of Higashi-Senda Innovative Research Center, Hiroshima University.
Opening hours

Tuesday	September 10	12:00-18:00 (8:30-10:00 only for participants of Tutorial II)
Wednesday	September 11	8:30-17:00
Thursday	September 12	8:30-17:00
Friday	September 13	8:30-15:30

Welcome Reception
Tuesday, September 10, 18:00-20:00, CLiP HIROSHIMA (the immediate proximity of the conference venue)
Address: 1-1-18 Higashi-Senda machi, Naka-ku, Hiroshima 730-0053, Japan
URL: https://cliiip.h-toyopet.com/
Note: Please bring your **NAME TAG and TICKET** distributed at the registration desk.

Opening Ceremony
Wednesday, September 11, 9:00-9:20, M401, M402 Higashi-Senda Innovative Research Center, Hiroshima University.

Coffee Service (Sponsored by Calbee & KOBELCO Construction Machinery Co. Ltd.)
Coffee service will be provided in 2F EV Hall from Tuesday, September 10th through Friday, September 13th.
Note: Please drink coffee at only M202. Eating and drinking is prohibited in other rooms (See the floor plan on p.47).

Exhibition
You can find our great exhibitors in the 2F EV Hall and the Group Work Room from Wednesday, September 11 through Friday, September 13.

Awards Ceremony
Thursday, September 12, 16:30-18:00, M401, M402 (Awards Ceremony will be held in Japanese)

Banquet
Thursday, September 12, 19:30-21:30, RIHGA Royal Hotel Hiroshima (next to the Kencho-Mae St. Astramline)
Address: 6-78 Motomachi, Naka-ku, Hiroshima 730-0011, Japan
URL: https://www.rihga.com/hiroshima
Note: Please bring your **NAME TAG and TICKET** distributed at the registration desk.

Closing Ceremony
Friday, September 13, 15:05-16:05, M401, M402

Farewell Reception (Sponsored by KOBELCO Construction Machinery Co. Ltd.)
Friday, September 13, 17:30-19:30, Dinner Cruising in the Seto Inland Sea
Gathering Time: 16:15 at the registration desk of the conference site (Higashi-Senda Innovative Research Center, Hiroshima University)
Note: Please bring your **NAME TAG and TICKET** distributed at the registration desk.

You can find the most updated information at http://www.sice.jp/siceac/sice2019/

SICE Technical Visit

Course 1

Date: Wednesday 11th September 2019

Visit place: **Robot Park Hiroshima** run by SANKO DENGYO Co.

Website: http://www.sumnet.co.jp/

(cf. https://www.hiroshimacvb.jp/unique-experience/industrial-tours/1308.html)

Means of travel: A chartered bus

Provisional Schedule

13:45 Depart the Innovative Research Center

(Travel time: 15 minutes)

14:00 Arrive at Robot Park

14:10 Start Technical Visit

- Brief introduction of SANKO DENGYO (5 minutes)
- Company tour (60 minutes)
- Session with SANKO DENGYO's engineers (25 minutes)

15:50 Depart Robot Park

(Travel time: 15 minutes; while travelling on the bus, participants will be asked to fill out feedback survey forms.)

16:05 Arrival at the Innovative Research Center

Course 2

Date: Thursday 12th September 2019

Visit place: **Kumahira co. "Showroom"**

Website: https://www.kumahira-safe.com/

(cf. https://www.hiroshimacvb.jp/unique-experience/industrial-tours/1306.html)

Means of travel: A chartered bus

Provisional Schedule

13:45 Depart the Innovative Research Center

(Travel time: 15 minutes)

14:00 Arrive at Kumahira co.'s Showroom

14:10 Start Technical Visit

- Company introduction video (8 minutes)
- Showroom tour (60 minutes)

- Session with Kumahira's engineers (30 minutes)

15:50 Depart Kumahira's showroom

(travel time: 15 minutes; while travelling on the bus, participants will be asked to fill out feedback survey forms.)

16:05 Arrive at the Innovative Research Center

Course 3

Date: Friday 13th September 2019

Visit Place: **OKOSTA and MAZDA Museum**

- **OKOSTA: https://www.otafukusauce.com/e/**
- **MAZDA: Museum https://www.mazda.com/en/about/museum/guide/**

(cf. https://www.hiroshimacvb.jp/unique-experience/industrial-tours/1298.html)

Means of travel: A chartered bus

If you choose course 3 and you have any dietary restrictions such as vegetarian or haral diet, please let us know beforehand.

Provisional Schedule

11:45 Depart the Innovative Research Center

(travel time: 20 minutes)

12:05 Arrive at OKOSTA

- Cooking experience (60 minutes)

13:00 Departure from OKOSTA

(travel time: 25 minutes)

13:25 Arrive at the MAZDA Museum

- Museum tour (60 minutes)

14:30 Depart the MAZDA Museum

(travel time: 30 minutes; while travelling on the bus, participants will be asked to fill out feedback survey forms.)

15:00 Arrive at the Innovative Research Center

Please kindly note following,

1. This model project is subsidized by Hiroshima Convention & Visitors Bureau (HCVB). Because of that, any pictures taken during this technical visit tour may be used on HCVB website or HCVB newsletters for promotion purposes.
2. Just in case of any accidents, we will need your name and your company name for

travel accident insurance. The insurance fee will be paid by HCVB.

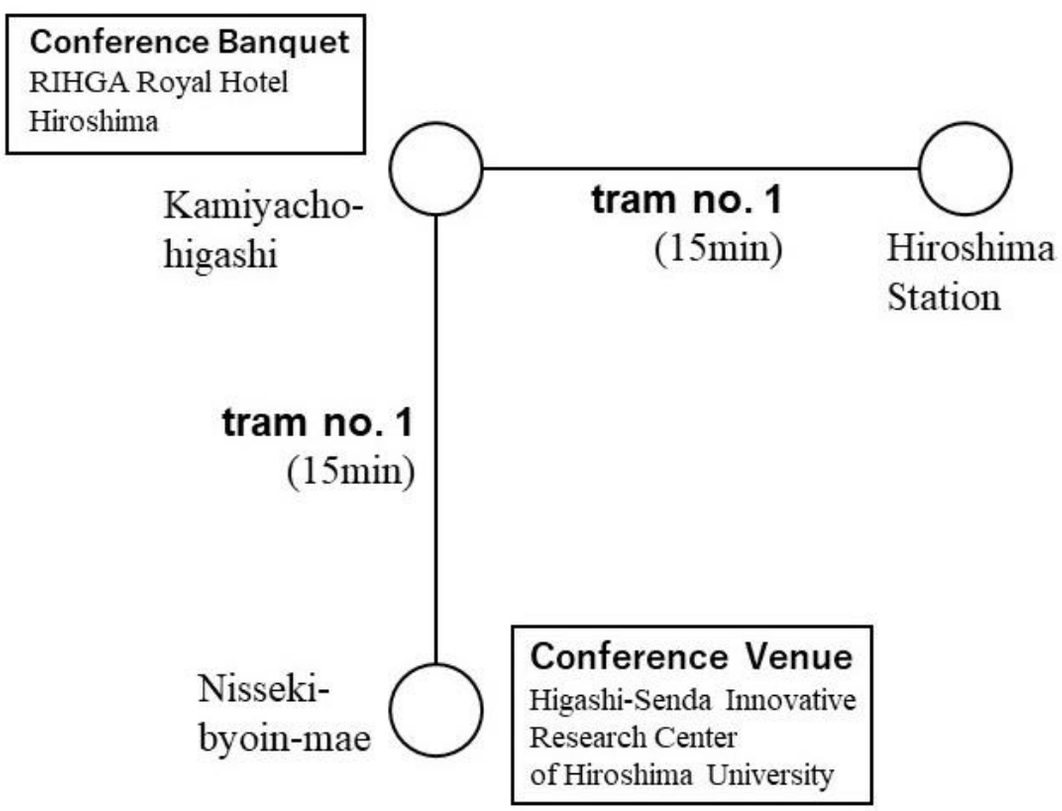
3. You will not be required to pay any costs to attend this technical visit tour.

Conference Venue

SICE Annual Conference is held at Higashi-Senda Innovative Research Center of Hiroshima University.
Address: 1-1-89 Higashi-Senda-machi Naka-ku, Hiroshima, 730-0053, Japan
URL: https://www.hiroshima-u.ac.jp/en/access/higashisendacampus

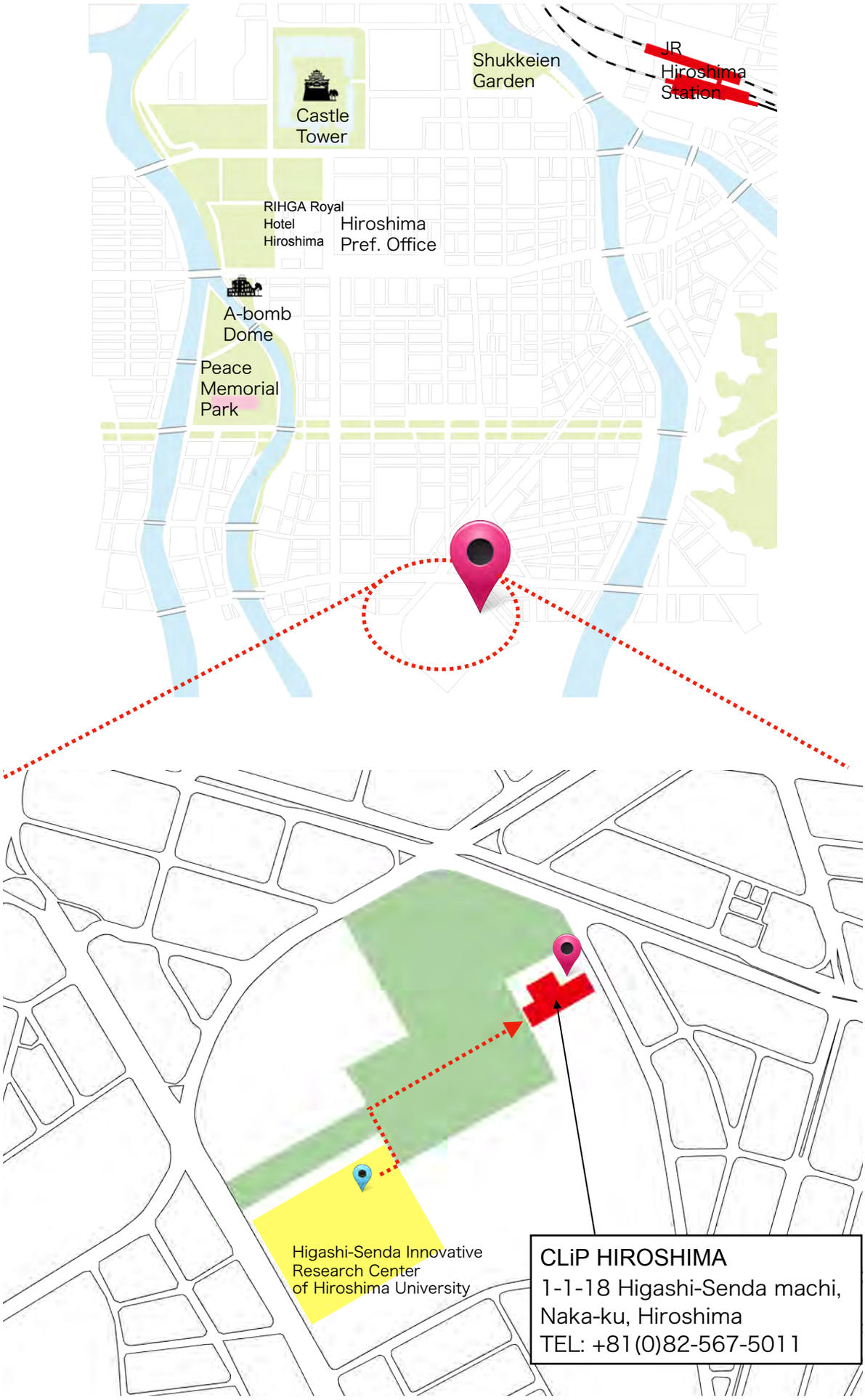
On Foot
Approximately 40 minutes from JR Hiroshima Station.

By Tram (Hiroshima Electric Railway https://www.hiroden.co.jp/en/s-routemap.html)
Take tram no. 1 from the tram stop located in front of Hiroshima Station. Get off the tram in front of the Red Cross Hospital (Nisseki-byoin-mae). It will take approximately 30 minutes. The Higashi-Senda Campus is located on the left hand side of the road, approximately 50 meters past the tram stop.

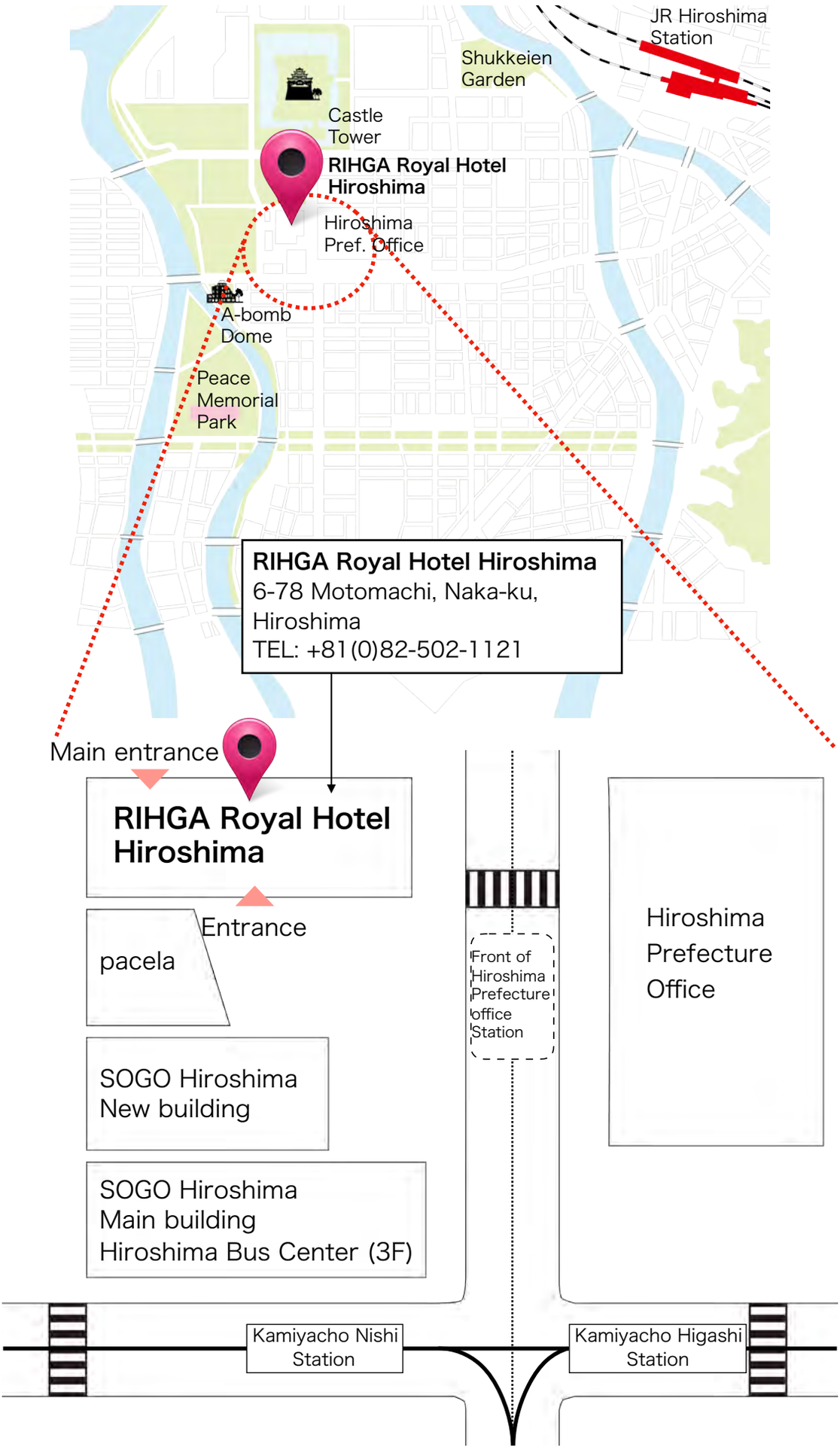


Access Map for Conference Venue

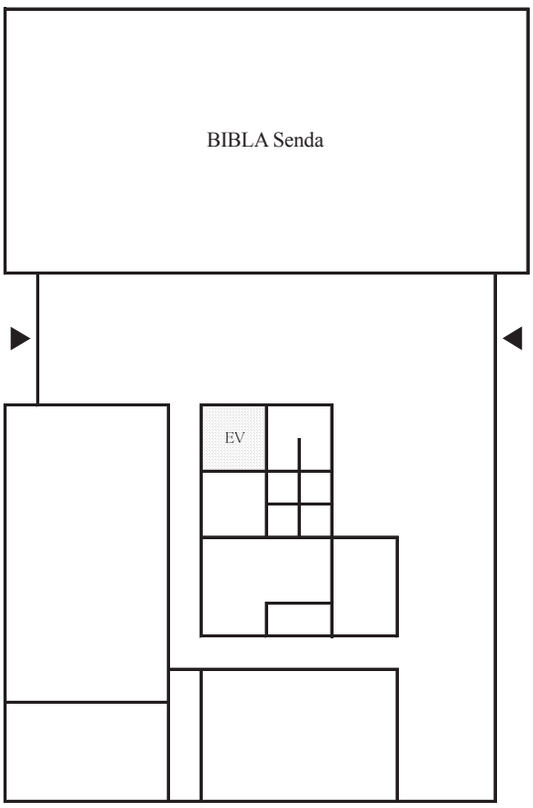
Access Map for Welcome Reception



Access Map for Banquet



Floor Plan



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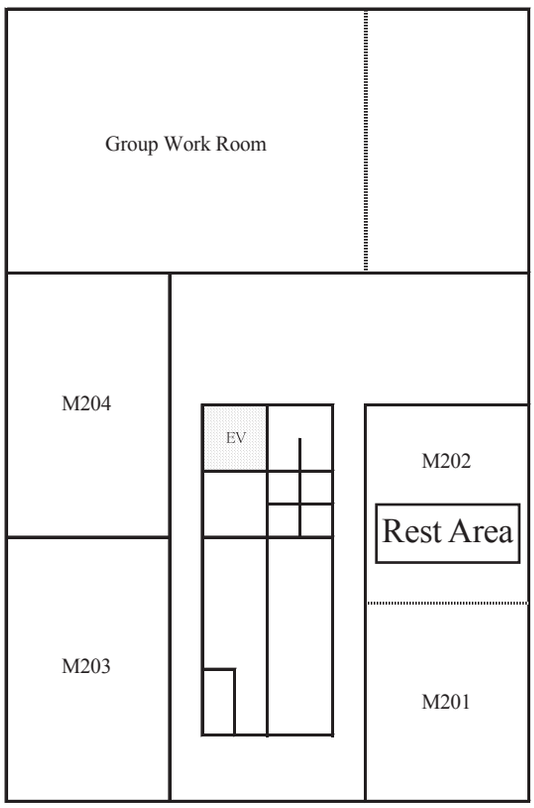

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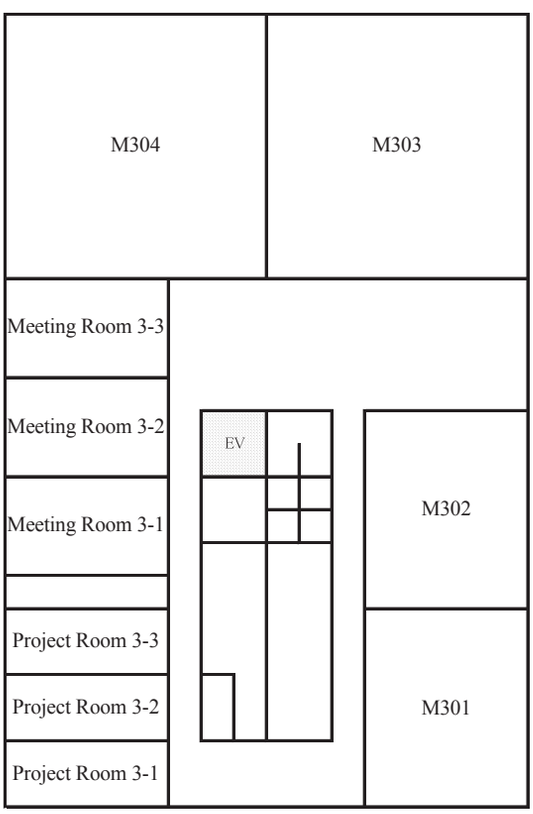

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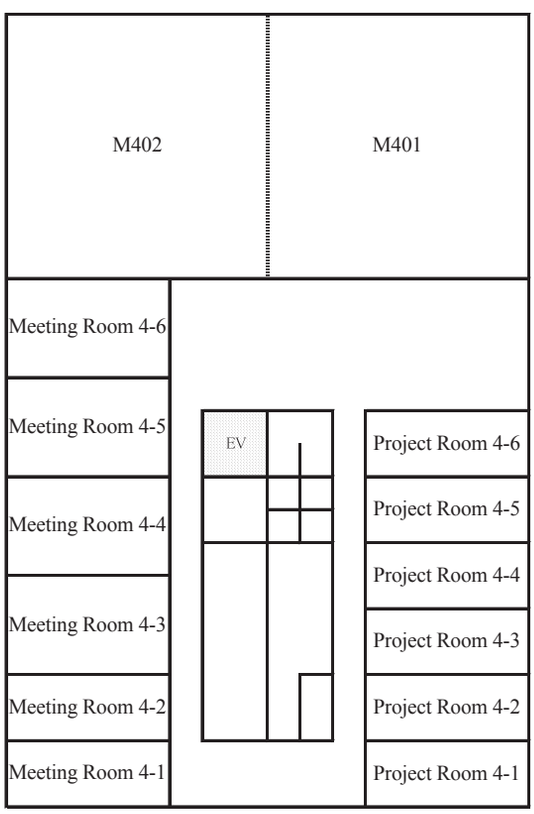

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Call for Papers
SICE JCMSI Special Issue on SICE Annual Conference 2019

SICE Journal of Control, Measurement, and System Integration (JCMSI) announces that it will publish a special issue entitled “the special issue on SICE Annual Conference 2019” in May, 2019.

The objective of this special issue is to gather original and high-quality studies presented in SICE Annual Conference 2019 and to dispatch their revised/extended versions to all over the world. This special issue focuses on any areas covered in the conference, which include, but not limited to:

Measurement,
Control,
System Integration,
System and Information,
Industrial Applications,
Life Engineering.

Important Dates

Paper Submission Deadline:	October 21, 2019
Paper Acceptance Notification:	January 2020
Journal Publication:	May 2020

Important matters to be attended to:

For submission to the special issue based on Position Papers of SICE Annual Conference 2019, the authors are recommended to revise/improve their conference papers to meet the high quality standard of the journal.

Regular papers of SICE Annual Conference 2019 will be included in the IEEE Xplore Digital Library. Hence, all submissions to the special issue based on extensions of materials presented in Regular Papers of the conference must comply with the following conditions:

(1) The paper titles must be different from the ones in the conference proceedings;
(2) The authors must cite their paper that appears in the conference proceedings;
(3) In the journal paper, the authors must describe in detail how the submitted journal paper differs from the cited conference paper. In particular, the additional original contribution in the journal paper has to be pointed out explicitly in the first section.

Meeting these three conditions is not mandatory for submission based on Position Papers of the conference. Upon submission, please indicate the SICE2019 Submission Number at "Enter Comments" on Editorial Manager.

Guest Editors

Hideyuki Tanaka (Hiroshima University), Hiroshi Ito (Kyushu Inst. Tech.)