

Final Program & Digest

**2015 15th International Conference on
Control, Automation and Systems
(ICCAS 2015)**

October 13 (Tuesday) -16 (Friday), 2015

BEXCO, Busan, Korea

Organized by

Institute of Control, Robotics and Systems (ICROS)

Co-Organized by

Pusan National University

Research Institute for Information and Communication Technology, Korea University

Technically Co-Sponsored by

IEEE Industrial Electronics Society

IEEE Robotics and Automation Society

IEEE Control Systems Society

The Society of Instrument and Control Engineers (SICE)

Asian Control Association (ACA)

The Instrumentation, Systems and Automation Society (ISA)

Chinese Automatic Control Society, China Instrument Society (CACS)

The Chinese Association of Automation (CAA)

The Chinese Association for Artificial Intelligence (CAAI)



I. Welcome Messages

▣ General Chair ▣



Keum-Shik Hong, Ph.D.
President of ICROS

Distinguished scholars, ladies and gentlemen! I feel really honored and privileged to welcome all the delegates and their guests to Busan, Korea, for the 15th International Conference on Control, Automation and Systems (ICCAS 2015). This is the largest annual event of the ICROS devoted to control engineering, robotics, and systems science.

The conference will bring together professionals from around the world to exchange ideas, discuss novel findings, develop new methods, reacquaint with colleagues, meet new friends, and broaden their knowledge. Also, it will provide participants with a valuable opportunity to benefit from a range of visions and ideas on the current issues and their implications for the future world.

As a General Chair of the conference, I am very happy and honored to open the ICCAS 2015 here in Busan. Busan, also a popular tourist location, is famed as Northeast Asia's perfect mix of natural beauty and modern infrastructure. With 3.6 million population, Busan is the second largest city in Korea, and has the 5th busiest/largest container terminals in the world, making the center of Korea's global trade.

Many people have helped make this conference a success. I would particularly like to express my sincere appreciation to Prof. Satoshi Honda (President of SICE, Japan), Prof. Ji-Feng Zhang (President of TCCT, CAA, China), Prof. Ching-Chih Tsai (President of CACS, Taiwan), and Prof. Sangchul Won (President of ACA) for their partnership and making this event possible. Another key partners in this conference are Prof. Myo Taeg Lim (Organizing Chair), Prof. Jae Weon Choi (Program Chair), Prof. Fumitoshi Matsuno (Award Committee Chair) and, of course, the organizing committee members of the conference. Without their dedicated works, this conference would not have been possible. Please give a round of applause for their contribution.

Finally, I would like to express my sincere appreciation and heartfelt thanks to plenary speakers for their willingness to give us their excellent lectures, and special thanks to the ICROS staff members and volunteers for their dedicated efforts to make this conference possible and fruitful.

Let us start the conference. But, I hope that you can find some extra time to look around the city of Busan including Jagalchi Fish Market, Nampo-dong, etc. We wish you an enjoyable stay and a memorable time in Busan.

Thank you very much.

■ Organizing Chair ■



Myo Taeg Lim, Ph.D.
Korea University

On behalf of the organizing committee, I would like to express my sincere thanks to all of you for participating in ICCAS 2015, the 15th International Conference on Control, Automation, and Systems in BEXCO, Busan, Korea. The organizing committee members have put an enormous amount of efforts into assuring the success of ICCAS 2015 and tried their best to make all participants feel at home.

ICCAS 2015 covers a wide range of fields from control and automation to robotics and system engineering. We are pleased to report that 511 papers have been submitted from 26 countries, and among them, 442 papers from 23 countries have been accepted to be presented at ICCAS 2015.

All of these papers will be presented in 45 lecture sessions and two interactive poster sessions over the three-days period. Moreover, five special sessions have been arranged to provide a forum for idea exchange among the researchers.

It is our great honor to have seven world-class scholars as plenary speakers. They are Prof. Karl Henrik Johansson, Prof. Peng Shi, Prof. Jay A. Farrell, Prof. Yoshihiko Nakamura, Prof. Sangbae Kim, Prof. David Boas, and Prof. Taek Lyul Song. They will share their new theoretical results and thoughts on the fields of control, robotics, and systems.

We sincerely thank all individuals who have contributed to ICCAS 2015. Special thanks go to distinguished plenary speakers, workshop speakers, the organizers of the special and organized sessions, as well as all of the authors and reviewers of all the submissions for their willingness to help, which led the conference technically rich and fruitful. We also would like to express our sincere appreciation and gratitude to the organizing committee members, Prof. Jae Weon Choi (Program Chair), the ICROS staff, the volunteer staff, the financial sponsors, and the exhibitors for making this conference possible.

We sincerely hope that all the participants benefit from and have time at ICCAS 2015.

Welcome to Busan and enjoy ICCAS 2015!

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II. Conference Organization

A. International Advisory Council

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 Youmin Zhang (Concordia Univ., Canada)

III. Conference Information

A. Financial Sponsors

Companies and organizations listed below contributed financial support for the ICCAS 2015.

Busan Tourism Organization

Samsung Heavy Industries Co., Ltd.

Korea Tourism Organization

LS Industrial System Co., Ltd.

Koh Young Technology Inc.

RS Automation

Robot Research Initiative, Chonnam National Univ.

Dong-il SHIMADZI Corp.

Bio-Mimetic Robot Research Center, SNU

B. Technical Program Overview

The technical program of the ICCAS 2015 consists of 45 lecture sessions and 2 interactive poster sessions with 442 papers contributed by the authors from 23 countries. They are selected for the final program from the 511 submissions. The conference is highlighted with 7 Plenary Lectures: "Cyber-secure Control Systems" by Prof. Karl Henrik Johansson, "Analysis and Design on Dynamical Systems with Hybrid Structure" by Prof. Peng Shi, "Precision Mapping and Vehicle State Estimation for Autonomous Highway Vehicles" by Prof. Jay A. Farrell, "Disaster-Response Humanoid Robots: Focusing on Actuators and Power Source for Field Robots " by Prof. Yoshihiko Nakamura, "The MIT Cheetah: New Design Paradigm for Mobile Robots" by Prof. Sangbae Kim, "Functional Near Infrared Spectroscopy – What is it and its potential role in brain-computer interfacing?" by Prof. David Boas, and "Computationally Efficient Multi-target Data Association" by Prof. Taek Lyul Song.

Welcome Reception will be held on Tuesday, October 13 in Room 205. Conference Banquet will be held on Friday, October 16 at the 1F Grand Ballroom, the Westin Chosun Busan Hotel.

The proceedings will be distributed in USBs and will be indexed in the IEEE Xplore, SCOPUS, and EI compendex.

C. Registration

All the conference attendees must register. If you have registered in advance, you can pick up your conference materials at the conference registration desk (2nd Floor Lobby). The registration desk will be opened from 3:00 pm to 6:00 pm on Oct. 13 and from 8:30 am to 6:00 pm on Oct. 14~16.

Conference registration includes Welcome Reception, Conference Banquet, Access to all sessions (not Workshop & Tutorial), Refreshment breaks, and E-proceeding & Digest book. Accompanying persons who wish to attend the banquet should purchase tickets (KRW 70,000) at the registration desk.

D. Conference Logistics

A beam projector and a laptop computer will be provided in the presentation rooms of all the technical sessions, workshops, and tutorials. The technical program of the ICCAS 2015 is organized in 9 parallel tracks of sessions on Oct. 14 and 6 parallel tracks of sessions on Oct. 15~16. The session rooms are located close to each other. All the parallel sessions are synchronized, allowing convenient switching between tracks. The session chairs and the speakers are requested to adhere to the timetable.

E. Social Programs and Events

◆ Welcome Reception

- Date & Time: October 13(TUE), 18:00~19:30
- Place: Room 205
- Fee: Free (included in both full and student registration)

◆ Opening Ceremony

- Date & Time: October 14(WED), 11:00~11:10
- Place: Room 205

◆ Banquet

- Date & Time: October 16(FRI), 19:00~21:00
- Place: Westin Chosun Busan Hotel (1st floor Grand Ballroom)
- Fee: Free (included in both full and student registration)

◆ Lunch

The lunch tickets can be used at the Food Court "Welly" on the B1F, Exhibition Center 1.

◆ Coffee and Refreshments

Coffee and refreshments will be served during the interactive poster session in the Room 201~204.

F. Exhibition

◆ Koh Young Technology Inc.

Website: www.kohyoung.com



▶ Exhibit Items: The Zenith series 3D AOI(Automated Optical Inspection) systems measure the true profilometric shape of components, solder joints, patterns and even foreign material on assembled PCBs with true 3 dimensional measurement, overcoming the shortcomings and vulnerabilities of 2D AOI.

▶ Profile: Koh Young is the 3D inspection market leader, proven by world leading EMS companies and electronics manufacturers, More than 7,000 in-line systems have been installed globally during the last 13 years. Using Koh Young's measurement accuracy and reliability, help customers optimize their SMT process and improve production line yields.

◆ **Yujin Robot Co., Ltd.**

Website: www.yujinrobot.com



▶ Exhibit Items: TurtleBot2 is an open robotics platform for education and research on state of art robotics. It's also a powerful tool to teach and learn ROS (Robot Operation System) and make the most of this cutting edge technology. Equipped with a 3D sensor, it can map and navigate indoor environments. The 3D Perception, together with the turtlebot arm, enables manipulation tasks.

▶ Profile: Yujin Robot, coupled with its technology and utmost quality, is committed to providing an abundant, convenient, and innovative life to the end users, continuously growing to become a world-class robotic company.

◆ **ROBOTIS Co., Ltd.**

Website: www.robotis.com



▶ ROBOTIS was found in 1999, in response to the question “What is a robot?” Having our foundation in CREATIVITY, we consider it to be the keyword that helps develop childhood dreams into reality, and the best solution for designing the future that robots and human live together.

ROBOTIS KIDSLAB – Robot Education Service

DYNAMIXEL – Robot Exclusive Actuator

ROBOTIS KIDSLAB products help enhance STEAM education and project-based learning, helping students develop on their creativity and participation.

With a full range education lineup + entertainment robots, the **ROBOTIS KIDSLAB** is an education solution open for any users.

Using the modular technology of the **DYNAMIXEL System**, users can easily build and expand on their work that may even be applicable for industrial purpose.

- 1. **Robot exclusive** : compact and lightweight
- 2. **All-in-one** : integrated sensors, drivers, network and reduction gears
- 3. **Modular** : easy assembly and maintenance
- 4. **Network driven** : systematic control for complicated systems

◆ **NIP Co., Ltd.**

Website: www.nip.co.kr



▶ Exhibit Items: SWIR Camera PAMINA PHK03M100CSV0 is optimized to science inspection application for industrials as well as Science, Biomedical field and external environment detection. This provides higher solution for inspection by maintainig hypersensitive perception and

reducing noise through using TEC cooler. It is possible to acquire image of fast-moving object with designating ROI at a high speed.

▶ Profile: Founded in 1984, **NIP** is a Machine solution company that has been coexisting along with the history of the Korean machine vision system. Our company provides cameras, interface, library, machine vision components which is part of the optical machine system and technical service. We have made strides in expanding the base of machine vision in the academics and the industry by developing the Nuro OCR, Viewer Analyzer and providing image data signal acquirement and solution analysis. Also, we are offering the customers the know-how and the advanced vision technology by education business and practical technology support. **NIP Company** continues to make efforts in development for our customers. In the rapidly developing machine vision market, fast introduction of new technology, technology advancements and increasing productivity is crucial element for success. Our company is currently researching new technology through internal employee education. And this is just a part of our efforts in providing the best suited products and service to our customers. We pursue to provide and share our experience and technology to the customers so they can successfully use our products. This conviction is the result of believing that our customer's success is our success. The thirty years of experience and technology is also our asset. This asset will be used for the practical purchase of the customers and we will reward them with our advanced technology. Based on our new slogan "*NEW Idea Provider*", we promise to provide technology, service with innovative new ideas and we will always be there for you.

◆ **FUNERS**



Website: www.funers.com

▶ Exhibit Items: FUNERS is specialized in educational solution and it provides creative and innovative educational products, contents, and programs. As the official partner of LEGO Education Korea FUNERS sells all items of LEGO Education such as Mindstorms EV3 and it also sells robotics products produced by Matrix Robotics as the exclusive distributor in Korea. FUNERS is official partner of other companies such as HiTechnic as well and it is supplying sensors, controllers, and robotics parts. FUNERS has been developing and selling its own controllers and sensors.

Products sold by FUNERS are very efficient to educate and study STEM(Science Technology Engineering and Mathematics), programming and programming language such as C and JAVA, software development, sensor and motor control, mechatronics and mechanism design, system development, ITS(Intelligent Transportation System), IOT(Internet Of Things), smart automation and logistics systems, etc.

▶ Profile: FUNERS has developed specialized and customized test beds, training mats and kits, demo systems, and training systems for various fields, has various related patents, and provides them.

FUNERS is composed of the president, a former teacher, and experts who has teacher's license and has very large network of educators and students. FUNERS provides over 170 times of education programs, camps, and consultations yearly such as staff training programs like SCSA(Samsung Convergence SW Academy), Teacher and students workshops, consultations for club activities and education contents. Education courses and consultations aims to learn not only technic but also creative and innovative leadership such as problem solving and communication using ingenious solutions developed by FUNERS.

FUNERS supports and operates various valuable competitions such as Korea Robot Championship which is the local event in Korea of worldwide robot competition of FIRST and Embedded SW Contest. It also supports and joins forces to operate education programs and workshops related to STEM, SW, and ICT(Information and Communications Technology) for youth such as STEM workshop and programs with U.S. Embassy Korea, Software Edu Fest with Naver, and Robot Olympia with SK Hynix.

FUNERS has hardly developed and studied original education solutions to nurture young talents who lead the future of Korea and is growing a leading company in creative and innovative total education solutions.

◆ Huins

Website: www.huins.com



▶ Exhibit Items:

Smart IoT :

Smart IoT Design System from HuinsInc, consists of Gateway (Raspberry Pi), 8 sensors, 7 actuators, and various peripherals.

It provides design and testing environment with 5 design/practical tasks.

It is also training system to confirm information and control the system designed by users through internet or Android app.

uBrain :

uBrain is a system control robot based on ARM Cortex-M4 microcontroller.

It can transmit image by Wi-Fi and choose temperature, humidity, gas, intensity of illumination sensor module, and so on.

Users can easily add functions who want to use and test

Fun Coding:

Creative Design Kit is not a simple materials to teach programming, but H/W & S/W Kit to improve logical thinking ability and creativity by learning and experiencing the creative design through thinking, touching, and playing.

It uses Sketch to program moving objects such as car, tank, and LED Cube.

un Dron :

You can practice basic programming skill, flight practice, attitude control, and image processing by Fun Dron. It is possible for you to develop applications for smart phone, PC, or Tablet that can be used for various practices and trainings.

Provide example sources. It can flight automatically by using GPS.

► Profile: Huins is a growing company with expert skills about ARM based solutions, SoC, Dron, IoT, Embedde, Wearable, and Robot control for 20 years .

Huins always provide various and convenient solutions for education and developers.

◆ FAULHABER



Website: www.swissamiet.com

► Exhibit Items: DC-MOTOR, BLDC MOTOR, GEAR, ENCODER, MOTION CONTROLLER, PIEZO

► Profile: The foundation for the unique FAULHABER DC-Micromotors was laid more than 65years ago with ironless bell-shaped motor developed by Dr. Fritz Faulhaber. The continuous development of our motors and the inclusion of high-tech components such as drive electronics, tachogenerators, encoder, and amplifiers has expended the FAULHABER product range. Today we offer an array of reliable components which are used for a variety of highly sophisticated applications.

◆ HANBACK ELECTRONICS CO., LTD



Website: www.hanback.co.kr

► Exhibit Items: Educational Training Kit
Android/Embedded System, Green IT, Intelligent Robot, LED, RFID, USN, MCU, DSP, FPGA, Optical communication, Sensor, Basic Training Kit.

► Profile: Hanback Electronics has provided a broad portfolio of Information Technology Training products that has allowed teachers and professors to choose the optimal solution for their Classrooms and lectures since 1984. As we move into the 21st century, rapidly changing information technology will have an ever increasing impact on our daily classroom. The increasing velocity in the pace of change and innovation of Information Technology is requiring a convergence concept wised engineering and technology on education at the classroom.

Engineering lectures of convergence technology needs the multidisciplinary integration of inhomogeneous methods, systems, views, knowledge areas and other disciplines of technology with the aim to reach an added value of service. But, present information technology related education with traditional training equipment cannot satisfy new trend of curricula.

Hanback Electronics provides a complete answer for effectively and easily incorporating innovative information technology engineering into standard curricula with broad portfolio of Hanback IT Training products

◆ SOOSANG ST

Website: <http://soosang.com>



- ▶ Exhibit Items: Tap&Talk, Moppy Pet (Smart Education products based on IoT)
- ▶ Profile: SOOSANG ST produces smart education products based on digital and analog contents.

◆ Dong-il Shimadzu Corp.

Website: www.shimadzu.co.kr



- ▶ Exhibit Items: Shimadzu provides powerful support for brain research in a wide range of fields, by near-infrared optical brain-function imaging systems (LABNIRS).
- ▶ Profile: Dongil SHIMADZU was established as a joint-venture company between SHIMADZU(JAPAN, Founded in 1875) and Dongil Corp.(KOREA, Founded in 1955) in 2000, which provides customers with high level of services.
Dongil SHIMADZU supplies many scientific instruments to contribute to development of science and chemical industry in Korea.

◆ ROBOTECH CO., LTD

Website: www.robotech.co.kr



1. Intelligent Health Assistant Robot "HARRY"

Lifecare robot is a kind of healthcare robot that gives a relaxation to human
By interaction such as recognizing a physical and mental state and providing
feedbacks



Health Assistant
HARRY

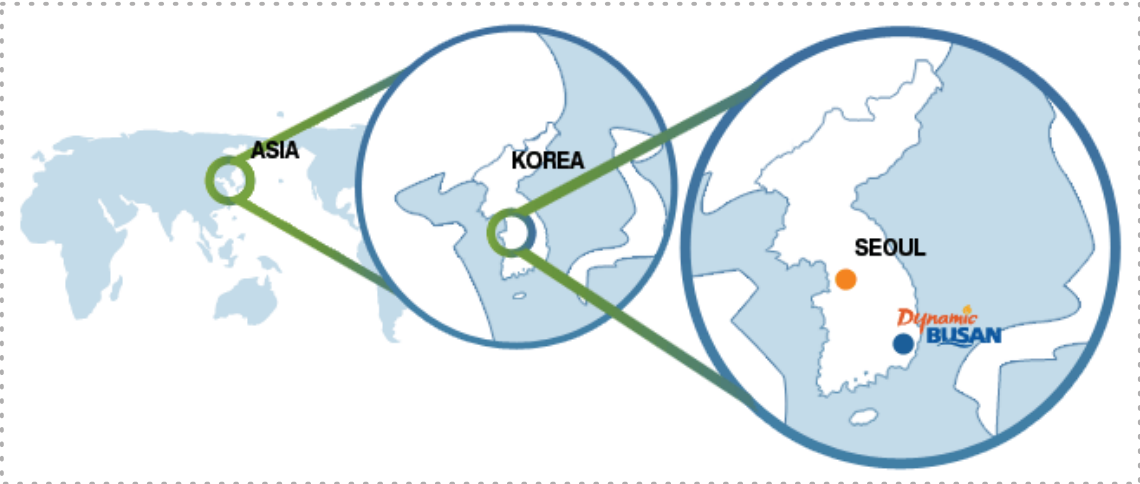
Remote monitoring and consultation with a healthcare manager or a doctor through wireless network

- Providing various service at home such as daily schedule, security/guard, speaker recognition and amusement with a linked network through a home automation system
- Perception of feelings by tone and the pulse, stabilization of emotion with contents like a Game and music

▶ Profile: ROBOTECH Co., Ltd., the leading company in the field of robot industry and Automated assembling system in Korea, launched in July 1993. Head office and main factory is located in Busan for the design and manufacturing of Automated assembling system. The main customers are the Hyundai, Daewoo, Kia motor company. The R&D center is located in Seoul for developing the robot manipulators, controllers and linear servo etc. The main customers are the manufacturer of LCD display, Cellular phone and components of automobile. We are exporting robots to USA, CHINA, EUROPE with CE certifications. We are doing our best to meet our customers' satisfaction and developing customer-oriented products.

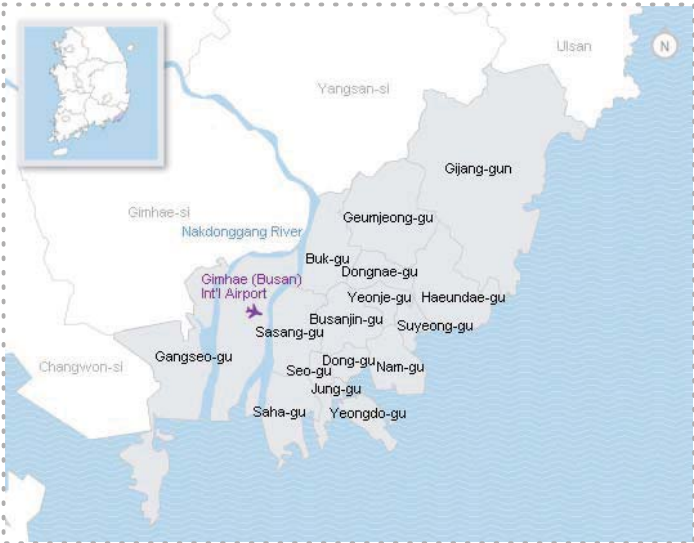
IV. Local Information

A. Host City, Busan



Busan, a bustling city of approximately 3.6 million residents, is located on the southeastern tip of the Korean peninsula. The size of Busan is 768.408km² which is 0.8% of the whole land of the Korean Peninsula. The natural environment of Busan is a perfect example of harmony between mountains, rivers and sea. Its geography includes a coastline with superb beaches and scenic cliffs, mountains which provide excellent hiking and extraordinary views, and hot springs scattered throughout the city. Busan enjoys four distinct seasons and a temperate climate that never gets too hot or too cold.

Busan is the second largest city in Korea. Its deep harbor and gentle tides have allowed it to grow into the largest container handling port in the country and the fifth largest in the world. The city's natural endowments and rich history have resulted in Busan's increasing reputation as a world class city of tourism and culture, and it is also becoming renowned as an international convention destination.



B. Local Information

◆ Passport and Visa

All the visitors to the Republic of Korea must have a valid passport and visa. Visitors with round trip transportation tickets from the countries that have a special agreement with Korea may be exempted from the visa requirement, and can stay in Korea Visa-free for periods up to thirty days, or ninety days, depending on the type of agreement between the two countries. For more information, please contact the local Korean Consulate or Embassy in your country, or refer to the web-site www.korea.net or www.moj.go.kr.

◆ Electricity

Korea uses 220-Volt, 60-Hz systems.

◆ Climate

Located on the southeastern tip of the Korean peninsula, in the east of the Eurasian continent and, influenced by the maritime climate, Busan is within the temperate monsoon zone having four distinct seasons. Busan has relatively strong wind compared to other regions with the average annual temperature being 15°C and the average rainfall being 1,176mm. Autumn starts in early September and ends in late November. Sunny days are continued by the influence of a continental high pressure. Entering September it begins to cool down in the morning and evening.

We recommend bringing light jacket for late night and early morning.

◆ Currency

The unit of currency of Korea is Won. Notes include 1,000, 5,000, 10,000, and 50,000 Won denominations. Coins include 10, 50, 100, and 500 Won denominations.

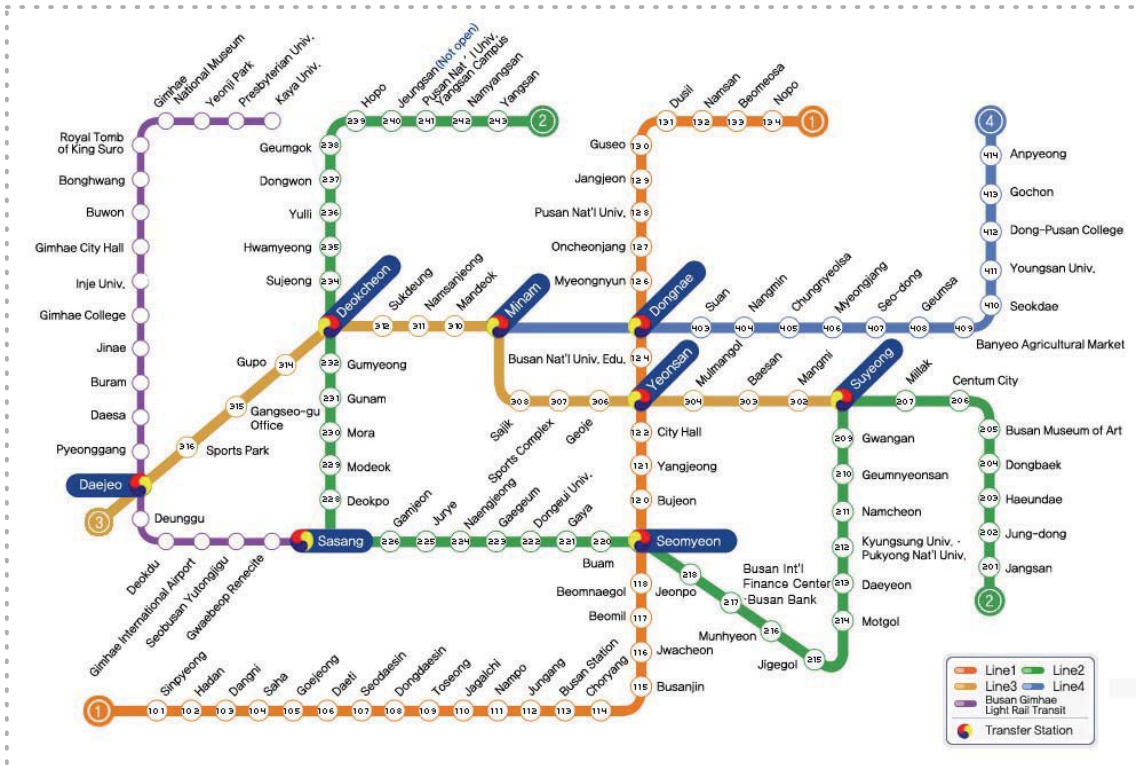
◆ Time Zone

Korean Time Zone is plus 9 hours to the Greenwich Mean Time.

C. Transportation

Subway: Centum City (BEXCO) Station, Line 2

* Exit No. 1, Centum City Station; approx. 50m or Exit No. 7, Busan Museum of Art Station



V. Tutorial and Technical Tour

A. Tutorial: Stability and control of Markovian Jump systems

- Date & Time : October 13(TUE) 10:00-17:30
- Room : 201
- Organizer : Prof. Hamid Reza Karimi (University of Agder)
- Fee : Student 150,000 KRW, Regular 200,000 KRW
- Language : English
- Program :

Markovian jump systems have been widely used to describe many practical systems, such as fault-tolerant systems, communication systems, power systems, economics systems and so on. The main aim of this tutorial is to provide an introduction to the basic principles and applications of Markovian jump systems in control systems and practice. In this workshop, we will deliver highly useful knowledge and experience for graduate students, scientists, and field engineers interested in this research area.

The workshop will begin with an introduction to the state-of-the-art of Markovian jump systems and present main challenges and more recent developments and progresses in this context. Then, conventional stability analysis of these systems will be presented with some discussions on more complex Markovian jump systems including singular and time delay systems. In the sequel, control synthesis in the form of state feedback and output feedback controllers are presented for Markovian jump systems and some recent developments are presented and discussed. Then, the concepts of synchronization, model approximation and observer-based controllers for these systems are presented in details. Finally, some practical examples will be presented to demonstrate the use of Markovian jump systems in practice.

- 10:00 - 11:00 an overview of Markovian jump systems and their properties
- 11:00 - 12:00 stability analysis of Markovian jump systems
- 12:00 - 13:00 Lunch
- 13:00 - 14:00 control design for Markovian jump systems
- 14:00 - 15:00 synchronization and model approximation for Markovian jump systems
- 15:00 - 15:30 coffee break
- 15:30 - 16:30 observer-based control design for Markovian jump systems
- 16:30 - 17:30 case studies on control of Markovian jump systems

B. Technical Tour: Samsung Heavy Industries

- Date & Time: October 15(THU), 2015 / 13:00 ~ 18:00
- Schedule: BEXCO Departure(13:00) – Samsung Heavy Industries (15:00~16:30) – BEXCO Arrival (18:00)
- Participation fee: 10,000 KRW

VI. Paper Identification Number

A. Lecture Sessions

| | |
|------------------|---------------|
| Day Code | Room Order |
| └ | └ |
| W | 01 - 1 |
| └ | └ |
| Time Period Code | Paper Order |

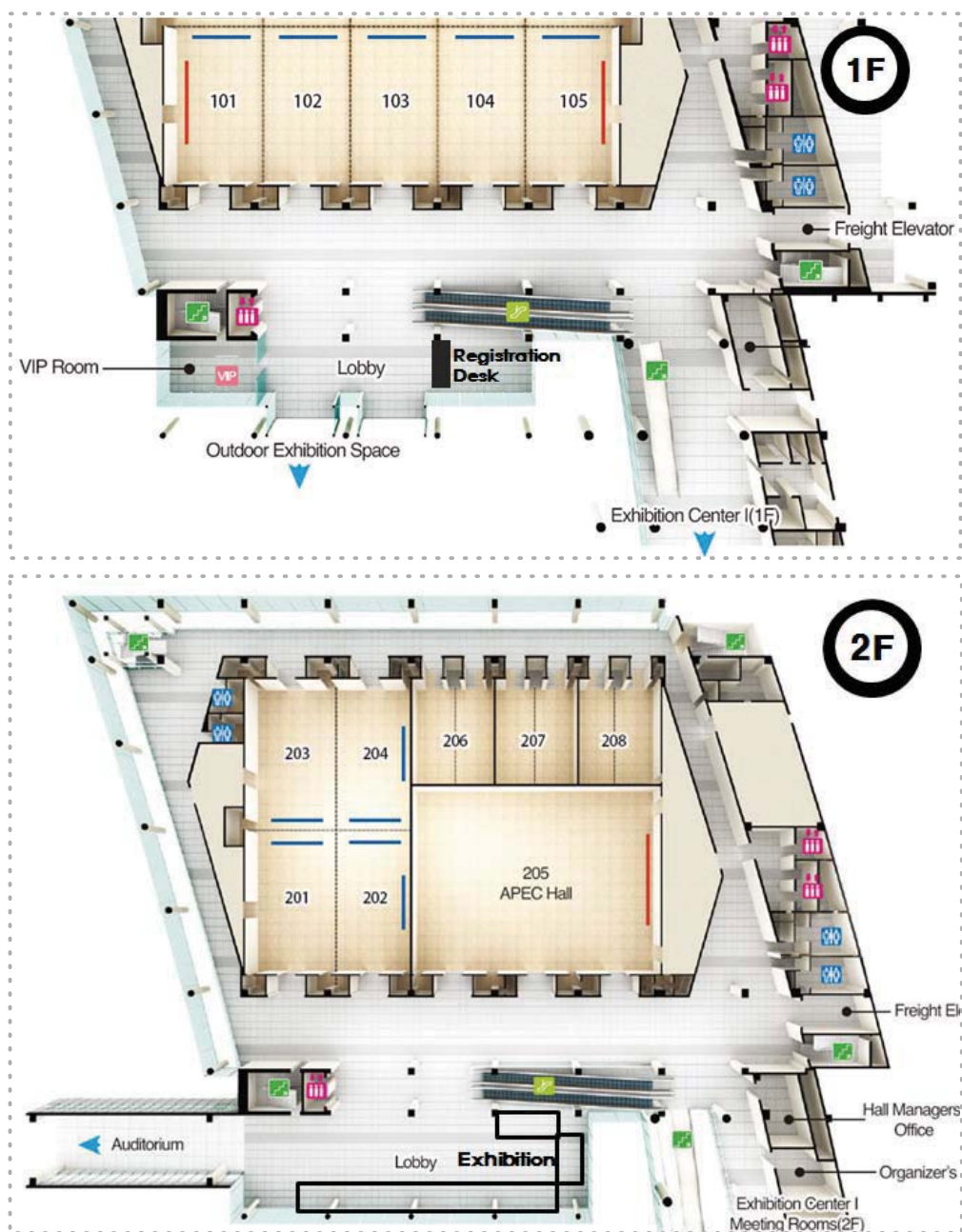
B. Interactive Poster Sessions

| | |
|----------|----------------------------|
| Day Code | Interactive Poster Session |
| └ | └ |
| T | P 01 - 1 |
| | └ |
| | Paper Order |

| Day Code | Time Period Code |
|---------------|------------------------------|
| W - Wednesday | WA/TA/FA- 09:10~10:40 |
| T - Thursday | WB/FB- 13:30~15:00 |
| F - Friday | TB- 13:00~14:30 |
| | WC- 16:30~18:00 |
| | TP- 17:00~18:30 |
| | FP- 16:30~18:00 |

VII. Floor Plan

A. BEXCO Convention Hall

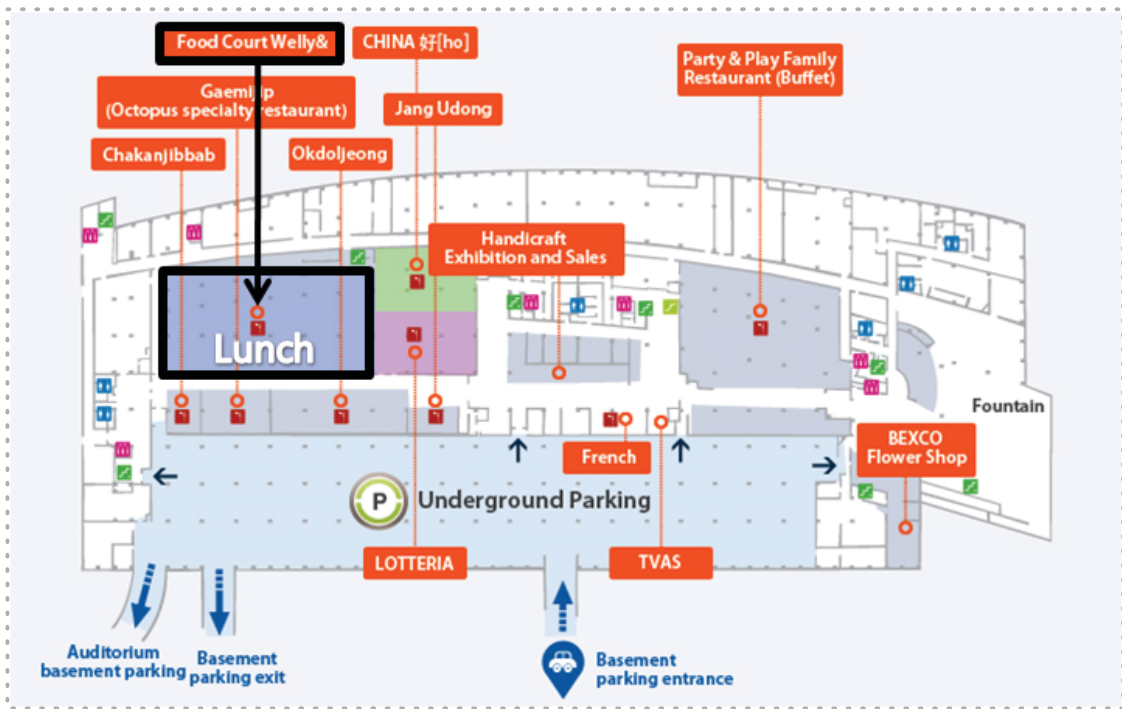


Registration Desk: 1F Lobby, Exhibition: 2F Lobby, Headquarters: 208

Opening Ceremony & Plenary Lectures & Welcome Reception: 205

Lecture Sessions: Room 01 (101), Room 02 (102), Room 03 (103), Room 04 (104),
Room 05 (105), Room 06 (201:Oct. 14 / 206:Oct. 15~16),
Room 07 (202), Room 08 (203), Room 09 (204)

Interactive Poster Session & Coffee Services: 201 & 202 & 203 & 204



Lunch: Food Court Welly, B1F Exhibition Center

B. The Westin Chosun Busan Hotel: Banquet Venue



The shuttle bus will leave from 5:50 pm to 6:40 pm in front of the BEXCO flagpoles.

VIII. Program Schedule and Session Timetable

A. Program Schedule

| | 10.13(TUE) | 10.14(WED) | 10.15(THU) | 10.16(FRI) |
|-------------|---------------------|---|--|-------------------------------|
| 08:30-18:00 | Workshop & Tutorial | Registration | | |
| 09:10-10:40 | | Lecture Session A | Lecture Session A | Lecture Session A |
| 11:00-12:00 | | Opening Ceremony & Plenary Lecture I | Plenary Lecture III | Plenary Lecture VI |
| 12:00-13:30 | | Lunch | Lunch | Lunch |
| 13:30-15:00 | | Lecture Session B | Lecture Session B (13:00~14:30) | Lecture Session B |
| 15:20-16:20 | | Plenary Lecture II | Plenary Lecture IV&V (14:50~16:50) | Plenary Lecture VII |
| 16:30-18:00 | | Lecture Session C | Interactive Poster Session I (17:00~18:30) | Interactive Poster Session II |
| 18:00-19:30 | | Welcome Reception | | Banquet (19:00-21:00) |

* Technical Tour: October 15(THU), 13:00~18:00

B. Session Timetable

| October 14 (Wednesday) | | | | | | | | | |
|------------------------|--|---|---------------------------------|---|---|---|--|--|---|
| | Room 01 (101) | Room 02 (102) | Room 03 (103) | Room 04 (104) | Room 05 (105) | Room 06 (201) | Room 07 (202) | Room 08 (203) | Room 09 (204) |
| 09:10~10:40 | WA01(Special Session) Korean Student Workshop: Do's and Don'ts in Paper Writing and Presentation | WA02 [OS] SICE-ICROS Joint Organized Session on Control Theory and Application | WA03 Adaptive Robust Control | WA04 Service and Field Robots | WA05 Automotive Systems and Automation | WA06 Power Systems | WA07 Neural Networks and Fuzzy Systems | WA08 Navigation, Guidance and Control I | WA09 Unmanned Aerial and Underwater Vehicles |
| 11:00~12:00 | Opening Ceremony & Plenary Lecture I (Room 205) - Karl Henrik Johansson, KTH Royal Institute of Technology : Cyber-secure Control Systems | | | | | | | | |
| 13:30~15:00 | WB01 [OS] Experimental Studies for Nonlinear Chemical Process Controls | WB02 [OS] Recent Advances of Disturbance Observer and Applications to Motion Control | WB03 New Control Approach | WB04 Object/Human Visual Recognition | WB05 Biomedical Systems | WB06 Sensor Fusion and Signal Processing | WB07 Communication and Embedded Systems | WB08 [OS] Navigation, Guidance, and Control II | WB09 [OS] Autonomy of Unmanned Marine Vehicles |
| 15:20~16:20 | Plenary Lecture II (Room 205) - Peng Shi, University of Adelaide : Analysis and Design on Dynamical Systems with Hybrid Structure | | | | | | | | |
| 16:30~18:00 | WC01(Special Session) Advances in Underwater Vehicle | WC02 [OS] Vehicle Control | WC03 Sliding Mode Control | WC04 Mobile Robots and Navigation | WC05 Information and Networking | WC06 Process Systems and Data Fusion | WC07 [OS] Statistical Inference and Data Mining | WC08 [OS] Navigation and Control Application for Military Robot Systems | WC09 Unmanned Ground Vehicles |

| | Room 01 (101) | Room 02 (102) | Room 03 (103) | Room 04 (104) | Room 05 (105) | Room 06 (206) |
|------------------------------|--|---|--|---|---------------------------------------|--|
| October 15 (Thursday) | | | | | | |
| | TA01 | TA02 | TA03 | TA04 | TA05 | |
| 09:10~ 10:40 | [OS] Control Techniques for Mechanical systems | [OS] Sensing and Control System Application for Marine Systems | Robot Mechanism and Control | Biorobotics and Medical Robots | [OS] Electro-Hydraulic System | |
| 11:00~ 12:00 | Plenary Lecture III (Room 205) - Jay A. Farrell, University of California, Riverside : Precision Mapping and Vehicle State Estimation for Autonomous Highway Vehicles | | | | | |
| | TB01 (Special Session) | TB02 | TB03 | TB04 | TB05 | TB06 |
| 13:00~ 14:30 | How to Achieve Successful Technology Transfer | [OS] SICE-ICROS Joint Organized Session on Intelligent Robot System | Nonlinear Systems | [OS] Machine Vision Applications | [OS] Image based Ambient Intelligence | [OS] State Estimation and Applications |
| 14:50~ 16:50 | Plenary Lecture IV (Room 205) - Yoshihiko Nakamura, University of Tokyo : Disaster-Response Humanoid Robots: Focusing on Actuators and Power Source for Field Robots Plenary Lecture V (Room 205) - Sangbae Kim, Massachusetts Institute of Technology : The MIT Cheetah: New Design Paradigm for Mobile Robots | | | | | |
| 17:00~ 18:30 | Interactive Poster Session I [TP] (Room 201~204) | | | | | |
| October 16 (Friday) | | | | | | |
| | FA01 (Special Session) | FA02 | FA03 | FA04 | FA05 | FA06 |
| 09:10~ 10:40 | Bio-inspired Robot Design | Control Applications I | [OS] Time Delay and Their Applications | [OS] Medical Robotics and Simulation | [OS] Health Care Technology | [OS] Signal and Image Processing |
| 11:00~ 12:00 | Plenary Lecture VI (Room 205) - David Boas, Harvard Medical School : Functional Near Infrared Spectroscopy – What is it and its potential role in brain-computer interfacing? | | | | | |
| | FB01 (Special Session) | FB02 | FB03 | FB04 | FB05 | FB06 |
| 13:30~ 15:00 | fNIRS Forum : Toward a Mobile Brain Imager (13:30~15:50) | Control Applications II | Identification and Estimation | Human-Robot Interaction and Visual Servoing | Civil and Urban Systems | Sensors and Instrumentation |
| 15:20~ 16:20 | Plenary Lecture VII (Room 205) - Taek Lyul Song, Hanyang University : Computationally Efficient Multi-target Data Association | | | | | |
| 16:30~ 18:00 | Interactive Poster Session II [FP] (Room 201~204) | | | | | |
| 19:00~ 21:00 | Banquet (The Westin Chosun Busan Hotel, 1F Grand Ballroom) | | | | | |

IX. Plenary Lectures

A. Plenary Lecture I

(Chair: Hyun Jin Kim)



October 14 (WED), 11:00~12:00, Room 205

Karl Henrik Johansson

Professor, Electrical Engineering

Director, ACCESS Linnaeus Centre

KTH Royal Institute of Technology, Sweden

Cyber-secure Control Systems

Abstract: Cyber-attacks on critical infrastructures are of growing societal concern. Several malicious attacks have been reported over the last few years and in many cases they have targeted control systems. The increasing use of off-the-shelf software and hardware components and open communication networks makes networked control systems vulnerable to cyber-attacks. As the cyber and physical components of these systems are tightly interconnected, traditional IT security focusing on the cyber part does not provide appropriate solutions. In this talk, we will discuss how to model, analyze and design cyber-secure networked control systems. We will introduce an adversary modeling framework and use it for quantifying cyber-security of control systems by means of constrained optimization problems. An attack space defined by the adversary's model knowledge, disclosure, and disruption resources is presented. It is shown that attack scenarios corresponding to denial-of-service, replay, zero-dynamics, and bias injection attacks can be analyzed using this framework. Applications to power networks and process industry will be used to illustrate the attack scenarios, their consequences, and potential countermeasures.

Biography: Karl Henrik Johansson is Director of the ACCESS Linnaeus Centre and Professor at the School of Electrical Engineering, KTH Royal Institute of Technology, Sweden. He is a Wallenberg Scholar and has held a six-year Senior Researcher Position with the Swedish Research Council. He is also heading the Stockholm Strategic Research Area ICT The Next Generation. He received MSc and PhD degrees in Electrical Engineering from Lund University. He has held visiting positions at UC Berkeley (1998-2000) and California Institute of Technology (2006-2007). His research interests are in networked control systems, hybrid and embedded system, and applications in transportation, energy, and automation systems. He has been a member of the IEEE Control Systems Society Board of Governors and the Chair of the IFAC Technical Committee on Networked Systems. He has been on the Editorial Boards of several journals, including *Automatica*, *IEEE Transactions on Automatic Control*, and *IET Control Theory and Applications*. He is currently on the Editorial Board of *IEEE Transactions on Control of Network Systems* and the *European Journal of Control*. He has been Guest Editor for special issues, including two issues of *IEEE Transactions on Automatic Control*. He was the General Chair of the ACM/IEEE Cyber-Physical Systems Week 2010 in Stockholm and IPC Chair of many conferences. He has served on the Executive Committees of several European research projects in the area of networked embedded systems. He received the Best Paper Award of the IEEE International Conference on Mobile Ad-hoc and Sensor Systems in 2009 and the Best Theory Paper Award of the World Congress on

Intelligent Control and Automation in 2014. In 2009 he was awarded Wallenberg Scholar, as one of the first ten scholars from all sciences, by the Knut and Alice Wallenberg Foundation. He was awarded an Individual Grant for the Advancement of Research Leaders from the Swedish Foundation for Strategic Research in 2005. He received the triennial Young Author Prize from IFAC in 1996 and the Peccei Award from the International Institute of System Analysis, Austria, in 1993. He received Young Researcher Awards from Scania in 1996 and from Ericsson in 1998 and 1999. He is a Fellow of the IEEE.

B. Plenary Lecture II

(Chair: Choon Ki Ahn)



October 22 (WED), 15:20~16:20, Room 205

Peng Shi

Professor, School of Electrical and Electronic Engineering
University of Adelaide, Australia

Analysis and Design on Dynamical Systems with Hybrid Structure

Abstract: A large class of dynamical systems has variable structures subject to deterministic or random changes, which may result from the abrupt phenomena such as component and interconnection failures, parameters shifting, tracking, and the time required to measure some of the variables at different stages. Systems with this character may be modelled as hybrid ones, that is, to the continuous state variable, a discrete variable called the mode, or operating form, is appended. The mode describes the changes or random jumps of the system parameters and the occurrence of discontinuities. On the other hand, in order to control the behaviour of a system, we should capture the system's salient features in a mathematical model. Indeed, any model of practical systems almost always contains some type of uncertainty. So the modelling and design should take into account the uncertainty inherent to a model of the system in order to maintain stability and performance specifications in the presence of these uncertainties. In this talk, the nature of hybrid dynamical systems will be explored, and some design techniques for such systems with uncertainties will be presented.

Biography: Peng Shi received the BSc degree in applied mathematics from Harbin Institute of Technology in 1982; the MSc degree in systems engineering from Harbin Engineering University in 1985, the PhD degree in electrical engineering from the University of Newcastle, Australia in 1994; and the PhD degree in mathematics from the University of South Australia in 1998. He was awarded the degree of Doctor of Science by the University of South Wales in 2006.

Dr Shi is a professor at the University of Adelaide, Australia. He was a professor at Victoria University, Australia; a professor at the University of South Wales; a senior scientist in the Defence Science and Technology Organisation, Australia; and a lecturer and post-doctorate at the University of South Australia. He has been an editorial board member for a number of journals, including *Automatica*; *IEEE Transactions on Automatic Control*; *IEEE Transactions on Circuits and Systems-I*; *IEEE Transactions on Cybernetics*; *IEEE Transactions on Fuzzy Systems*; and *IEEE Access*. He is a Fellow of IEEE, IET and IMA; and a member of College of Expert, Australian Research Council. His research interests include systems and control, computational intelligence, and operational research.

C. Plenary Lecture III

(Chair: Kang Hyun Jo)



October 15 (THU), 11:00~12:00, Room 205

Jay A. Farrell

Professor, Department of Electrical and Computer Engineering
University of California, Riverside, USA

Precision Mapping and Vehicle State Estimation for Autonomous Highway Vehicles

Abstract: Autonomous and wirelessly connected vehicles face various challenges before effective and publicly acceptable deployment. Key amongst these challenges is accurate and reliable awareness of world interactions. Awareness arises both from onboard sensors and from ubiquitous communication between vehicles and infrastructure. Safety and coordination necessitate “where-in-lane” (i.e., decimeter accuracy) knowledge of vehicle position (and state) relative to other vehicles and the environment. This presentation will discuss the role of control and systems theoretic methods related to practical autonomous vehicle applications, particularly as they relate to automated construction of precise feature maps and reliable real-time navigation (i.e., position and state estimation). Both applications require reliable and automated data fusion from various sensor modalities: LIDAR, camera, global navigation satellite systems, inertial measurements, etc. The presentation will survey and present modern methods for roadway feature mapping and vehicle state estimation.

Biography: Jay A. Farrell is a Professor and two time Chair of the Department of Electrical and Computer Engineering at the University of California, Riverside. He has served the IEEE Control Systems Society (CSS) on the Board of Governors for two terms ('03-'06, '12-'14), as Vice President Finance and Vice President of Technical Activities, as General Chair of IEEE CDC 2012, and as President in 2014. He was named a GNSS Leader to Watch for 2009-2010 by GPS World Magazine in May 2009 and a winner of the Connected Vehicle Technology Challenge by the U.S. Department of Transportation's (DOT's) Research and Innovative Technology Administration in July 2011. He is a Fellow of the IEEE, a Fellow of AAAS, a Distinguished Member of IEEE CSS, and author of over 200 technical publications. He is author of the book "Aided Navigation: GPS with High Rate Sensors" (McGraw-Hill 2008). He is also co-author of the books "The Global Positioning System and Inertial Navigation" (McGraw-Hill, 1998) and "Adaptive Approximation Based Control: Unifying Neural, Fuzzy and Traditional Adaptive Approximation Approaches" (John Wiley 2006).

D. Plenary Lecture IV

(Chair: Woojin Chung)



October 15 (THU), 14:50~15:50, Room 205

Yoshihiko Nakamura

Professor, Department of Mechano-Informatics
University of Tokyo, Japan

Disaster-Response Humanoid Robots: Focusing on Actuators and Power Source for Field Robots

Abstract: The goal of a disaster-response robot is saving a person or doing what can be done by a person in the extremely hazardous space that was collapsed by the disaster but still remains typical properties as a space for human activities. One may find a difficulty to convince another who questions whether humanoid is suitable for such a robot. It is, however, a natural consequence that the robot should not be too tall or short, too wide or thin, too heavy or light as compared to a human. The robot should have sufficient degrees of freedom for moving in the man-made space and manipulating a tool or an equipment found in the space of human activities. The DARPA Robotics Challenge in June 2015 was a program pursuing the breakthrough of such technology. Team NEDO-Hydra started the development towards the DRC in August 2014 seeking for a breakthrough in the actuation system and the power source system. The team unfortunately had to give up the participation because it could not complete the robot in time for the competition. The development is still underway. This talk will report and discuss the development and the current status of the robot, Hydra.

Biography: Yoshihiko Nakamura received Ph.D. from Kyoto University and started his work as Assistant Professor at Automation Research Laboratory, Kyoto University. After serving as Assistant and Associate Professor at the Department of Mechanical and Environmental Engineering, University of California, Santa Barbara, he joined Department of Mechano-Informatics, University of Tokyo, Japan, and is currently Professor. Dr. Nakamura's research stems from the foundation of kinematics, dynamics, and control. Humanoid robotics, cognitive robotics, neuro-musculoskeletal human modeling, biomedical systems, and their computational algorithms are the current fields of his research. His book publication includes "Advanced Robotics: Redundancy and Optimization" (1991 Addison-Wesley), "Building the Robot Brain" (2003 Iwanami), and "Robot Motion" (coauthored with M. Uchiyama, 2004 Iwanami) for which the Publication Award was presented by the Society of Instrument and Control Engineers in 2005. Dr. Nakamura was a recipient of King-Sun Fu Memorial Best Transactions Paper Award, IEEE Transaction of Robotics and Automation in 2001 and 2002. He was appointed as the Distinguished Lecture for 2006-2008 of the Robotics and Automation Society of IEEE and received the Most Active Distinguished Lecture Award in 2007. He is the President of International Federation for the Promotion of Mechanism and Machine Science (2012-2015). He is a founding member and a co-chair of IEEE-RAS Technical Committee on Robotics and Automation in Nuclear Facilities (2012-). Dr. Nakamura is Fellow of the Japan Society of Mechanical Engineers, Fellow of the Robotics Society of Japan, Fellow of IEEE and Fellow of World Academy of Arts and Science. Dr. Nakamura is Foreign Member of Academy of Engineering Science of Serbia, and TUM Distinguished Affiliated Professor of Technische Universität München.

E. Plenary Lecture V

(Chair: Kyujin Cho)



October 15 (THU), 15:50~16:50, Room 205

Sangbae Kim

Professor, Department of Mechanical Engineering
Massachusetts Institute of Technology, USA

The MIT Cheetah: New Design Paradigm for Mobile Robots

Abstract: Now we are entering the new era where robots are moving around us serving for humanity in our environments. Unlike the conventional manufacturing robots focusing on accuracy in position-tracking, these new mobile robot applications such as service, human assistive, and disaster response require a different set of functional requirements including impact mitigation and contact force control. The talk will discuss the new design paradigm for these emerging robotic applications, and introduce an embodiment of such paradigm, the MIT Cheetah. The MIT cheetah is capable of running upto 6m/s at animals' efficiency and capable of jumping over a 40cm-high obstacle.

Biography: Prof. Sangbae Kim, is the director of the Biomimetic Robotics Laboratory and an Associate Professor of Mechanical Engineering at MIT. His research focuses on the bio-inspired robotic platform design by extracting principles from complex biological systems. Kim's achievements on bio-inspired robot development include the world's first directional adhesive inspired from gecko lizards, and a climbing robot, Stickybot, that utilizes the directional adhesives to climb smooth surfaces featured in TIME's best inventions in 2006. The MIT Cheetah achieves stable outdoor running at an efficiency of animals and autonomous jumping over obstacle, employing biomechanical principles from studies of best runners in nature. This achievement was covered by more than 200 articles. He is a recipient of King-Sun Fu Memorial Best Transactions on Robotics Paper Award (2008), DARPA YFA(2013), and NSF CAREER (2014) award.

F. Plenary Lecture VI

(Chair: Keum-Shik Hong)



October 16 (FRI), 11:00~12:00, Room 205

David Boas

Professor, Radiology
Harvard Medical School, USA

Functional Near Infrared Spectroscopy – What is it and its potential role in brain-computer interfacing?

Abstract: This increase in blood flow also corresponds with an increase in the local concentration of hemoglobin. Hemoglobin concentrations in the brain of humans can be interrogated with near infrared light because hemoglobin is the dominated chromophore in tissue in the near infrared, the absorption length is relatively long (~10 cm), and the

scattering length is not too short (~0.1 cm). These optical properties of the scalp, skull, and brain, permit near infrared photons to diffuse through the scalp and skull, interrogate the hemoglobin absorption in the brain, and diffuse back to the surface of the scalp to be detected. Modulation of the hemoglobin concentration by brain activation then results in modulation of the amount of near infrared light detected at the surface of the scalp.

Over the last 20 years, functional near infrared spectroscopy (fNIRS) has been used in a broad range of applications to better understand the functioning brain. It complements PET and MRI measures of brain activity by being portable versus requiring large imaging structures, and complements EEG by measuring hemodynamic responses to brain activity versus the electrical responses. fNIRS is proving to have important impact in studying the developing brain of infants and in applications require subject mobility such studies of gait and interactions with real world environments. The portability advantages are leading to numerous investigations of the potential to use fNIRS as a brain computer interface (BCI). During my talk, I will review the principles of fNIRS, important applications that are being developed, and discuss how fNIRS is being used in BCI.

Biography: David Boas is the director of the Martinos Optics Division in the Department of Radiology at Massachusetts General Hospital, and is a full professor of Radiology at Harvard Medical School. He received his BS on Physics at Rensselaer Polytechnic Institute and PhD in Physics at the University of Pennsylvania. His research focuses on developing novel optical methods to study cerebral physiology and pathophysiology with a particular focus on studying brain function, oxygen delivery, and consumption. He has developed methods spanning the length scales from microscopic capillary and cellular resolution to macroscopic measurements of human cerebral physiology through the intact scalp and skull. He is the founding President of the Society for Functional Near Infrared Spectroscopy and founding Editor-in-Chief of the journal Neurophotonics published by SPIE. Dr. Boas has published more than 150 papers that have been broadly cited with an h-index >65

G. Plenary Lecture VII

(Chair: Taesam Kang)



October 16 (FRI), 15:20~16:20, Room 205

Taek Lyul Song

Professor, Department of Electronic Systems Engineering
Hanyang University, Korea

Computationally Efficient Multi-target Data Association

Abstract: Data association filters are used when the origin of data is unknown. They are often used in target tracking situations where the existence, number or trajectories of the targets are unknown a priori. Measurements obtained by sensors include target positions corrupted by the measurement noises, but unwanted measurements termed clutter are also contained in them.

The target measurements will appear only with a certain probability of detection which is less than 1. In such an environment, the task of data association filters are to decide on the number and the presence of the targets, and to estimate their trajectories.

At each scan, the sensor will obtain a number of measurements. candidate objects or tentative tracks are formed using the measurements. tracks may be true tracks or false tracks. each true track is formed by measurements originating from the same target and is following the target. Other tracks are termed false tracks. The first task of the data association filters is to decide which tentative tracks is true and to confirm the track, and which track is or has become a false track and to subsequently terminate the false track. This procedure is called the false track discrimination (FTD). FTD procedure uses a track quality measure provided by the data association filter. One such track quality measure is the track score evaluated from logarithm measurement likelihood ratio as introduced in multiple hypothesis tracking. The probability of target existence is often used as a track quality measure. The probability of target existence uses the Bayes equation to directly estimate the probability that the target exists in a recursive manner.

In each scan, a number of candidate measurements may exist to update the state of each track. If we define the measurement history of a track as a sequence of candidate measurements, the number of possible measurement histories for each track would grow exponentially in time. This soon exceeds the available computational resources so that various suboptimal approaches are used in data association filters. Another source of exponential complexity is the number of possible measurement-to-track allocations in each scan which grows exponentially in the number of tracks and the number of measurements involved. This again exceeds the available computational resources even in relatively benign situations, and suboptimal methods are used instead. In this talk,

- (1) the existing multi-target data association methods and related target tracking filters will be reviewed,
- (2) performance limits of the existing methods in terms of available computational resources will be examined,
- (3) practical and computationally efficient multi-target data association will be introduced.

Biography:

[Experiences]

1974: B.S. in Nuclear Engineering, Seoul National University

1981: M.S. in Aerospace Engineering, Texas at Austin (USA)

1983: Ph.D. in Aerospace Engineering, Texas at Austin (USA)

[Professional Activities]

2000 ~ present : Professor of Department of Electronic Systems Engineering, Hanyang University

2005 ~ present : Business advisory leader of Gyeonggi Techno Park

2008 ~ 2010 : Chair of Department of Electric, Electronic, Instrumental Engineering, Hanyang University(Graduate)

2008 ~ 2010 : Chair of Department of Electronic Information Systems Engineering, Hanyang University(Undergraduate)

2008 ~ 2010 : Director of Research Institute Engineering & Technology, Hanyang University
2004 ~ 2006 : Director of Business Incubator Center, Hanyang University
2003 ~ 2005 : Head of Business Division, Gyeonggi Techno Park
1995 ~ 2000 : Associate Professor of Department of Electronic Computer Engineering, Hanyang University
1984 ~ 1995 : Associate Research Engineer, Agency for Defense Development
1984 ~ 1984 Post Doc., Texas at Austin
1980 ~ 1983 Research Assistant, Texas at Austin
1974 ~ 1980 : Senior Research Engineer, Agency for Defense Development

[Research Achievements]

- Major Research Projects

Guidance Control Performance Improvement by analyzing guided flight tests of a Multiple Launch Rocket System

2010.09 ~ 2012.03 / Hanwha

Development of object tracking and track management performance for car systems

2012.4 ~ 2012.12 / Hyundai Mobis

Information Fusion and Tactics for CFCS

2011.10 ~ 2012.09 / LIG NEX1

Feedback Enhanced Signal Processing for Robust Target Tracking using Underwater Sensors

2010.07 ~ 2012.06 / Agency for Defense Development

A study on the Optimal Engagement Algorithm for the Submarine by the Target Information Fusion and Maneuver Estimation/ 2009.07 ~ 2014.12 / Agency for Defense Development

A study on Target Information Fusion Technology – Underwater Communication Research Center(UCRC)

2007.01 ~ 2015.12 / Agency for Defense Development

Guidance and control technique using Multi-sensor information fusion – Image Information Research Center(IIRC)

2004.01 ~ 2012.12 / Agency for Defense Development

Target tracking with Multi-sensor data processing

2007.01 ~ 2008.12 / Samsung Thales

- Major Papers

Taek Lyul Song, Darko Musicki and Hyoung Won Kim, “Distributed (nonlinear) target tracking in clutter,” IEEE Transactions on Aerospace and Electronic Systems, Vol. 51, No. 1, Jan. 2015

Taek Lyul Song, Darko Musicki, and Da Sol Kim, “Target Tracking with Target State Dependent Detection,” IEEE transactions on signal Processing, Vol. 59, No. 3, Mar. 2011.

Taek Lyul Song and Darko Musicki, “Adaptive Clutter Measurement Density Estimation for Improved Target Tracking,” IEEE Transactions on Aerospace and Electronic Systems, Vol. 47, No. 2, Apr. 2011.

Taek Lyul Song, Hyoung Won Kim and Darko Musicki, “Iterative joint probabilistic data association for multitarget tracking,” IEEE Transactions on Aerospace and Electronic Systems, Vol. 51, No. 1, Jan. 2015.

X. Special Sessions

A. Korean Student Workshop: Do's and Don'ts in Paper Writing and Presentation

- **October 14(WED) ; 9:10~10:40**
- Room : 101
- Organizer: Choon Ki Ahn (Korea University) & Hyungbo Shim (Seoul National University)
- 09:10~09:55 - On Paper Writing (Choon Ki Ahn)
- 09:55~10:40 - On Presentation (Hyungbo Shim)
- Theme: This session discusses how to write a good journal paper for Korean graduate students who are writing or preparing a journal paper. In addition, this session introduces how to prepare and make an effective and engaging conference presentation for Korean graduate students.
- *Korean is used in the session.

B. Advances in Underwater Vehicle

- **October 14(WED) ; 16:30~18:00**
- Room : 101
- Organizer: Ayoung Kim (KAIST)
- Theme: In this Session, advances in underwater vehicle researches will be presented. The topic covers from sensing, design, and wide application of underwater vehicles.

C. How to Achieve Successful Technology Transfer

- **October 15(THU) ; 13:00~14:30**
- Room : 101
- Organizer: Jae-Bok Song (Korea University), Sungchul Kang (KIST), Sam Park (Yujin Robot)
- Theme: In recent years, technology transfer from the research labs of the academia and research institutes to the industry has become increasingly important because the world is facing technology warfare. Especially, in Korea, most doctoral degree holders are working in academia and national research institutes, so many new technologies are developed in these research labs. Obviously, successful transfer of such technologies to the industry will strengthen the competitiveness of high-tech companies. In this special session, three speaker from the academia, research institute, and enterprise will talk about some successful cases and their experiences about successful technology transfer.
- * Korean is used in the session.

D. Bio-inspired Robot Design

- **October 16(FRI) ; 9:10~10:40**
- Room : 101
- Organizer: Sangbae Kim (MIT), Kyujin Cho (Seoul National University), Hoon Cheol Park (Konkuk University)
- Theme: Bio-inspired robot designs attempt to translate biological principles into engineered systems,

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replacing more classical engineering solutions in order to achieve a function observed in the natural system. This special session will present bio-inspired robots that replicate key principles from nature with novel engineering solutions. The challenges of bio-inspired robot design include developing a deep understanding of the relevant natural system and translating this understanding into engineering design rules. This often entails the development of novel fabrication and actuation technologies to realize the design.

E. fNIRS Forum : Toward a mobile brain imager

Sponsored by  **Dong-il SHIMADZU Corp.**

- **October 16(FRI) ; 13:30~15:50**

- Room : 101

A **forum on fNIRS** (functional near-infrared spectroscopy) will be held in Busan, Korea, during the International Conference on Control, Automation and Systems (ICCAS 2015, <http://2015.iccas.org>), which is co-organized by the Institute of Control, Robotics and System (ICROS). In this forum, international scholars and experts will be gathered together to discuss the state-of-the-art methods, results, applications, and future perspectives in the fNIRS field.

Theme: fNIRS's role as a mobile brain imaging modality

Organizer/Chair: **Prof. Keum-Shik Hong, PNU, Korea**

- 13:30~13:45** Handling motion, systemic interference, and anatomical guidance for fNIRS
(**Prof. David Boas, Harvard Medical School**)
- 13:45~14:00** Artifacts and pitfalls in fNIRS
(**Prof. Satoru Kohno, Tokushima University**)
- 14:00~14:15** A unified sparse recovery and inference framework for functional DOT using random effect model
(**Prof. Jong Chul Ye, KAIST**)
- 14:15~14:30** fNIRS: An effective neural modality for discovering brain plasticity in rehabilitation
(**Dr. Jinung An, DGIST**)
- < Break: 14:30~14:40 >
- 14:40~14:55** Towards more intuitive BCI: Classification of binary covert intentions using fNIRS
(**Prof. Chang-Hwan Im, Hanyang University**)
- 14:55~15:10** Drowsiness detection during automobile driving by a combined NIRS and EEG system
(**Prof. Jae Gwan Kim, GIST**)
- 15:10~15:25** A portable, multi-channel fNIRS system for prefrontal cortex: Preliminary study on neurofeedback and imagery tasks
(**Prof. Beop Min Kim, Korea University**)
- 15:25~15:40** Detection of initial dip: Possibility of 3D imaging using fNIRS
(**Prof. Keum-Shik Hong, PNU**)
- 15:40~15:50** **Discussion**