ICAROB 2019

PROCEEDINGS OF THE 2019 INTERNATIONAL CONFERENCE ON ARTIFICIAL LIFE AND ROBOTICS

January 10-13, 2019
B-Con Plaza, Beppu, Oita, JAPAN
24th AROB International Meeting Series

Editor-in-Chief
Masanori Sugisaka
Editors: Yingmin Jia, Takao Ito, Ju-Jang Lee
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ARTIFICIAL LIFE AND ROBOTICS

(ICAROB2019)

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HISTORY

The International Conference on Artificial Life and Robotics (ICAROB) resulted from the AROB-symposium (International Symposium on Artificial Life and Robotics) whose first edition was held in 1996 and the eighteenth and last edition in 2013. The AROB symposium was annually organized by Oita University, Nippon Bunri University (NBU), and ALife Robotics Corporation Ltd., under the sponsorship of the Science and Technology Policy Bureau, the Ministry of Education, Science, Sports, and Culture (Monbusho), presently, the Ministry of Education, Culture, Sports, Science, and Technology (Monkasho), Japanese Government, Japan Society for the Promotion of Science (JSPS), the Commemorative Organization for the Japan World Exposition ('70), Air Force Office of Scientific Research, Asian Office of Aerospace Research and Development (AFOSR/AOARD), USA. I would like to express my sincere thanks to not only Monkasho (annually fund support from 1996 to 2013) but also JSPS, the Commemorative Organization for the Japan World Exposition ('70), and various other Japanese companies for their repeated support. The old symposium (this symposium has been held every year at B-Con Plaza, Beppu, Oita, Japan except in Oita, Japan (AROB 5th ’00) and in Tokyo, Japan (AROB 6th ’01).) was organized by the International Organizing Committee of AROB and was co-operated by the Santa Fe Institute (USA), RSJ, IEEJ, ICASE (Now ICROS) (Korea), CAAI (P. R. China), ISCIE, IEICE, IEEE (Japan Council), JARA, and SICE. The old AROB-symposium expanded much by absorbing much new knowledge and technologies into it. This history and character of the former AROB symposiums are passed on the current ICAROB conference and to this journal, International Journal of Robotics, Networking and Artificial Life (JRNAL). From now on, ALife Robotics Corporation Ltd. is in charge of management of both the conference and the journal. The future of the ICAROB is brilliant from a point of view of yielding new technologies to human society in the 21st century. We also expect to establish an international research institute on Artificial Life and Robotics in the future with the help of Japanese Government and ICAROB. This conference invites you all.

AIMS AND SCOPE

The objective of this conference is the development of new technologies for artificial life and robotics which have been recently born in Japan and are expected to be applied in various fields. This conference presents original technical papers and authoritative state-of-the-art reviews on the development of new technologies concerning robotics, networking and artificial life and, especially computer-based simulation and hardware for the twenty-first century. This conference covers a broad multidisciplinary field, including areas such as:
Artificial intelligence & complexity
Artificial living
Artificial mind research
Artificial nervous systems for robots
Artificial sciences
Bipedal robot
Brain science and computing
Chaos
Cognitive science
Computational Molecular biology
Computer graphics
Data mining
Disasters robotics
DNA computing
Empirical research on network and MOT
Environment navigation and localization

Evolutionary computations
Facial expression analysis, music recommendation and augmented reality
Foundation of computation and its application
Fuzzy control
Genetic algorithms
Human-welfare robotics
Image processing
Insect-like aero vehicles
Intelligence in biological systems
Intelligent control
Management of technology
Medical surgical robot
Micro-machines
Multi-agent systems
Nano-biology
Nano-robotics
Networking
Neural circuits
Neuro-computer
Neuromorphic Systems
Neuroscience
Pattern recognition
Quantum computing
Reinforcement learning system & genetic programing
Robotics
Software development support method
System cybernetics
Unmanned underwater vehicles
Unmanned Aerial Systems Technologies
Unmanned Aerial Systems designing, controls and navigation
Unmanned Aero vehicles
Virtual reality
Visualization

Hardware-oriented submissions are particularly welcome. This conference will discuss new results in the field of artificial life and robotics

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MESSAGES

Masanori Sugisaka
General Chair
(President, ALife Robotics Co., Ltd. Japan)

Masanori Sugisaka

Masanori Sugisaka

General Chair of ICAROB

It is my great honor to invite you all to The 2019 International Conference on Artificial Life and Robotics (ICAROB 2019).

This Conference is changed as the old symposium from the first (1996) to the Eighteenth (2013) annually which were organized by Oita University, Nippon Bunri University(NBU), and ALife Robotics Corporation Ltd. under the sponsorship of the Science and Technology Policy Bureau, the Ministry of Education, Science, Sports, and Culture (Monbusho), presently, the Ministry of Education, Culture, Sports, Science, and Technology (Monkasho), Japanese Government, Japan Society for the Promotion of Science (JSPS), The Commemorative Organization for the Japan World Exposition ('70), Air Force Office of Scientific Research, Asian Office of Aerospace Research and Development (AFOSR/AOARD), USA. I would like to express my sincere thanks to not only Monkasho (annually fund support from 1996 to 2013) but also JSPS, the Commemorative Organization for the Japan World Exposition ('70), Japanese companies for their repeated support.

The old symposium was organized by International Organizing Committee of AROB and was co-operated by the Santa Fe Institute (USA), RSJ, IEEJ, ICASE (Now ICROS) (Korea), CAAI (P. R. China), ISCIE, IEICE, IEEE (Japan Council), JARA, and SICE. The old AROB symposium was growing up by absorbing many new knowledge and technologies into it.

This history and character was inherited also from ICAROB2014(The 2014 International Conference on Artificial Life and Robotics, included a series of ICAROB proceedings in SCOPUS and CPCI now. From now on, ALife Robotics Corporation Ltd. is in charge of management. This year we have The 2019 International Conference on Artificial Life and Robotics (ICAROB2019) (24th AROB Anniversary). The future of The ICAROB is brilliant from a point of view of yielding new technologies to human society in 21st century.

I hope that fruitful discussions and exchange of ideas between researchers during Conference (ICAROB2019) will yield new merged technologies for happiness of human beings and, hence, will facilitate the establishment of an international joint research institute on Artificial Life and Robotics in future.

Yingmin Jia
Co-General Chair
(Professor, Beihang University,
R .P. China)

Yingmin Jia

Co-General Chair of ICAROB

It is my great pleasure to invite you to The 2019 International Conference on Artificial Life and Robotics (ICAROB 2019), in B-Con Plaza, Beppu, Oita, Japan from January 10 to 13, 2019.

ICAROB develops from the AROB that was created in 1996 by Prof. Masanori Sugisaka and will celebrate her 24 th birthday in 2019. Doubtless, new mission and big challenges in the field of artificial life and robotics will promote ICAROB to start a new stage and attract wide interests among scientist, researchers, and engineers around the world.

For a successful meeting, many people have contributed their great efforts to ICAROB. Here, I would like to express my special thanks to all authors and speakers, and the meeting organizing team for their excellent works.

Looking forward to meeting you at ICAROB in Beppu and wishing you enjoy your stay in Japan.

Takao Ito

Co-General Chair
(Professor Hiroshima
University, Japan)

Takao Ito

Takao Ito

Co General Chair of ICAROB

It is my great honor to invite you all to The 2019 International Conference on Artificial Life and Robotics (ICAROB 2019). This Conference is changed as the old symposium (ISAROB) from the first (1996) to the Eighteenth. I am pleased to welcome you to The 2019 International Conference on Artificial Life and Robotics in the wonderful city of Beppu, Oita city, Oita Prefecture, Japan.

The ICAROB has its long history. The former organization of the ICAROB was developed under the strong leadership of the President, famous Professor Masanori Sugisaka, the father of AROB. We gathered many researchers, faculty members, graduate students from all over the world, and published many high-quality proceedings and high-reputational journals every year.

Over the years, dramatic improvements have been made in the field of artificial life and its applications. The ICAROB has becoming the unifying the exchange of scientific information on the study of man-made systems that exhibit the behavioral characteristic of natural living systems including software, hardware and wetware. Our conference shapes the development of artificial life, extending our empirical research beyond the territory circumscribed by life-as-we-know-it and into the domain of life-as-it-could–be. It will provide us a good place to present our new research results, excellent ideas, and valuable information about artificial intelligence, complex systems theories, robotics, and management of technology.

The conference site is B-con Plaza, one of the most famous international convention centers in Kyushu island, Japan. You can find many fantastic scenic spots and splendid historical places in Beppu, Oita city. Enjoy your stay and take your time to visit Beppu, Oita city.

I am looking forward to meeting you in Beppu, Oita city, during the ICAROB 2019 and to sharing the most pleasant, interesting and fruitful conference with you.

Ju-Jang Lee
Co-General Chair
(Honorary professor, KAIST)

Ju-Jang Lee

Co-General Chair of ICAROB

The First International Conference on Artificial Life and Robotics (ICAROB) was held in Oita City, Oita, Japan from Jan. 11th to 13th, 2014. This year's Conference will be held amidst the high expectation of the increasingly important role of the new interdisciplinary paradigm of science and engineering represented by the field of artificial life and robotics that continuously attracts wide interests among scientist, researchers, and engineers around the globe.

Distinguished researchers and technologists from around the world are looking forward to attending and meeting at ICAROB. ICAROB is becoming the annual excellent forum that represents a unique opportunity for the academic and industrial communities to meet and assess the latest developments in this fast growing artificial life and robotics field. ICAROB enables them to address new challenges, share solutions, discuss research directions for the future, exchange views and ideas, view the results of applied research, present and discuss the latest development of new technologies and relevant applications.

In addition, ICAROB offers the opportunity of hearing the opinions of well-known leading experts in the field through the keynote sessions, provides the bases for regional and international collaborative research, and enables to foresee the future evolution of new scientific paradigms and theories contributed by the field of artificial life and robotics and associated research area. The twenty-first century will become the century of artificial life and intelligent machines in support of humankind and ICAROB is contributing through wide technical topics of interest that support this direction.

It is a great honor for me as a Co-General Chair of the 6th ICAROB 2019 to welcome everyone to this important event. Also, I would like to extend my special thanks to all authors and speakers for contributing their research works, the participants, and the organizing team of the 6th ICAROB.

I'm looking forward to meeting you at the 6th ICAROB in Beppu, Oita Prefecture and wishing you all the best.

GENERAL SESSION TOPICS

GS1 Robotics I (3)	GS2 Robotics II (6)
GS3 Complexity (2)	GS4 Poster (5)
GS5 Others (8)	

ORGANIZED SESSION TOPICS

OS1 Intelligent Systems and Control (8)	OS2 Theory and Implementation of Neuromimetic Systems (5)
OS3 Intelligent navigation & Robotics (4)	OS4 Service Robotics (7)
OS5 Business Models and Management (4)	OS6 Software Development Support Method (6)
OS7 Media Information Processing and Artificial Intelligence (4)	OS8 Computational intelligence and cognitive science for human biosignals and human well-being (7)
OS9 Natural Computing and Beyond (3)	OS10 Mathematical Informatics (5)
OS11 Recognition and Control (12)	OS12 Robot Design and Simulation (5)
OS13 System and Control (10)	OS14 Intelligent Control (4)
OS15 Advanced Control (5)	OS16 New development about Control Engineering Education (4)
OS17 Multiagent and Complex Systems (3)	OS18 Data-Driven Control and Diagnosis Control Systems (5)
OS19 Advanced Technology on Sensing Technology, Devices, Application (3)	OS20 Advances in Field Robotics and Sensing System (8)
OS21 Advances in Marine Robotics and It's Applications (5)	OS22 Robot Competitions for Social Contribution (6)
OS23 Kansei and Information Engineering (4)	OS24 Automated content generation for narrative and cognitive contents (5)
OS25 High-Performance Computing for Interactive Content Creation and Rendering (3)	

1/10(Thu.) 17:30-19:30	Welcome Party (Hotel Shiragiku)
1/10(Thu.) - 1/13(Sun.)	ICAROB Secretariat
1/13(Sun.)	Farewell Party (Conference Site: 3F, Meeting Room 31)

TIME TABLE (1/11)

1/11(Fri.)	Conference Room	Meeting Room 31	Meeting Room 32	Meeting Room 33	Meeting Room 1	Meeting Room 4
8:40-	Registration (3F)					
9:00-10:15		OS8 Computational intelligence and cognitive science for human biosignals and human well-being (7) Chair: T. Hiroyasu	OS1-1 Intelligent Systems and Control (4) Chair: Kuo-Hsien Hsia	OS14 Intelligent Control (4) Chair: Yingmin Jia	OS21 Advances in Marine Robotics and It's Applications (5) Chair: Keisuke Watanabe	OS11 Recognition and Control (12) Chair: Fengzhi Dai
10:15-10:30	Coffee break					
10:30-11:00	Opening Ceremony (Conference Room)					
11:10-12:10	Chair: Kuo-Hsien Hsia (H. H. Lund), Chair: Jangmyung Lee (L. Pagliarini) Invited Speech IS1-1, IS1-2(Conference Room) Henrik Hautop Lund, Luigi Pagliarini					
12:10-13:10	Lunch					
13:10-14:10	Chair: Kazuo Ishii Plenary Speech PS-2(Conference room) Masanori Sugiyama					
14:10-14:30	Coffee break					
14:30-15:30			OS1-2 Intelligent Systems and Control (4) Chair: Kuo-Hsien Hsia	OS7 Media Information Processing and Artificial Intelligence (4) Chair: Yasunari Yoshitomi	OS3 Intelligent navigation & Robotics (4) Chair: Chan Gook Park	GS1 Robotics I (3) Chair: Jiwu Wang
15:30-15:50	Coffee break					
15:50-17:50		OS20 (8) Advances in Field Robotics and Sensing System (8) Chair: Eiji Hayashi	OS4 Service Robotics (7) Chair: Evgeni Magid	OS2 Theory and Implementation of Neuromimetic Systems (5) Chair: Timothée Levi	OS18 Data-Driven Control and Diagnosis Control Systems (5) Chair: Takuya Kinoshita	OS13 System and Control (10) Chair: Qiang Wei

Meeting Room 31: Committee waiting room and Rest room

TIME TEBLE (1/12)

1/12(Sat.)	Conference Room	Meeting Room 31	Meeting Room 32	Meeting Room 33	Meeting Room 1	Meeting Room 4
8:40-	Registration					
9:00-9:45			OS17 Multiagent and Complex Systems (3) Chair: Akihiro Yamaguchi	GS3 Complexity (2) Chair: Manabu Sugii	OS9 Natural Computing and Beyond (3) Chair: Marion Oswald	OS19 Advanced Technology on Sensing Technology, Devices, Application (3) Chair: Hiroki Tamura
9:45-10:00	Coffee break					
10:00-11:00		GS4 Poster (5) Chair: Evgeni Magid	OS16 New development about Control Engineering Education (4) Chair: Yoshihiro Ohnishi	OS23 Kansei and Information Engineering (4) Chair: T. Hattori		
11:00-11:10	Coffee break					
11:10-12:10	Chair: Ju-Jang Lee (Y. I. Cho), Chair: Marion Oswald (K. Sumi) Invited sessionIS-2, IS-3 (Conference Room) Young Im Cho, Kaoru Sumi					
12:10-13:10	Lunch					
13:10-14:10	Chair: Akira Nakamura Plenary Speech PS-1 (Conference Room) Kensuke Harada					
14:10-14:30	Coffee break					
14:30-16:00		GS4 Poster	OS15 Advanced Control (5) Chair: Yingmin Jia	OS12 Robot Design and Simulation (5) Chair: QinJian Zhang	OS22 Robot Competitions for Social Contribution (6) Chair: Yasunori Takemura	
16:00-16:20	Coffee break					
16:20-17:50			GS2 Robotics II (6) Chair: Jiwu Wang	OS25 High-Performance Computing for Interactive Content Creation and Rendering (3) Chair: R.P.C. Janaka Rajapakse		
18:30-20:30	Banquet: Hotel Shiragiku					

Meeting Room 31: Committee waiting room and Rest room

TIME TABLE (1/13)

1/13(Sun.)	Meeting Room 31	Meeting Room 32	Meeting Room 33	Meeting Room 1	Meeting Room 4
8:40-	Registration				
9:00-10:30		OS6 Software Development Support Method (6) Chai: Tetsuro Katayama	OS5 Business Models and Management (4) Chair: Takao Ito		
10:30-10:40	Coffee break				
10:40-11:40	Chair: Takao Ito Plenary Speech PS-3(Meeting Room 31) Yingmin Jia				
11:40-12:40	Lunch				
12:40-13:55		OS10 Mathematical Informatics (5) Chair: Makoto Sakamoto	OS24 Automated content generation for narrative and cognitive contents (5) Chair: Jumpei Ono		
Farewell Party (13:55-14:25) Meeting Room 31					

Meeting Room 31: Committee waiting room and Rest room

GS5 Others (8)

no presentation, only papers

The 2019 International Conference on ARTIFICIAL LIFE AND ROBOTICS (ICAROB2019)

January 10 (Thursday)

17:30-19:30 Welcome Party (Hotel Shiragiku)

January 11 (Friday)

10:30-11:00

Opening Ceremony (Conference Room)
Chair: Marion Oswald (Technische Universität Wien, Austria)

Welcome Addresses

1. General Chairman of ICAROB	Masanori Sugisaka (ALife Robotics Co., Ltd., Japan)
2. Co-General Chairman of ICAROB	Yingmin Jia (Beihang University, P. R. China)
3. Co-General Chairman of ICAROB	TaKao Ito (Hiroshima University, Japan)
4. Co-General Chairman of ICAROB	Ju-Jang Lee (KAIST, Korea)
5. Vice General Chair of ICAROB	Henrik Hautop Lund (Technical University of Denmark, Denmark)
6. Vice General Chair of ICAROB	Jangmyung Lee (Pusan National University, Korea)

January 12 (Saturday)

Banquet: Hotel Shiragiku

18:30-20:30

Chair: Takao Ito (Hiroshima University, Japan)

Welcome Addresses

Prof. Kensuke Harada (Osaka University, Japan)

Prof. Yingmin Jia (Beihang University, P.R. China)

Prof. Henrik Hautop Lund (Technical University of Denmark, Denmark)

Prof. Ju-Jang Lee (KAIST, Korea)

TECHNICAL PAPER INDEX

January 11 (Friday)

8:40-Registration

Conference Room
10:30-11:00 Opening Ceremony
Chair: Marion Oswald (Technische Universität Wien, Austria)

11:10-11:40
Invited session IS1-1
Chair: Kuo-Hsien Hsia (Far East University, Taiwan)

IS1-1-1 *Engineering Modular Playware*
Henrik Hautop Lund, Morten Roed Frederiksen, Massimiliano Leggieri
(Technical University of Denmark, Denmark)

IS1-1-2 *User-Friendly Robotics 3 – Playware*
Henrik Hautop Lund, Luigi Pagliarini (Technical University of Denmark, Denmark)

11:40-12:10
Invited session IS1-2
Chair: Jang-Myung Lee (Pusan National University, Korea)

IS1-2-1 *User-Friendly Robotics 1 – AI Software*
Luigi Pagliarini [1,2], Henrik Hautop Lund [1]
([1]Technical University of Denmark, Denmark, [2]Academy of Fine Arts of Macerata, Italy)

IS1-2-2 *User-Friendly Robotics 2– Interfacing Robotics with any user*
Luigi Pagliarini[1,2], Henrik Hautop Lund[1]
([1]Technical University of Denmark, Denmark) ([2]Academy of Fine Arts of Macerata, Italy)

13:10-14:10

Plenary Speech PS-2

Chair: Kazuo Ishii (Kyushu Institute of Technology, Japan)

PS-2 *Toward Life with Partner Robots-Developing robots with the field trial toward the practical use*
Masanori Sugiyama (Toyota Motor Corporation, Japan)

Meeting Room 31
9:00-10:45 OS8 Computational intelligence and cognitive science for human biosignals and human well-being (7)

Chair: Tomoyuki Hiroyasu (Doshisha University, Japan)
Co-Chair: Hiroshi Furutani (Doshisha University, Japan)

OS8-1 *Unified Approach to (1+1) EA on Discrete Linear Functions*
Kenji Aoki, Makoto Sakamoto (University of Miyazaki, Japan)
Hiroshi Furutani, Satoru Hiwa, Tomoyuki Hiroyasu (Doshisha University, Japan)

OS8-2 *A fNIRS study of brain state during letter and category fluency tasks*
Akane Onishi, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu (Doshisha University, Japan)

OS8-3 *Construction of a meditation practice support system leads to a good meditation state: an fNIRS study*
Seika Fujii, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu (Doshisha University, Japan)

OS8-4 *Automated panoramic image creation system for corneal endothelial cells*
Keitaro Kobayashi, Naoki Okumura, Noriko Koizumi, Satoru Hiwa, Hiroshi Furutani,
Tomoyuki Hiroyasu (Doshisha University, Japan)

OS8-5 *An fMRI study of the inhibitory effects of the random stimulus-response compatibility task on brain function*
Kei Sahara, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu (Doshisha University, Japan)

OS8-6 *Measurement of brain activity and problem discovery during actual driving*
Seishiro Nakamura, Satoru Hiwa, Kenya Sato, Hiroshi Furutani, Tomoyuki Hiroyasu
(Doshisha University, Japan)

OS8-7 Control of driving simulator based on state detection of the driver using Electrocardiogram measurement
Koma Yoshioka, Satoru Hiwa, Kenya Sato, Hiroshi Furutani, Tomoyuki Hiroyasu
(Doshisha University, Japan)

15:50-17:50 OS20 Advances in Field Robotics and Sensing System (8)

Chair: Eiji Hayashi (Kyushu Institute of Technology, Japan)

Co-Chair: Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS20-1 *Field Robot and Sensing system*
Eiji Hayashi (Kyushu Institute of Technology, Japan)

OS20-2 *Saliency Map Based on Maximization of Difference between Central and Surround Visions and Its Relationship with Image Feature Points*
Ryuugo Mochizuki, Shinsuke Yasukawa, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS20-3 *Dynamic Wireless Network System using Multiple Drones for Tunnel Applications*
Raji Alahmad, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS20-4 *Counting Crops under Cultivation using Drone*
Yasunori Takemura[1], Yusuki Hirata[2], Eiji Mizoe[3], Masao Tashiro[4] and Yousuke Nagai[5]
([1]Nishinippon Institute of Technology, [2]Kyushu Institute of Technology, [3]Sky Canvas Co.
[4]Joint Corp. Project Sky-eye, [5]Aruku Aguriculture Service LLC, Japan)

OS20-5 *Soil Compaction and Rolling Resistance Evaluation of a Locomotion System with Adjustable Contact Patches for Applications in the Vineyard*
Enrico di Maria, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS20-6 *Robot Navigation in Forest Management Based on Graph*
Ayumu Tominaga[1], Ryusuke Fujisawa[1], Eiji Hayashi[1], Abbe Mowshowitz[2]
([1]Kyushu Institute of Technology, Japan, [2]The City College of New York, USA)

OS20-7 *Development of Autonomous Moving System for Field Robot*
Kengo Kawazoe, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)

OS20-8 *Development of the sense system that is combined force feedback and vision feedback*
-Improvement reproducibility of deformation simulation by using LEM-
Tamon Shigeyama, Eiji Hayashi , Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)

Meeting Room 32

9:00-10:00 OS1-1 Intelligent Systems and Control (4)

Chair: Kuo-Hsien Hsia (Far East University, Taiwan)

Co-Chair: Chung-Wen Hung (National Yunlin University of Science & Technology, Taiwan)

OS1-1 *A Vishay Supercapacitor based Fast Charge Battery*
Chung-Wen Hung, Yi-Chang Yang, Chun-Chu Lin, Li-Sheng Jheng
(National Yunlin University of Science and Technology, Taiwan)

OS1-2	*Multi-Motor Synchronous Control with CANOpen* Chung-Wen Hung, Roger CL Lee, Bo-Kai Huang, Shit-Ting Yu (National Yunlin University of Science and Technology, Taiwan)
OS1-3	*Selection Strategy for VM Migration Method* Yan-Ren Chen, I-Hsien Liu, Keng-Hao Chang, Jung-Shian Li (National Cheng Kung University, Taiwan)
OS1-4	*VM Migration Placement in Cloud Service* Yan-Ren Chen, I-Hsien Liu, Keng-Hao Chang, Chuan-Gang Liu, Jung-Shian Li (National Cheng Kung University, Taiwan)

14:30-15:30 OS1-2 Intelligent Systems and Control (4)

Chair: Kuo-Hsien Hsia (Far East University, Taiwan)

Co-Chair: Chung-Wen Hung (National Yunlin University of Science & Technology, Taiwan)

OS1-5	*Control System for Maintaining Safe Following Distance while Driving* Kuo-Hsien Hsia, Jia-Hong Cai, Shu-Li Pai (Far East University, Taiwan) Evgeni Magid (Kazan Federal University, Russia)
OS1-6	*Markerless Indoor Augmented Reality Navigation Device Based on Optical-Flow-Scene Indoor Positioning and Wall-Floor-Boundary Image Registration* Chian C. Ho, Bo-Kai Wang, Guan-Lung Liao (National Yunlin University of Science and Technology, Taiwan)
OS1-7	*Development of the handheld gas detector with IoT function.* Jr-Hung Guo, Kuo-Hsien Hsia, Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan)
OS1-8	*Research on Employee Attribute Correlation of Information Security Awareness in Organization* Tse-Yao Wang (Air Force Institute of Technology, Taiwan) Fu-Hsiang Wen (National Kaohsiung University of Science and Technology, Taiwan)

15:50-17:35 OS4 Service Robotics (7)
Chair: Evgeni Magid (Kazan Federal University, Russia)
Co-Chair: Kuo-Hsien Hsia (Far East University, Taiwan),
Co-Chair: Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan)

OS4-1	*Apply 2D Barcode Scanner for Mobile Robot Navigation in Checkerboard Mapping* Chun-Chi Lai[1], Kuo-Lan Su[1], Chia-Jen Lin[1], Evgeni Magid[2] ([1]National Yunlin University of Science and Technology, Taiwan) ([2]Kazan Federal University, Russia)

OS4-2 *Development of the MyRio Based Mobile Platform*
Bo-Jun Yang[1], Sheng-Jie Liou[1], Jr-Hung Guo[1], Kuo-Lan Su[1], Evgeni Magid[2]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]Kazan Federal University, Russia)

OS4-3 *Modelling Avrora Unior Car-like Robot in Gazebo Environment*
Ksenia Shabalina[1], Artur Sagitov[1], Kuo-Lan Su[2], Kuo-Hsien Hsia[3], Evgeni Magid[1]
([1]Kazan Federal University, Russia)
([2]National Yunlin University of Science and Technology, Taiwan)
([3]Far East University, Taiwan)

OS4-4 *Transfer of learned exploration strategies for a mobile robot from a simulated world to real Environments*
Artur Sagitov[1], Tetsuo Takano[2], Shohei Muto[2], Evgeni Magid[1]
([1]Kazan Federal University, Russia) ([2]Kanazawa University, Japan)

OS4-5 *Extending Gazebo simulator for surgical robotics: tissue and suture modeling*
Artur Sagitov[1], Hongbing Li[2], Evgeni Magid[1]
([1]Kazan Federal University, Russia) ([2]Shanghai Jiao Tong University, China)

OS4-6 *Experiences of Robotics students in Machine Vision course being taught in a foreign language: comprehension, self-efficiency, and active learning strategies improvement*
Tatyana Tsoy, Artur Sagitov, Evgeni Magid (Kazan Federal University, Russia)

OS4-7 *Pilot Virtual Experiments on ArUco and AprilTag Systems Comparison for Fiducial Marker Rotation Resistance*
Aufar Zakiev[1], Ksenia Shabalina[1], Kuo-Lan Su[2], Kuo-Hsien Hsia[3], Evgeni Magid[1]
([1]Kazan Federal University, Russia)
([2]National Yunlin University of Science and Technology, Taiwan)
([3]Far East University, Taiwan)

Meeting Room 33
9:00-10:00 OS14 Intelligent Control (4)
Chair: Yingmin Jia (Beihang University (BUAA), China)
Co-Chair: Weicun Zhang (University of Science and Technology Beijing, China)

OS14-1 *Flock Guiding of Hybrid Agents via Root Block*
Yunzhong Song, Ziyi Fu, Fuzhong Wang (Henan Polytechnic University, China)

OS14-2 *Multiple Model Adaptive Control of Flexible Arm*
Yingzhao Zhang[1], Xiao Wang[1], Handong Li[1], Weicun Zhang[2]
([1]Guizhou University, [2]University of Science and Technology Beijing, China)

OS14-3 *Time-Varying Lyapunov Function for Mechanical Systems*
Bin Zhang[1], Yingmin Jia[2]
([1]Beijing University of Posts and Telecommunications, [2]Beihang University (BUAA), China)

OS14-4 *Optimizing Control Parameters of Space Robot Manipulator for Pulsar X-ray Interference Measurement*
Qiang Chen[1], Hengbin Zhang[1], Xiaomin Bei[1], Hanwen Zhang[2]
([1]Chinese Academy of Space Technology, [2]Beijing Institute of Control Engineering, China)

14:30-15:30 OS7 Media Information Processing and Artificial Intelligence (4)

Chair: Yasunari Yoshitomi (Kyoto Prefectural University, Japan)
Co-Chair: Masayoshi Tabuse (Kyoto Prefectural University, Japan)

OS7-1 *Effectiveness of Data Augmentation in Automatic Summarization System*
Tomohito Ouchi, Masayoshi Tabuse (Kyoto Prefectural University, Japan)

OS7-2 *A System for Posting on SNS Portrait Selected Using Facial Expression Analysis While Writing Message*
Taro Asada[1], Yuiko Yano[2], Yasunari Yoshitomi[1], Masayoshi Tabuse[1]
([1] Kyoto Prefectural University, [2] Nara Guarantee Corporation, Japan)

OS7-3 *A Method Using Wavelet Transform for Judging Character to be Inserted into Image*
Yasunari Yoshitomi[1], Takashi Sato[2], Taro Asada[1], Masayoshi Tabuse[1]
([1] Kyoto Prefectural University, [2] Tokyo Institute of Technology, Japan)

OS7-4 *An Authentication Method for Digital Audio Using Wavelet Transform and Fundamental Frequencies*
Yasunari Yoshitomi[1], Shohei Tani[2], Masaki Arasuna[3], Ryota Kan[4], Taro Asada[1], Masayoshi Tabuse[1]
([1] Kyoto Prefectural University, [2] Fukuchiyama City Hall, [3] Nissay Information Technology Co., Ltd., [4] Shimazu Business Systems Co., Ltd., Japan)

15:50-17:05 OS2 Theory and Implementation of Neuromimetic Systems (5)

Chair: Timothée Levi (The University of Tokyo, Japan)
Co-Chair: Yuichi Katori (Future University Hakodate, Japan)

OS2-1 *Decoding spike patterns of auto-associative memory on spiking neuronal networks*
Naoki Toyoshima, Takashi Kohno (The University of Tokyo, Japan)

OS2-2 *Possible Mechanism of Internal Visual Perception: Context-dependent Processing by Predictive Coding and Reservoir Computing Network*
Hiroto Tamura[1], Yuichi Katori[1,2], Kazuyuki Aihara[1]
([1]The University of Tokyo, [2]Future University Hakodate, Japan)

OS2-3 *Snake robot controlled by biomimetic CPGs*
Damien Blanchard[1], Kazuyuki Aihara[2], Timothée Levi[2]
([1]University of Bordeaux, France, [2]The University of Tokyo, Japan)

OS2-4 *Real-time implementation of ReSuMe learning in Spiking Neural Network*
Xia Yang, Seiji Uenohara, Kazuyuki Aihara, Takashi Kohno, Timothée Levi
(The University of Tokyo, Japan)

OS2-5 *Biomimetic spike-timing based ionic micro-stimulation for neuron culture*
Stephany Mai Nishikawa[1], Farad Khoyratee[1,2], Soo Hyeon Kim[1], Yoshiho Ikeuchi[1], rawr Kazuyuki Aihara[1], Teruo Fujii[1], Timothée Levi[1]
([1]The University of Tokyo, Japan, [2]University of Bordeaux, France)

Dynamical network model for visual cortex: hierarchical reservoir computing with bidirectional interactions (withdraw)
Shohei Takaichi[1], Yuichi Katori[2], Kazuyuki Aihara[1]
([1]The University of Tokyo, [2]Future University Hakodate, Japan)

Meeting Room 1
9:00-10:15 OS21 Advances in Marine Robotics and It's Applications (5)
Chair: Keisuke Watanabe (Tokai University, Japan)
Co-Chair: Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS21-1 *System Development of AUV's Sampling Device Controller Employing MATLAB/Simulink Toolboxes*
Takashi Sonoda[1], Shinsuke Yasukawa[2], Ahn Jonghyun[2], Yuya Nishida[2], Kazuo Ishii[2]
([1]Nishinippon Institute of Technology, [2]Kyushu Institute of Technology, Japan)

OS21-2 *Inspection System for Underwater Structure of Bridge Pier*
Takumi Ueda[1], Hiyoyasu Hirai[1], Kazuki Fuchigami[1], Ryoma Yuki[1], Ahn Jonghyun[1], Shinsuke Yasukawa[1], Yuya Nishida[1], Takashi Sonoda[1], Kazuo Ishii[1], Katsunori Higashi[2], Katsunori Tanaka[2], Tomomasa Ikeda[2]
([1]Kyushu Institute of Technology, [2]West Nippon Expressway Engineering Kyushu, Japan)

OS21-3 *Three-dimensional measurement using laser pattern and its application to underwater scanner*
Yuya Nishida, Tomoya Shinnoki, Shinsuke Yasukawa, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

OS21-4 *Development of Dam Inspection Underwater Robot*
Hiroyasu Hirai, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS21-5 *Conceptual Design of Small ROV for Sky to Water System*
Keisuke Watanabe, Koshi Utsunomiya, Kazumasa Harada, Nakajima Shuhei
(Tokai University, Japan)

14:30-15:30 OS3 Intelligent navigation & Robotics (4)
Chair: Chan Gook Park (Seoul National University, Korea)
Co-Chair: Jang-Myung Lee (Pusan National University, Korea)

OS3-1 *Trajectory tracking control for a 7-arms robot manipulator*
Wang Jie, Hyun-Hee Kim, Saad abbasi, Min-Cheol Lee (Pusan National University, Korea)

OS3-2 *Estimation tire-rod friction coefficient based on mobile robot*
Ji-Hyeon Kim, Zhang Hongyu, Jang-Myung Lee (Pusan National University, Korea)

OS3-3 *Real-time reflection removal algorithm using stereo camera only*
Do-Kyung Hwang, Jong-Woo An, Jang-Myung Lee (Pusan National University, Korea)

OS3-4 *The Effect of Inertial Measurement Unit on Synthetic Aperture Radar Image Quality*
Soo-Jeong Lee[1], Yong-Gonjong Park[1], Woo-Jung Park[1], Chan Gook Park[1], Jong-Hwa Song[2]
(Seoul National University, Korea[1], Hanwha Systems, Korea[2])

15:50-17:05 OS18 Data-Driven Control and Diagnosis Control Systems (5)
Chair: Takuya Kinoshita (Hiroshima University, Japan)
Co-Chair: Takao Sato (University of Hyogo, Japan)

OS18-1 *A Design Scheme of a Data-driven Predictive-PI Controller*
Yoichiro Ashida, Shin Wakitani and Toru Yamamoto (Hiroshima University, Japan)

OS18-2 *Improvement in Intersample Response of Multirate Regulation Control*
Takao Sato, Natsuki Kawaguchi, Nozomu Araki, Yasuo Konishi (University of Hyogo, Japan)

OS18-3 *Design of a PID Controller using a Fictitious Exogenous Signal for a Fluctuation System*
Masatoshi Kozui, Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

OS18-4 *Izhikevich Model Based Self-Repairing Control for Plants with Sensor Failures and Disturbances*
Masanori Takahashi (Tokai University, Japan)

OS18-5 *Design of a Data-Driven Controller with Evaluating Controller Performance*
Takuya Kinoshita and Toru Yamamoto (Hiroshima University, Japan)

Meeting Room 4
9:00-10:15 OS11 Recognition and Control (12)
Chair: Fengzhi Dai (Tianjin University of Science and Technology, China)
Co-Chair: Yizhun Peng (Tianjin University of Science and Technology, China)

OS11-1 *Design of feed part control system for rectification process*
Lingran An[1], Fengzhi Dai[1], Yujie Yan[1], Zhongyong Ye[1], Xia Jin[1], Yiqiao Qin[12], Chengcai Wang[3], Kaige Liu[1] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd, China)

OS11-2 *Ultrasonic range finder for vehicle collision avoidance system*
Ying Chen[1], Guowei Yang[1], Fengzhi Dai[1], Yuxuan Zhu[1], Di Yin[1], Yasheng Yuan[1],Yiqiao Qin[12], Ce Bian[12], Chengcai Wang[3], Xinyu Zhang[1] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd, China)

OS11-3 *Chaos synchronization method of Qi system and the circuit design*
Xia Jin[1], Fengzhi Dai[1], Zhongyong Ye[1], Lingran An[1], Yujie Yan[1], Chenglin Zhao[1], Yiqiao Qin[12], Hao Li[3] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd,, China)

OS11-4 *Design of air quality monitoring platform based on Internet of Things*
Yujie Yan[1], Fengzhi Dai[1], Kailun Zhang[1], Wei Wang[2], Jialin Han[1], Yang Li[3], Tianyi Zhang[1] ([1]Tianjin University of Science and Technology, [2]China Institute of Aerospace Engineering , [3]CETC Ocean Information Co., Ltd, China)

OS11-5 *Design of metal weld seam tracking equipment based on image processing*
Yujie Yan[1], Fengzhi Dai[1], Lingran An[1], Xia Jin[1], Zhongyong Ye[1], Yufan He[2], Xinran Guo[3] ([1]Tianjin University of Science and Technology, [2]CETC Ocean Information Co., Ltd, [3]Nanjing University, China)

OS11-6 *The recognition and implementation of handwritten character based on deep learning*
Zhongyong Ye[1], Fengzhi Dai[1], Xia Jin[1], Yasheng Yuan[1], Lingran An[1], Yujie Yan[1], Yiqiao Qin[12], Hao Li[3] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, [3]CETC Ocean Information Co., Ltd, China)

OS11-7 *Cluster analysis of wine based on three-dim fluorescent spectra characteristic*
Di Yin[1], Fengzhi Dai[1], Yuxuan Zhu[1], Yasheng Yuan[1], Tingting Zhang[1], Ying Chen, Yiqiao Qin[12], Chengcai Wang[3] ([1]Tianjin University of Science and Technology, [2] Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, [3]CETC Ocean Information Co., Ltd, China)

OS11-8 *The control design of the planting device for the hydroponic vegetable*
Yasheng Yuan[1], Fengzhi Dai[1], Zhongyong Ye[1], Yuxuan Zhu[1], Di Yin[1], Tingting Zhang[1], Yiqiao Qin[12], Yang Li[3] ([1]Tianjin University of Science and Technology, [2] Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd, China)

OS11-9 *An anti -theft system based on the self-checkout*
Yuxuan Zhu[1], Fengzhi Dai[1], Yasheng Yuan[1], Di Yin[1], Tingting Zhang[1], Ying Chen[1], Ce Bian[12], Yufan He[3] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd, China)

OS11-10 *Case study on communication between embedded linux environment and microcontroller*
Ziheng Gao, Yizhun Peng, Shuo Wang
(Tianjin University of Science and Technology, China)

OS11-11 *Design and implementation of a baby care robot*
Yizhun Peng, Zefan Ge, Kaixuan Geng, Zhou Yang,Rui Yang
(Tianjin University of Science and Technology, China)

OS11-12 *Research on intelligent shopping service robot design*
Shuo Wang, Yizhun Peng, Ruixiang Bai, Ziheng Gao
(Tianjin University of Science and Technology, China)

14:30-15:15 GS1 Robotics I (3)
Chair: Jiwu Wang (Beijing Jiaotong University, China)

GS1-1 *System to decide unit's layout of cell assembly machine by GA (Big Mutation in mutation process)*
Yoshiki Ito, Hidehiko Yamamoto, Takayoshi Yamada (Gifu University, Japan)

GS1-2 *Autonomous decentralized FMS that adopts priority ranking structure based on AGV's lies*
Kento Uejo, Hidehiko Yamamoto, Takayoshi Yamada (Gifu University, Japan)

GS1-3 *CULET: Cubelet Lego Turing Machine*
Ricardo Q. Figueroa, Daniel A. Zamorano, Genaro J. Martínez (Instituto Politécnico Nacional, México), Andrew Adamatzky (University of the West of England, UK)

15:50-17:50 OS13 System and Control (10)
Chair: Qiang Wei (Jianghan University, China)
Co-Chair: Huailin Zhao (Shanghai Institute of Technology, China)

OS13-1 *Research on a non-invasive measuring method of blood glucose concentration based on electrical impedance spectrum*
Tong Yin, Xiaoyan Chen, Meng Du, Hongyi Yin
(Tianjin University of Science and Technology, China)

OS13-2 *Synchronization of Novel 4D Chaotic Systems with Different Control Laws*
Hong Niu (Tianjin University of Science and Technology, China)

OS13-3 *Chaotic characteristics analysis of fractional-order Liu system*
Wengxin Shi, Hongyan Jia (Tianjin University of Science and Technology, China)

OS13-4 *Design and analysis of the multi-robot grouping aggregation algorithm*
Huailin Zhao, Zhen Nie (Shanghai Institute of Technology, China)

OS13-5 *Research of the ARM-based multi-robot aggregation control*
Huailin Zhao, Jingnan Zheng, Zhen Nie, Weiya Zhang, Zonglin Liu
(Shanghai Institute of Technology, China)

OS13-6 *Research on the Trajectory Planning Problem of Robots in Spherical Cutting*
Jun Min, Wenping Jiang, Huailin Zhao (Shanghai Institute of Technology, China)

OS13-7 *Emotional processing between artificial voices and human voices*
Qiang Wei[1], Xiaoyu Zhang[1], Xiao Yang[1], Yixin Lin[2], Qingming Liu[3]
([1]Jianghan University, [2]Huazhong University of Science and Technology, [3]Wuhan Rayson School, China)

OS13-8 *How people are affected by emoticon icon: An ERP study*
Qiang Wei[1], Jingxuan Huang[1], Yu Han[1], Yixin Lin[2]
([1]Jianghan University, [2]Huazhong University of Science and Technology, China)

OS13-9 *Single Chinese character fragments: an ERPs study on orthographic neighborhood effect*
Qiang Wei[1], Yunfei Wang[1], Chen Song[1], Yixin Lin[2]
([1]Jianghan University, [2]Huazhong University of Science and Technology, China)

OS13-10 *Research on embedded electrical impedance measurement system*
Tong Yin, Xiaoyan Chen, Hongyi Yin (Tianjin University of Science and Technology, China)

January 12 (Saturday)

8:40-Registration

Conference Room
11:10-11:40
Invited session IS-2
Chair: Ju-Jang Lee (KAIST, Korea)

IS-2 *A New Machine Learning Algorithm Applicable for Weather Visibility and Food Recognition*
Young Im Cho (Gachon University, Korea)

11:40-12:10

Invited session IS-3

Chair: Marion Oswald (Technische Universität Wien, Austria)

IS-3 *Affective Interactive Systems*

Kaoru Sumi (Future University Hakodate, Japan)

13:10-14:10

Plenary Speech PS-1

Chair: Akira Nakamura (National Institute of Advanced Industrial Science and Technology, Japan)

PS-1 *Motion-Data Driven Grasp/Assembly Planner*
Kensuke Harada[12], Natsuki Yamanobe[2], Weiwei Wan[12], Kazuyuki Nagata[2]
Ixchel G. Ramirez-Alpizar[1], Tokuo Tsuji[3] ([1]Osaka University, [2]National Institute of Advanced Industrial Science and Technology, [3]Kanazawa University, Japan)

Meeting Room 31

10:00-16:00 GS4 Poster (5)

Chair: Evgeni Magid (Kazan Federal University, Russia)

GS4-1 *Relevance Research among Destination Image, Brand Trust, and Satisfaction: Tainan Festival in Taiwan as Example*
Shang-Hui Li, Shu-Fang Hsu, Yi-Tai Shang (Far East University, Taiwan)

GS4-2 *Third-party Logistics Service Supply: Catering Service Trade as Example*
Shu-Fang Hsu, Shang-Hui Li (Far East University, Taiwan)

GS4-3 *Pedal Scale Control Device for Weighing Food Ingredients or Chemical Materials*
Shang-Hui Li, Shu-Fang Hsu, Yi-Tai Shang, Kuan-Ying Chen (Far East University, Taiwan)

GS4-4 *Convolution Neural Network Based Fault Diagnosis of Induction Motors*
Jong-Hyun Lee, In-Soo Lee(Kyungpook National University, Korea)

GS4-5 *Analysis of Value Chain on Food and Beverage Micro-enterprises: Mobile Diner as Example*
Shu-Fang Hsu, Shang-Hui Li (Far East University, Taiwan)

Meeting Room 32
9:00-9:45 OS17 Multiagent and Complex Systems (3)
Chair: Akihiro Yamaguchi (Fukuoka Institute of Technology, Japan)
Co-Chair: Saori Iwanaga (Japan Coast Guard Academy, Japan)

OS17-1 *Different Type of Interaction or Decision Error contribute to Functional Differences*
Saori Iwanaga[1], Masao Kubo[2]
([1]Japan Coast Guard Academy, [2]National Defense Academy of Japan, Japan)

OS17-2 *Evaluation for the Synchronization of the Parade with OpenPose*
Yohei Okugawa, Masao Kubo, Hiroshi Sato, Bui Duc Viet
(National Defense Academy of Japan, Japan)

OS17-3 *Phase shift estimation of the bifurcating neuron from superimposed chaotic spike sequences*
Akihiro Yamaguchi[1], Yutaka Yamaguti[1], Masao Kubo[2]
([1]Fukuoka Institute of Technology, [2]National Defense Academy of Japan, Japan)

10:00-11:00 OS16 New development about Control Engineering Education (4)
Chair: Yoshihiro Ohnishi (Ehime University, Japan)
Co-Chair: Kazuo Kawada (Hiroshima University, Japan)

OS16-1 *Skill Model Estimation of Ability for Reading Drawings*
Kazuo Kawada, Tsukasa Hiyama (Hiroshima University, Japan）

OS16-2 *Learning simulation based on a computational model of neuromodulators*
Yuki Moriguchi, Masayasu Nagamatsu
(Hiroshima University, Japan)

OS16-3 *Estimation of Programming Learning Achievement by Line Tracing Robot*
Yoshihiro Ohnishi[1], Teruyuki Tamai[1], Shinnosuke Mori[1], Kawada Kazuo[2]
（[1]Ehime University, [2]Hiroshima University, Japan）

OS16-4 *Development of Cultivate Computational Thinking using Finger Robot*
Kaito Omata, Shinichi Imai (Tokyo Gakugei University, Japan)

14:30-15:45 OS15 Advanced Control (5)
Chair: Yingmin Jia (Beihang University (BUAA), China)
Co-Chair: Weicun Zhang (University of Science and Technology Beijing, China)

OS15-1 *Pulse Pose Follow Control and Simulation for a 4-DOF Pulse Diagnosis Robot*
Qunpo Liu[1], Guanghui Liu[1], Hongqi Wang [1], Xianzhe Liu[1], Hanajima Naohiko[2]
([1]Henan Polytechnic University, China, [2]Muroran Institute of Technology, Japan)

OS15-2 *A New Adaptive Control System Design Method Based on Neuronetwork Prediction*
Weicun Zhang, Sufang Wang, Yongnan Jia, Qing Li
(University of Science and Technology Beijing, China)

OS15-3 *Mean-square quasi-composite rotating formation control of second-order multi-agent systems under stochastic communication noise*
Lipo Mo[1], Xiaolin Yuan[1], Yingmin Jia[2], Shaoyan Guo[3]
([1]Beijing Technology and Business University, [2]Beihang University (BUAA),
[3]South China University of Technology, China)

OS15-4 *Distributed Energy Resource Control Based on Multi-Agent Group Consensus*
Yize Yang[1,2], Hongyong Yang[1], Fan Liu[1], Yuling Li[1], Yuanshan Liu[1]
([1]Ludong University, China, [2]The University of New South Wales, Australia)

OS15-5 *Robust Adaptive Control of Air-to-air Refueling Boom with State-dependent Output Constraints*
Liang Chang, Yingmin Jia (Beihang University (BUAA), China)

16:20-17:50 GS2 Robotics II (6)
Chair: Jiwu Wang (Beijing Jiaotong University, China)

GS2-1 *Automated Guided Vehicle System Analysis in Foam Manufacturing Plant Using Petri-net*
Amornphun Phunopas[1], Wisanu Jitviriya[1], Noppadol Pudchuen[1], Sutee Kumjaikong[1],
Songklod Tunsiri[2], Eiji Hayashi[3] ([1]King Mongkut's University of Technology North Bangkok,
Thailand, [2]Urban Community, Development College, Thailand,
[3]Kyushu Institute of Technology, Japan)

GS2-2 *Preliminary Comparative Experiments of Support Vector Machine and Neural Network for EEG-based BCI Mobile Robot Control*
Yasushi Bandou, Takuya Hayakawa, Jun Kobayashi (Kyushu Institute of Technology, Japan)

GS2-3 *Position Tracking Error Constrained Super-Twisting Dynamic Surface Control with Disturbance Observer for Robot Manipulators*
Seong Ik Han (Dongguk University, Korea Republic)

GS2-4 *Image Processing for Picking Task of Random Ordered PET Drinking Bottles*
Chen Zhu, Takafumi Matsumaru (Waseda University, Japan)

GS2-5 *The Use of Importance Ranks to Derive Suitable Timing of Visual Sensing in Manipulation Task Containing Error Recovery*
Akira Nakamura[1], Kazuyuki Nagata[1], Kensuke Harada[2], Yukiyasu Domae[1]
([1]National Institute of Advanced Industrial Science and Technology (AIST),
[2]Osaka University, Japan)

GS2-6-1 *Electronic Measurement and Gamification of Balance Tests*
Yan-Xin Liu, Massimiliano Leggieri, Henrik Hautop Lund
(Technical University of Denmark, Denmark)

GS2-6-2 *Playful Body and Brain Test with the Moto Tiles*
Yan-Xin Liu, Massimiliano Leggieri, Henrik Hautop Lund
(Technical University of Denmark, Denmark)

Meeting Room 33
9:00-9:30 GS3 Complexity (2)
Chair: Manabu Sugii (Yamaguchi University, Japan)

GS3-1 *Extracting Co-occurrence Feature of Words for Mail filtering*
Seiya Temma, Manabu Sugii, Hiroshi Matsuno (Yamaguchi University, Japan)

GS3-2 *Learning Style Classification with Weighted Distance Grey Wolf Optimization*
Duangjai Jitkongchuen, Piyalak Pongtawevirat (Dhurakij Pundit University, Thailand)

10:00-11:00 OS23 Kansei and Information Engineering (4)
Chair: Chair: Tetsuo Hattori (Kagawa University)
Co-Chair: Yoshiro Imai (Kagawa University)

OS23-1 *Color Image Arrangement Based on Histogram Matching Using Smoothed Brightness Histogram (I) --- Overall Smoothing ---*
Yusuke Kawakami, Tetsuo Hattori, Yoshiro Imai, Koji Kagawa, Yo Horikawa (Kagawa University, Japan), R. P. C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

OS23-2 *Color Image Arrangement Based on Histogram Matching Using Smoothed Brightness Histogram (II) --- Piecewise Smoothing---*
Yusuke Kawakami, Tetsuo Hattori, Yoshiro Imai, Koji Kagawa, Yo Horikawa (Kagawa University, Japan), R. P. C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

OS23-3 *Parameter Estimation Method for Compartment Model - PET Inspection -*
Tetsuo Hattori, Yusuke Kawakami, Yoshiro Imai, Koji Kagawa, Yo Horikawa (Kagawa University, Japan), Hiromichi Kawano (NTT Advanced Technology Company Ltd, Japan)

OS23-4 *Application and Trial Evaluation of Document Writing Support System to Avoid Emotional Misunderstanding*
Shunsuke Doi, Yoshiro Imai, Koji Kagawa, Tetsuo Hattori, Yusuke Kawakami
(Kagawa University, Japan)

14:30-15:45 OS12 Robot Design and Simulation (5)
Chair: QinJian Zhang (Beijing Jiaotong University, China)
Co-Chair: Wei Liu (Beijing Jiaotong University, China)

OS12-1 *Design and Research of Navigation and Dynamics Co- Simulation Platform for Planetary Rover*
Huang Tie-qiu, Zhang Bo-wen, Huang Qian-li (Beijing Jiaotong University, P.R China)

OS12-2 *Research on Application of SFM Method in Virtual Reality Modeling*
Jiwu Wang, Chenyang Li (Beijing Jiaotong University, China)
Min Li (Beijing Forestry University, China)

OS12-3 *Visual SLAM System Design based on Semantic Segmentation*
Jiwu Wang, Yafan Liu, Qinjian Zhang (Beijing Jiaotong University, China)

OS12-4 *Spherical Mobile Robot Designed with Single Omnidirectional Wheels*
Wei Liu, Lian Luo, Jiwu Wang (Beijing Jiaotong University, China)

OS12-5 *An augmented reality implementation method based on Unity3D*
Weixin Zeng, Jiwu Wang (Beijing Jiaotong University, China)

16:20-17:05 OS25 High-Performance Computing for Interactive Content Creation and Rendering (3)
Chair: R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Co-Chair: Chia-Chen Kuo (National Center for High-performance Computing (NCHC), Taiwan)

OS25-1 *High-Performance Computing for Visual Simulations and Rendering*
Jasmine Wu, Chia-Chen Kuo, Shu-Hsin Liu, Chuan-Lin Lai, Chiang-Hsiang Lien, Ming-Jen Wang, Chih-Wei Wang (National Center for High-performance Computing (NCHC), Taiwan)

OS25-2 *Virtual Reality as an Art Form*
R.P.C. Janaka Rajapakse, Yi-ping Hung (Tainan National University of the Arts, Taiwan)

OS25-3 *Using Quill as a Tool for Real-Time Rendering*
Jasmine Wu, Chia-Chen Kuo, Shu-Hsin Liu, Chuan-Lin Lai, Chiang-Hsiang Lien, Ming-Jen Wang, Chih-Wei Wang (National Center for High-performance Computing (NCHC), Taiwan)

Meeting room 1
9:00-9:45 OS9 Natural Computing and Beyond (3)
Chair: Marion Oswald (Technische Universität Wien, Austria)
Co-Chair: Yasuhiro Suzuki (Nagoya University, Japan)

OS9-1 *Tactile Score: Development and Applications*
Yasuhiro Suzuki (Nagoya University, Japan)

OS9-2 *Tactileology; Haptic Informatics by using Tactile bit, T-bit*
Yasuhiro Suzuki (Nagoya University, Japan)

OS9-3 *Natural Computing and Formal Computing*
Yasuhiro Suzuki (Nagoya University, Japan)

14:30-16:00 OS22 Robot Competitions for Social Contribution (6)
Chair: Yasunori Takemura (Nishinippon Institute of Technology, Japan)
Co-Chair: Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS22-1 *Study on Position Estimation Using Small Size ZigBee Module*
Atsushi Sanada (Nishinippon Institute of Technology, Japan)

OS22-2 *The 4th Tomato Harvesting Robot Competition*
Takayuki Matsuo[1], Takashi Sonoda[2], Yasunori Takemura[2], Kazuo Ishii[3]
([1]National Institute of Technology, Kitakyushu College, [2]NishiNippon Institute of Technology, [3]Kyushu Institute of Technology, Japan)

OS22-3 *End-effector for robotic harvesting of a tomato fruit with calyx*
Binghe Li, Shinsuke Yasukawa, Takuya Fujinaga, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

OS22-4 *Evaluation for Ball Dribbling Mechanism of RoboCup Middle Size League Robot in The World Teams*
Kenji Kimura, Shota Chikushi, Kazuo Ishii (Kyushu Institute of Technology)

OS22-5 *Robot-control method based on personal space*
Kota Kawamoto, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology)

OS22-6 *Recognition method of target objects for autonomous tomato harvesting robot*
Keiji Kamei, Hiroyuki Moriyama (Nishinippon Institute of Technology, Japan)

Meeting room 4
9:00-9:45 OS19 Advanced Technology on Sensing Technology, Devices, Application (3)
Chair: Hiroki Tamura (University of Miyazaki, Japan)
Co-Chair: Keiko Sakurai (University of Miyazaki, Japan)

OS19-1 *The Actual Car Driving Evaluation System using Combined with Eyeball and Face Angle*
Keiko Sakurai, Hiroki Tamura, Koichi Tanno (University of Miyazaki, Japan),
Yukio Hattori (OFA SUPPORT INC, Japan)

OS19-2 *A Study on Speaker Identification Approach by Feature Matching Algorithm using Pitch and Mel Frequency Cepstral Coefficients*
Barlian Henryranu Prasetio, Keiko Sakurai, Hiroki Tamura, Koichi Tanno
(University of Miyazaki, Japan)

OS19-3 *A Study on Breathing and Heartbeat Monitoring System during Sleeping using Multi-Piezoelectric Elements*
Praveen Nuwantha Gunaratne, Chika Yoshida, Keiko Sakurai, Hiroki Tamura, Koichi Tanno,
(University of Miyazaki, Japan)

January 13 (Sunday)

8:40-Registration

Meeting Room 31
10:40-11:40
Plenary Speech PS-3
Chair: Takao Ito (Hiroshima University)

PS-3 *Robust Consensus Control of Multi-vehicle Systems*
Yingmin Jia (Beihang University, P.R.China)

Meeting Room 32
9:00-10:30 OS6 Software Development Support Method (6)
Chair: Tetsuro Katayama (University of Miyazaki, Japan)
Co-Chair: Tomohiko Takagi (Kagawa University, Japan)

OS6-1 *Prototype of an Animated Graphics-Based Training Support Tool for Bug Fixing of Extended Place/Transition Nets*
Tomohiko Takagi, Shogo Morimoto, Yuki Ue, Yoshiro Imai (Kagawa University, Japan)

OS6-2 *Prototype of a Modeling Tool to Convert between Extended Place/Transition Nets and VDM++ Specifications*
Tomohiko Takagi, Ryo Kurozumi (Kagawa University, Japan)

OS6-3 *Application of Pairwise Testing to Test Cases by Boundary Value Analysis in BWDM*
Futa Hirakoba*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, †Tokyo University of Technology, Japan)

OS6-4 *Development of Library Fescue Extracting Elements of Attributes and Operations of Class Diagram in UML*
Keisuke Mori*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki* (*University of Miyazaki, †Tokyo University of Technology, Japan)

OS6-5 *Tamias: a Syntax File Checker for Parsing Expression Grammar*
Toshihiro Miyaji*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki* (*University of Miyazaki, †Tokyo University of Technology, Japan)

OS6-6 *Implementation of an Arduino Simulator to Support Circuit Design*
Tatsumi Nishida*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada* And Naonobu Okazaki* (*University of Miyazaki, †Tokyo University of Technology, Japan)

12:40-13:55 OS10 Mathematical Informatics (5)

Chair: Makoto Sakamoto (University of Miyazaki, Japan)

Co-Chair: Amane Takei (University of Miyazaki, Japan)

OS10-1 *A Study on Tourism Support Application Using the Virtual Technology*
Masamichi Hori[1], Makoto Sakamoto[1], Takahiro Ishizu[1], Satoshi Ikeda[1], Amane Takei[1], Takao Ito[2], Yu-an Zhang[3] ([1]University of Miyazaki, [2]Hiroshima University, Japan, [3]Qinghai University, China)

OS10-2 *Proposal for Interaction Techniques for Intuitive Virtual Objects Manipulation in Augmented Reality*
Takahiro Ishizu[1], Makoto Sakamoto[1], Takaaki Toyota[1], Masamichi Hori[1], Satoshi Ikeda[1], Amane Takei[1], Takao Ito[2], Yu-an Zhang[3]
([1]University of Miyazaki, [2]Hiroshima University, Japan, [3]Qinghai University, China)

OS10-3 *Two-Dimensional Image Based Body Size Measurement and Body Weight Estimation for Yaks*
Zijie Sun[1], Chen Zhang[1], XiaoFeng Qin[1], Yu-an Zhang[1], Rende Song[2], Makoto Sakamoto[3]
([1]Qinghai University, [2]Yushu Prefecture Animal Husbandry and Veterinary Station, China
[3]University of Miyazaki, Japan)

OS10-4 *An efficient structure of organization with complete group guidance*
Satoshi Ikeda[1], Mamoru Yoshimura[1], Makoto Sakamoto[1], Takao Ito[2]
([1]University of Miyazaki, [2]Hiroshima University, Japan)

OS10-5 *Parallel finite element analysis for hyperbolic problems*
Amane Takei,, Makoto Sakamoto (University of Miyazaki, Japan)

Meeting Room 33

9:00-10:00 OS5 Business Models and Management (4)

Chair: Takao Ito (Hiroshima University, Japan)

Co-Chair: Minoru Kumano (University of Miyazaki, Japan)

OS5-1 *Determining the Key Factors of Michinoeki in Yamaguchi Area*
Minoru Kumano[1], Tsutomu Ito[2], Takao Ito[3], Toru Hiraoka[4], Hirofumi Nonaka[5]
([1]University of Miyazaki, [2]Hino Motors, Ltd., [3]Hiroshima University, [4]University of Nagasaki, [5]Nagaoka University of Technology, Japan)

OS5-2 *Discovering the Characteristics of Michinoeki in Japan*
Minoru Kumano[1], Tsutomu Ito[2], Takao Ito[3], Toru Hiraoka[4], Hirofumi Nonaka[5]
([1]University of Miyazaki, [2]Hino Motors, Ltd., [3]Hiroshima University,
[4]University of Nagasaki, [5]Nagaoka University of Technology, Japan)

OS5-3 *An Analysis of Robotic Relationship between Transaction Network and Cross-shareholding Network in Yokokai*
Takao Ito[1], Tsutomu Ito[2], Rajiv Mehta[3], Seigo Matsuno[4], Makoto Sakamoto[5], Satoshi Ikeda[5]
([1]Hiroshima University, Japan, [2]Hino Motors, Ltd., Japan, [3]New Jersey Institute of Technology, U.S.A., [4]Ube National College of Technology, Japan, [5]University of Miyazaki, Japan)

OS5-4 *Technological Discontinuities and the R&D Strategy of Automobile Companies*
Yousin Park[1], Iori Nakaoka[2], Yun-ju Chen[3] ([1]Prefectural University of Hiroshima, [2]National Institute of Technology, Ube College, [3]Shiga University, Japan)

12:40-13:55 OS24 Automated content generation for narrative and cognitive contents (5)
Chair: Jumpei Ono (Vocational School of Digital Arts Sendai, Japan)
Co-Chair: Hiroki Fukushima (Kyushu Womens' University, Japan)
Co-Chair: Takashi Ogata (Iwate Prefectural University, Japan)

OS24-1 *A Method of Haiku Generation Using Deep Learning for Advertising Generation*
Jumpei Ono (Vocational School of Digital Arts Sendai, Japan)
Takashi Ogata (Iwate Prefectural University, Japan)

OS24-2 *The Usage Features of Onomatopoeias in the Recipes in Japanese*
Hiroki Fukushima (Kyushu Womens' University, Japan)

OS24-3 *Storytelling in the Conversation of Aged People*
Yuki Hayashi (Chiba University / Center for Advanced Intelligence Project, Riken, Japan)
Akinori Abe (Chiba University /Dwango Artificial Intelligence Laboratory, Japan)

OS24-4 *Expression of the taste of Japanese sake and metaphor*
Akinori Abe (Chiba University / Dwango Artificial Intelligence Laboratory, Japan)

OS24-5 *An Analysis on Advertising Techniques of Beverages Using Positive Factors of Evaluation Database System*
Yoji Kawamura (Kindai University, Japan)

GS5 Others (8)

GS5-1 *Suppression of Roll Oscillation in Turning of Quadruped Robot by Asymmetric Amplification of Central Pattern Generator Output Waveform*
Makoto Kitani, Ryo Asami, Noritake Sato (Nagoya Institute of Technology, Japan),
Tomofumi Fujiwara, Takahiro Endo, Fumitoshi Matsuno (Kyoto University, Japan),
Yoshifumi Morita (Nagoya Institute of Technology, Japan)

GS5-2 *Tumble avoidance system for rescue robot by estimating the contact points using a 3D depth sensor*
Noritaka Sato, Kotaro Ohshima, Yoshifumi Morita (Nagoya Institute of Technology, Japan)

GS5-3 *Rule based Intrusion Detection System by Using Statistical Flow Analysis Technique for Software Defined Network*
Mahnoor Ejaz, Osama Sohail, Talha Naqash, Zain ul Abideen, Sajjad Hussain Shah
(Bahria University, Pakistan)

GS5-4 *Development of Testbed for SDN to Know Its Feasibility of Deployment on Access Layer*
Rafay Shah, M Osama Shaikh, Talha Shaikh, Tanveer Hussain
(Mehran University of Engineering & Technology, Pakistan)

GS5-5 *Spectrum Sensing using Unsupervised Learning for Cognitive Radio*
Asmara Shaukat, Danish Khan, Talal Arshad, Haseeb Ahmad (PAF-KIET, Pakistan)

GS5-6 *Tracking Secondary User In Cognitive Radio For 5g Communication*
Muhammad Adnan, Muhammad Umair, Sameed bin Junaid
（PAF-KIET, Pakistan）

GS5-7 *Wireless Power Transfer And Data Communication For Biomedical Applications*
Hammad Saleem, Muhammad Awais, Siraj Din, Attequa
(PAF-KIET, Pakistan)

GS5-8 *Feasibility Study Of UAV Implementation In Route Surveying*
D.Hazry, M A Azizan, Safwan Suhaimi, Zulaiha Ramli, Mohamad Syafiq A.K, Zainuddin Hat
(Universiti Malaysia Perlis, Malaysia)

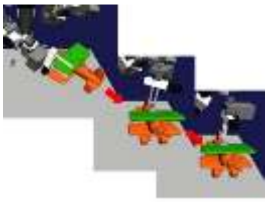
Farewell Party

PS abstracts

PS-1 Motion-Data Driven Grasp/Assembly Planner

Kensuke Harada[12], Natsuki Yamanobe[2], Weiwei Wan[12], Kazuyuki Nagata[2],
Ixchel G. Ramirez-Alpizar[1], Tokuo Tsuji[3]
([1]Osaka University, [2]National Institute of Advanced Industrial Science and Technology,
[3]Kanazawa University, Japan)

This paper proposes a robotic grasp/assembly planner partially using a motion data. A motion data includes an information on skillful motion which cannot simply be realized by using conventional grasp/assembly planners. We first explain the structure of motion data. Then, we explain the proposed grasp/assembly planner. Finally, we show a numerical example to confirm the effectiveness of our proposed method.



PS-2 Toward Life with Partner Robots - Developing robots with the field trial toward the practical use

Masanori Sugiyama (Toyota Motor Corporation, Japan)

In the near future, robots are expected to be utilized as partners to coexist with people for various social needs. TOYOTA is developing robots aimed to help societies. As a first step, rentals of a rehabilitation robot for walking training at medical institutions have been launched in 2017. Another robot, Human Support Robot, which is aimed for use to support daily living, has been adopted as a standard platform of the domestic environment league at the RoboCup competition since 2017. For the robot development, it is important to learn deeply about the field which the robot is to be actually used. In this presentation, we will show the scene of the field trial toward the practical use of our robots. Also, we will introduce a humanoid robot which is integrated with advanced technologies that would benefit us in the future.

Where Toyota Partner Robots are Used

Use technology to help bring joy to "families" and maintain/recover "health"

TOYOTA

Frontier Research Center

PS-3 Robust Consensus Control of Multi-vehicle Systems

Yingmin Jia (Beihang University, P.R.China)

Consensus control of multi-vehicle systems is to design a coordinated protocol based on the communication topology, so that the multi-vehicle states can reach consensus rapidly and safely to achieve the desired cooperative tasks. Considering parameter variations of vehicles, modelling errors and external disturbances, the corresponding robust consensus control problems should be investigated. To this end, this talk focuses on three basic issues, i.e., single-vehicle maneuverability, multi-vehicle coordination, and disturbance attenuation of control performance of vehicle systems in the uncertain environment, and some recent advances are reviewed. In particular, it is found that most of the existing results are very limited from a practicable point of view because the traditional decoupling control methods are inapplicable to vehicles with varying velocity, the previous coordinated protocols require connectivity of dynamical topologies, and the robust consensus control of multi-vehicle systems with internal uncertainties and external disturbances has not yet fully been studied so far. Doubtless, these limitations make the applications of consensus control theory for multi-vehicle systems to actual objects more difficult, and therefore, it is necessary to develop novel control methods to remove these limitations and all these will be introduced in detail.

IS abstracts

IS1-1-1 Engineering Modular Playware

Henrik Hautop Lund, Morten Roed Frederiksen, Massimiliano Leggieri
(Technical University of Denmark, Denmark)

In this paper, we describe the engineering of modular playware. The modularity of constructing playware systems out of modules may allow the system to be easily transported to be used anywhere, to easily build different bodies and brains, and to allow people to construct and combine the modules to become creative. Hence, the modularity helps fulfilling the Playware ABC. We exemplify the engineering challenges of the hardware, software and communication design of modules through the development of handheld modules for playful rehabilitation. The handheld modules allow for a fun and motivational training of upper extremities, and can be viewed as an extension to the Moto Tiles for lower extremity training, which have proved to be a highly successful playware for prevention and rehabilitation among seniors. The paper outlines the engineering challenges and proposed solutions to make such modular playware for playful upper extremity training.

IS1-1-2 User-Friendly Robotics 3 – Playware

Henrik Hautop Lund, Luigi Pagliarini (Technical University of Denmark, Denmark)

The sustainable The design of playware based on the lessons learned from user-friendly robotics suggests a focus on a number of design criteria to help achieving playware systems that can and will be used according to the Playware ABC by anybody, anywhere, anytime. The design criteria are described in this paper, and they include: modularity, explicit immediate feedback, robustness, simplicity, one-click, design. Each criterion is described based on the lessons learned from user-friendly robotics. We exemplify the use of these design criteria with the development of the playware system, Moto Tiles. The Moto Tiles system is designed as a playful prevention and rehabilitation system for seniors, who are normally not exposed to such high technology systems. The paper discusses how the design criteria allowed for a successful design of a user-friendly system, which is now used daily by tens of thousands seniors all over the globe.

IS1-2-1 User-Friendly Robotics 1 – AI Software

Luigi Pagliarini[1,2], Henrik Hautop Lund[1]
([1]Technical University of Denmark, Denmark) ([2]Academy of Fine Arts of Macerata, Italy)

In this paper we present the trajectory of decades of research in AI and Robotics by highlight the continuity of our method that has always taken into consideration the common user's point of view as a priority. We call such an approach User-Friendly Robotics, and we hereby unravel it by describing our path step-by-step, to see on one side its evolution and on the other its methodological continuity. Therefore, starting from the earliest AI-based application we slowly move-up towards the first Robotics ones to finally describe the last results of our research. We discuss how this User-Friendly Robotics approach leads to solutions that fit particular purposes in society and lead to useful user interaction with technological developments.

IS1-2-2 User-Friendly Robotics 2– Interfacing Robotics with any user

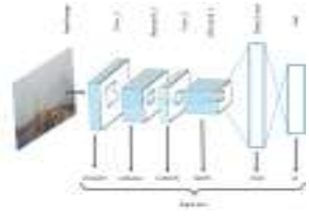
Luigi Pagliarini[1,2], Henrik Hautop Lund[1]
([1]Technical University of Denmark, Denmark) ([2]Academy of Fine Arts of Macerata, Italy)

In this paper, the second part out of three, we continue presenting the route of our long experience in interfacing AI and Robotics with the public. This paper, in particular, highlights a crucial step we experimented when creating computer based software architecture so to let the common user easily interact with complex behaviour robotics. We define such an approach User-Friendly Robotics, and we hereby describe the principles and the techniques we used to evolve its methodology reporting here the most important case studies we went through, as examples. We then analyse the impact of such method on both science and educational field. Finally, we discuss how this User-Friendly Robotics approach leads to solutions that fit particular purposes in society and lead to useful user interaction with technological developments.

IS-2 A New Machine Learning Algorithm Applicable for Weather Visibility and Food Recognition

Young Im Cho (Gachon University, Korea)

The sustainable Smart City need many intelligent technologies. In this paper, we implement a new Machine Learning algorithm for visibility of weather images. The aim of the research is that to estimate weather visibility using a new machine learning techniques. We use images taken from CCTV cameras as inputs and deep convolutional neural network model to predict results. Our new machine learning algorithm apply to smart life for food recognition, too. We augment many images using a new machine learning algorithm. In this paper, we will detail explain regarding an architecture of the ML model, System Structure, and other essential details.



IS-3 Affective Interactive Systems

Kaoru Sumi (Future University Hakodate, Japan)

In this talk, I will present the effect of using emotions in humans and artifacts (computer systems, virtual agents, robots, etc.) interaction. As known as Media Equation, the relationship between humans and artifacts is similar to the social relationship between humans and humans. For example, when a human is helped by an artifact a human want to thank artifacts and return something. Like humans, it is important for artifacts to recognize emotions and express emotions in relation between humans and artifacts. In this talk, I introduce a technique to recognize and express emotions in human interaction with artifacts and show examples of how effective artifacts are when using emotions.

OS abstracts

OS1 Intelligent Systems and Control (8)

OS1-1 A Vishay Supercapacitor based Fast Charge Battery

Chung-Wen Hung, Yi-Chang Yang, Chun-Chu Lin, Li-Sheng Jheng
(National Yunlin University of Science and Technology, Taiwan)

A supercapacitor (SC) power supply management system based on is proposed in this paper. Due to the high charging current characteristics of the SC, means short charging time, the proposed SC-base battery is suitable as a backup battery. The proposed system includes the input voltage, current and temperature protection implemented with analog integrated circuits (IC); and output current limitation circuit. In order to keep output voltage when the SC voltage drops, a boost circuit is used to provide a stable voltage for the load. The circuit design is detailed in this paper, and the experimental results show the proposed system works well.

OS1-2 Multi-Motor Synchronous Control with CANOpen

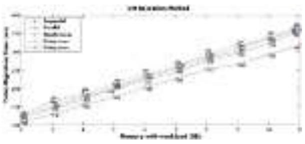
Chung-Wen Hung, Roger CL Lee, Bo-Kai Huang, Shit-Ting Yu
(National Yunlin University of Science and Technology, Taiwan)

A Brushless DC (BLDC) Motors synchronous control system based on the CANopen protocol is proposed in this paper. Multi-motor control is popular in Robot or automation system, and the synchronization is an important issue, may be the key issue. The CANopen is a solution, due to Process Data Object (PDO) protocol. A Texas Instruments microcontroller TMS320F28069 is used as master to control six BLDC Motors used as slave in this paper. The Master sends synchronization object (SYNC) to slaves base on the communication profile CAN in Automation (CiA) 301 and the motion control profile CiA402. The system suns at 500Kbits/s and 1Mbits/s transmission rate by setting process data object (PDO). The firmware details in this paper to show six-motor synchronous control.

OS1-3 Selection Strategy for VM Migration Method

Yan-Ren Chen, I-Hsien Liu, Keng-Hao Chang, Jung-Shian Li
(National Cheng Kung University, Taiwan)

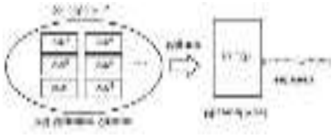
Virtual machine (VM) live migration occurs frequently in cloud environments. When it is necessary to migrate many VMs, minimizing the migration time is an important concern. Thus, choosing an appropriate strategy to perform VM migration is essential. Accordingly, this paper discusses the advantages and disadvantages of four different migration methods and evaluates their respective migration times and throughputs.



OS1-4 VM Migration Placement in Cloud Service

Yan-Ren Chen, I-Hsien Liu, Keng-Hao Chang, Chuan-Gang Liu, Jung-Shian Li
(National Cheng Kung University, Taiwan)

Smooth and transparent VM migration is essential in maximizing the utilization of cloud resources and ensuring user satisfaction. Previous studies have focused on VM operational procedures, live migration models and efficient migration methods. By contrast, the paper focuses on the fundamental theorems of VM migration. The present study considers two different VM migration problems and proves that they too are NP-complete. In the first problem, subsets of the VM migration groups are migrated to a physical host until their combined resource usage approaches the threshold value of the host. In the second problem, the VM migration groups are migrated simultaneously in such a way as to minimize the total migration time.



OS1-5 Control System for Maintaining Safe Following Distance while Driving

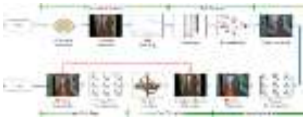
Kuo-Hsien Hsia, Jia-Hong Cai, Shu-Li Pai (Far East University, Taiwan)
Evgeni Magid (Kazan Federal University, Russia)

Safety is the most important thing while driving. Many traffic accidents occur because of insufficient safe distance. With the advancement of technology, there are cars with a front distance safety warning system. The invention relates to a driving safety distance control system. Some of them are with fixed safe distance regardless of the speed of the car. Other advanced distance detection systems switch between different modes such as high speed and low speed. In this paper, we proposed a driving safety system which can dynamically adjust the safety distance between vehicles depending on the speed and weather conditions. This system can be used to determine and maintain safe distances both in front and rear of a car. This idea has obtained the invention paten of Taiwan. A car with this system can be driven more safely.

OS1-6 Markerless Indoor Augmented Reality Navigation Device Based on Optical-Flow-Scene Indoor Positioning and Wall-Floor-Boundary Image Registration

Chian C. Ho, Bo-Kai Wang, Guan-Lung Liao
(National Yunlin University of Science and Technology, Taiwan)

For markerless indoor Augmented Reality Navigation (ARN) technology, camera pose is inevitably the fundamental argument of positioning estimation and pose estimation, and floor plane is indispensably the fiducial target of image registration. This paper proposes optical-flow-scene indoor positioning and wall-floor-boundary image registration to make ARN more precise, reliable, and instantaneous. Experimental results show that both optical-flow-scene indoor positioning and wall-floor-boundary image registration have higher accuracy and less latency than conventional well-known ARN methods. On the other hand, these proposed two methods are seamlessly implemented on the handheld Android embedded platform and are smoothly verified to work well on the handheld indoor augmented reality navigation device.



OS1-7 Development of the handheld gas detector with IoT function.

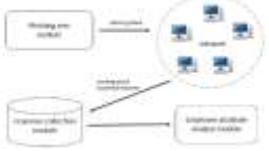
Jr-Hung Guo, Kuo-Hsien Hsia, Kuo-Lan Su
(National Yunlin University of Science and Technology, Taiwan)

Gas detection is very cumbersome because the gas will diffuse and mix with other gases. Therefore, this paper is development a handheld gas detector using a single chip controller. This detector can use a variety of different gas sensors. And use the Fuzzy Analytic Hierarchy Process (fuzzy-AHP) and the Adaptive Fusion Method to improve the correctness and recognition rate of the sensor. In terms of communication, because this gas detection module is hand-held, we use Wi-Fi, LoRa, and wireless communication interfaces such as 433/868/915 Mhz. Let this gas detection module still transmit data while moving. In addition, multiple gas detection modules can be used to form a detection network for large area detection. And we can use the built-in algorithm to do the calibration data for the detection and isolation of network module or sensor. Make this gas detection module more flexible in use.

OS1-8 Research on Employee Attribute Correlation of Information Security Awareness in Organization

Tse-Yao Wang (Air Force Institute of Technology, Taiwan)
Fu-Hsiang Wen (National Kaohsiung University of Science and Technology, Taiwan)

Enterprises are attacked by phishing emails, causing significant business losses. The information security protection strategies adopted by enterprises, such as mail filtering, phishing attack website screening and phishing website blacklists, cannot guarantee complete defense. This study attempts to propose another perspective that can reduce the risk of corporate information security. The quality of employees' information security used as an indicator, and the Logistic regression model used as a tool to analyze the key factors that can be used to measure the quality of information security awareness.

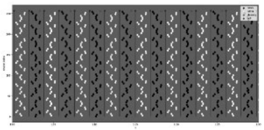


OS2 Theory and Implementation of Neuromimetic Systems (5)

OS2-1 Decoding spike patterns of auto-associative memory on spiking neuronal networks

Naoki Toyoshima, Takashi Kohno (The University of Tokyo, Japan)

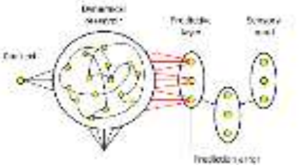
Spiking neuronal networks model the electrophysiological activities in Spiking neuronal cells' networks, in which spikes emitted by the neuronal cells transmit information. A well-known application of the spiking neuronal networks is auto-associative memory, in which one of the pre-stored patterns that is mostly similar to the input pattern is retrieved. It is known that the spatio-temporal output spikes are converged to anti-synchronized two groups that correspond to the retrieved pattern and its complement. The spikes in each group are synchronized. For practical use of auto-associative memory on the spiking neuronal networks, it is necessary to convert the spatio-temporal output spikes to digital codes that can be utilized in ordinary digital computer systems. In this manuscript, we propose methods to efficiently do this conversion and extract some more information by additional neurons receiving signals from the neurons in the all-to-all connected network which is a typical configuration for the auto-associative memory.



OS2-2 Possible Mechanism of Internal Visual Perception: Context-dependent Processing by Predictive Coding and Reservoir Computing Network

Hiroto Tamura[1], Yuichi Katori[1,2], Kazuyuki Aihara[1]
([1]The University of Tokyo, [2]Future University Hakodate, Japan)

How our brains perceive visual stimuli and generate internal visual images largely remains unknown. Here, we propose a network model by combining the idea of predictive coding and reservoir computing (PCRC). First, we define the context-dependent task by simplifying the process of human's internal visual perception, and then train the PCRC network for the task. In our model, the context represents the category of the visual stimuli, and the network forms different attractor landscapes depending on each context. However, the mismatch between the context and the sensory stimuli induces the perceptual error, which corresponds to the symptoms of the hallucination in dementia with Lewy bodies. Furthermore, we incorporate the parameter representing a sort of neuromodulation into the network model and analyze the influences of the neuromodulation to the stability of the attractor on the network dynamics and performance of the visual perception.



OS2-3 Snake robot controlled by biomimetic CPGs

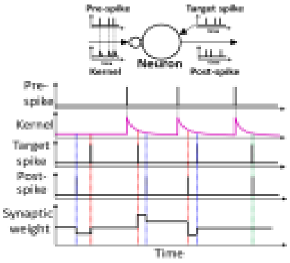
Damien Blanchard[1], Kazuyuki Aihara[2], Timothée Levi[2]
([1]University of Bordeaux, France, [2]The University of Tokyo, Japan)

Locomotion is one of the most basic abilities in animals. Neurobiologists have established that locomotion results from the activity of half-center oscillators that provides alternation of bursts. Central Pattern Generators (CPGs) are neural networks capable of producing rhythmic patterned outputs without rhythmic sensory or central input. We propose a network of several biomimetic CPGs using biomimetic neuron model and synaptic plasticity. This network is implemented on a FPGA (Field Programmable Gate Array). We designed one unsupervised snake robot using this network of CPG. It is composed of one head wagon and 7 slave wagon. Infrared sensors are also embedded in the head wagon. This robot can reproduce the locomotion of one snake. The hardware robot is also described in this paper.

OS2-4 Real-time implementation of ReSuMe learning in Spiking Neural Network

Xia Yang, Seiji Uenohara, Kazuyuki Aihara, Takashi Kohno, Timothée Levi
(The University of Tokyo, Japan)

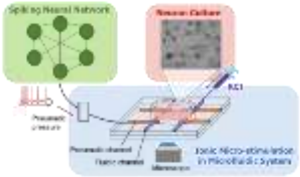
Neuromorphic systems are designed by mimicking or being inspired by the nervous system, which realizes robust, autonomous, and power-efficient information processing by highly parallel architecture. Supervised learning was proposed as a successful concept of information processing in neural network. Recently, there has been an increasing body of evidence that instruction-based learning is also exploited by the brain. ReSuMe is a proposed algorithm by Ponulak and Kasinski in 2010. It proposes a supervised learning for biologically plausible neurons that reproduce template signals (instructions) or patterns encoded in precisely timed sequences of spikes. Here, we present a real-time ReSuMe learning implementation on FPGA using LIF Spiking Neural Network (SNN). FPGA allows real-time implementation and embedded system. We show that this implementation can make successful the learning on a specific pattern.



OS2-5 Biomimetic spike-timing based ionic micro-stimulation for neuron culture

Stephany Mai Nishikawa[1], Farad Khoyratee[1,2], Soo Hyeon Kim[1], Yoshiho Ikeuchi[1], Kazuyuki Aihara[1], Teruo Fujii[1], Timothée Levi[1]
([1]The University of Tokyo, Japan, [2]University of Bordeaux, France)

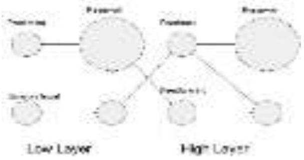
Neurodegenerative diseases influence cognitive and/or motor functions in millions of people worldwide. Neuroprosthesis are used today to support the quality of life but have yet to improve in their power consumption and biocompatibility issues. Here, we propose a novel microfluidic system to investigate the response of the neurons directly stimulated by the potassium ions in biomimetic timing. Unlike the conventional way of stimulating neurons by pipetting or sending electrical stimulus, this biomimetic stimulation system enables precise and rapid control of ion concentration by utilizing microfluidic pneumatic valves, which mimics physiological stimulation in a body. To circumvent these limitations, we propose a new bio-hybrid system. There are three parts that consists this neuro-hybrid system: Spiking Neural Network, neuron culture and ionic micro-stimulation device. By using the system, we demonstrated biomimetic spike-timing based ionic stimulation of the neuron cells with potassium ions and monitored neural activities with a calcium-specific fluorescence indicator.



OS2-6 Dynamical network model for visual cortex: hierarchical reservoir computing with bidirectional interactions (withdraw)

Shohei Takaichi[1], Yuichi Katori[2], Kazuyuki Aihara[1]
([1]The University of Tokyo, Japan, [2] Future University Hakodate, Japan)

In visual cortex, there is a feedback connection between high-layer and low-layer. However, the effect of feedback remains poorly understood. We describe a hierarchical neural network model for visual recognition using reservoir computing. We adapt this model to predictive coding of video information. Because input of the network is an image of each frame of video, which is too high dimension for the reservoir computing, we divide the image to patches and integrate divided information in high-layer and send it as feedback.



OS3 Intelligent Navigation & Robotics (4)

OS3-1 Trajectory tracking control for a 7-arms robot manipulator

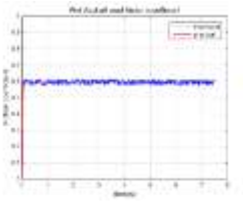
Wang Jie, Hyun-Hee Kim, Saad abbasi, Min-Cheol Lee (Pusan National University, Korea)

This paper proposes a trajectory tracking control based TSMCSPO (terminal silding mode control with sliding perturbation observer) for a 7-arms robot manipulator. The 7-arms robot arm are designed to assemble small parts or packaging. System dynamics, kinematics and inverse kinematics are introduced at first. Because dynamics of this 7-arms robot are difficult to determine precisely with the uncertainties and many nonlinear terms. TSMCSPO are used as a robust controller with the observer for unknown states and perturbation which can estimate the error in obtained system dynamics.

OS3-2 Estimation tire-rod friction coefficient based on mobile robot

Ji-Hyeon Kim, Zhang Hongyu, Jang-Myung Lee (Pusan National University, Korea)

It is very important to estimate the friction coefficient of tire-road for vehicle dynamic control system. For the current dynamic control research, a large amount of experimental data is needed. The theoretical tire model is used to estimate the friction coefficient based on the Gim tire model to improve the tire experience model. Simulation by MATLAB, the simulation results show that the Gim tire model has high precision and can predict the mechanical properties of the tire well.



OS3-3 Real-time reflection removal algorithm using stereo camera only

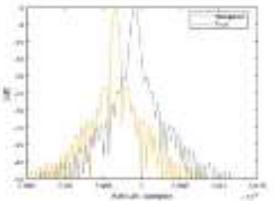
Do-Kyung Hwang, Jong-Woo An, Jang-Myung Lee (Pusan National University, Korea)

In this paper, we implemented a light reflection elimination algorithm which is one of the main obstacles of various object recognition systems using vision systems. In other words, this algorithm can be used to remove robotic recognition obstacles from the factory and perform tasks such as locating robots, autonomous vehicles, or unmanned aerial vehicles. This algorithm has been studied with versatility in mind and does not require sensors other than stereo cameras. A brief description of the algorithm is an algorithm that intuitively interprets pixels in HSI space and processes pixels corresponding to light. For intuitive analysis, take an angle, intensity, or other light source (sunlight, fluorescent light, candle) from the camera, then record each pixel value and separate it from a white object (whiteboard, paper, etc.). After pixel operation, object recognition is implemented using the CNN (Convolution Neural Network) method using the YOLO_V2 algorithm

OS3-4 The Effect of Inertial Measurement Unit on Synthetic Aperture Radar Image Quality

Soo-Jeong Lee[1], Yong-Gonjong Park[1], Woo-Jung Park[1], Chan Gook Park[1], Jong-Hwa Song[2] (Seoul National University, Korea[1], Hanwha Systems, Korea[2])

This paper analyzes the effect of inertial measurement unit (IMU) on synthetic aperture radar (SAR) image quality. While operating SAR, it is supposed that an aircraft flies straight and level at a constant speed. Because of atmospheric turbulence and aircraft maneuvers, it deviates from its nominal trajectory. With navigation solutions, the deviations can be compensated through motion compensation procedure. However, uncompensated motion errors generated by IMU errors degrade SAR image quality, such as broadening bandwidth and blurring the image. Since the residual errors depend on the degree of IMU inaccuracies, SAR images and impulse response function (IRF) according to IMU grades are compared with each other. Through this result, the IMU specification is suggested to satisfy given SAR image quality.

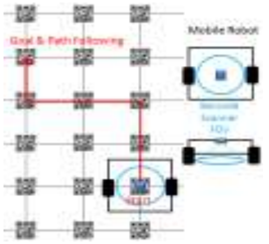


OS4 Service Robotics (7)

OS4-1 Apply 2D Barcode Scanner for Mobile Robot Navigation in Checkerboard Mapping

Chun-Chi Lai[1], Kuo-Lan Su[1], Chia-Jen Lin[1], Evgeni Magid[2]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]Kazan Federal University, Russia)

In this work, a mobile robot is equipped with an industrial barcode scanner which can provide the pose information respect to the tag in the field of view (FOV). For real multiple mobile robot transportation applications, the mobile robot navigation flow is considered to get the global checkerboard type path planning from a remote master server as an input. For the local planner, each robot is applied with a simple path controller to track the global path. The simulation and experimental results show that this implementation has good feasibility and effectiveness for multi- robot co-working such as in a factory area.



OS4-2 Development of the MyRio Based Mobile Platform

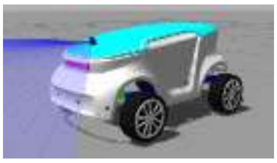
Bo-Jun Yang[1], Sheng-Jie Liou[1], Jr-Hung Guo[1], Kuo-Lan Su[1], Evgeni Magid[2]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]Kazan Federal University, Russia)

The paper develops the MyRio based mobile platform with a robot arm. The structure of the mobile platform uses the Matrix elements. The Matrix element set builds the robot arm with four degrees of freedom. The mobile platform integrates some sensors, three DC servomotors, a RC servomotor, a MyRio based controller, and a vision system. The core of the MyRio based controller is the NI-Single-Board RIO 9606 module. The mobile platform embeds a robot arm on the front side. The driver device of the gripper is a RC servomotor. The vision system of the mobile platform can search and recognize the assigned shape and color that is on the front side of each box using Otsu algorithm. The mobile platform uses the robot arm to catch the ball, and moves to the assigned box simultaneously. In the experimental results, the mobile platform moves to the assigned location from the start location, and uses the vision system to find out the assigned ball, and puts down the ball on another box by the robot arm. Finally, the mobile platform moves to the start location and stop.

OS4-3 Modelling Avrora Unior Car-like Robot in Gazebo Environment

Ksenia Shabalina[1], Artur Sagitov[1], Kuo-Lan Su[2], Kuo-Hsien Hsia[3], Evgeni Magid[1]
([1]Kazan Federal University, Russia)
([2]National Yunlin University of Science and Technology, Taiwan)
([3]Far East University, Taiwan)

In order to conduct thousands of complicated experiments on autonomous car navigation algorithms it is much safer and cheaper to start algorithm verification within a simulation area given that we succeed to achieve a proper model configuration, which preserves physical properties of underlying objects. This paper focuses on model construction of Avrora Unior mobile robot. Avrora Unior is a Russian car-like mobile robot with Ackermann drive mechanism. For the robot model design we used open source Robot operating system (ROS) and 3D simulator Gazebo. We describe the entire process of modeling and first steps of control implementation for the model.



OS4-4 Transfer of learned exploration strategies for a mobile robot from a simulated world to real environments

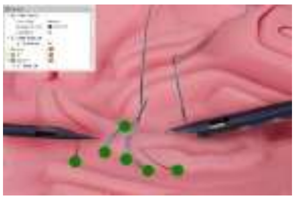
Artur Sagitov[1], Tetsuo Takano[2], Shohei Muto[2], Evgeni Magid[1]
([1]Kazan Federal University, Russia) ([2]Kanazawa University, Japan)

Reinforcement learning based approaches show promises in various robotic applications, but a significant amount of time and resources are required for a robot to learn optimal behavior. Using virtual environments, we could significantly speed up and improve performance of a target task. We implemented a reinforcement learning based exploration algorithm for a mobile robot, training in Gazebo environment and transferring learned strategy to a real robot. We show that it is convenient and appropriate to use simulation to train strategies for mobile robots.

OS4-5 Extending Gazebo simulator for surgical robotics: tissue and suture modeling

Artur Sagitov[1], Hongbing Li[2], Evgeni Magid[1]
([1]Kazan Federal University, Russia) ([2]Shanghai Jiao Tong University, China)

Active use of a simulator as a training tool has proven to be advantageous to a human surgeon, but there is no open source and convenient universal surgery simulation of a robot surgeon. This paper presents an extension of Gazebo simulator for surgical robots using Robot Operating System. We present software architecture that allows modeling robot interaction with different types of tissue and suture. We plan to apply the resulting system for a surgical task of autonomous suturing with different techniques and algorithms to be compared in the same virtual environment.



OS4-6 Experiences of Robotics students in Machine Vision course being taught in a foreign language: comprehension, self-efficiency, and active learning strategies improvement

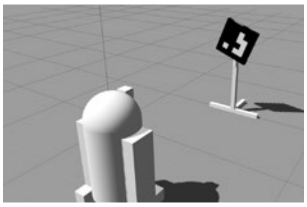
Tatyana Tsoy, Artur Sagitov, Evgeni Magid (Kazan Federal University, Russia)

Historical development of Russia in the end of 20th century significantly decreased the quality of engineering education. Now, in order to catch up with the developed countries, at Kazan Federal University a novel 2-year Master program in Intelligent Robotics was designed and implemented. The program, which curriculum is based on experience of world leading universities in the field of robotics, targets to educate competitive specialists with competences that are required in the world labor market. Students with various technical backgrounds were enrolled in the program. To follow students' progress in core robotics courses we conducted surveys in the beginning and by the end of each course. This paper presents surveys that were conducted in Machine Vision course. The paper reports results of the survey analysis covering such issues as English language comprehension, self-efficiency, and active learning strategies in the context of Machine Vision.

OS4-7 Pilot Virtual Experiments on ArUco and AprilTag Systems Comparison for Fiducial Marker Rotation Resistance

Aufar Zakiev[1], Ksenia Shabalina[1], Kuo-Lan Su[2], Kuo-Hsien Hsia[3], Evgeni Magid[1]
([1]Kazan Federal University, Russia)
([2]National Yunlin University of Science and Technology, Taiwan)
([3]Far East University, Taiwan)

There exists a large number of fiducial marker system types and both researchers and industry have difficulties to select among this variety a single system that could provide optimal behavior for a particular task. This paper presents design and results of pilot virtual experiments that were conducted in order to compare a performance of two marker systems, ArUco and AprilTag. Experiments were designed to estimate and compare marker systems resistance against rotation with regard to different principal axes in 3D space. Pilot experiment design eliminates influence of external environment, including light conditions, camera resolution, sensor noise, distance between camera and marker, etc. Experiments were implemented in ROS/Gazebo environment. In total over 300,000 virtual experiments were performed and analyzed in order to collect statistically significant data amount.

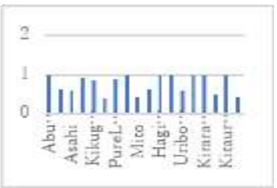


OS5 Business Models and Management (4)

OS5-1 Determining the Key Factors of Michinoeki in Yamaguchi Area

Minoru Kumano[1], Tsutomu Ito[2], Takao Ito[3], Toru Hiraoka[4], Hirofumi Nonaka[5]
([1]University of Miyazaki, [2]Hino Motors, Ltd., [3]Hiroshima University,
[4]University of Nagasaki, [5]Nagaoka University of Technology, Japan)

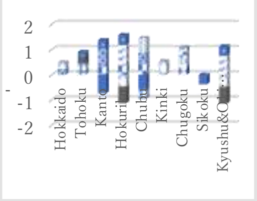
It is becoming an important issue to improve efficiency in Michinoeki. Thus to find the key determinants is considered as the most urgent task for Michinoeki. This paper proposed a new approach with two steps: to calculate the efficiency using regression model after determing the relevant factors using DEA model. The data are collected from Chugoku area, because Chugoku is the birthplace of Michinoeki. The efficiency of all Michinoeki have been calculated, and the implications have been discussed in this paper.



OS5-2 Discovering the Characteristics of Michinoeki in Japan

Minoru Kumano[1], Tsutomu Ito[2], Takao Ito[3], Toru Hiraoka[4], Hirofumi Nonaka[5]
([1]University of Miyazaki, [2]Hino Motors, Ltd., [3]Hiroshima University,
[4]University of Nagasaki, [5]Nagaoka University of Technology, Japan)

World Bank reported that four stages including identification, preparation, appraisal and operation are necessary to improve Michinoeki. Thus to estimate the value of Michinoeki is a crucial issue. As our best knowledge, no research to study the whole Michinoeki although there are 1,107 Michinoeki by April, 2017 in Japan. Nine areas: Hokkaido, Tohoku, Kanto, Hokuriku, Chubu, Kinki, Chugoku, Sikoku, and Kyushu&Okinawa have been divided, eleven basic elements are used as the determinants of the Michinoeki. This paper examined the determinants of the nine areas and found that the key determinants of those nine areas are totally different. It contributes not only to understand the status quo of Michinoeki, but also helpful to find the potential possibility for further development.



OS5-3 An Analysis of Robotic Relationship between Transaction Network and Cross-shareholding Network in Yokokai

Takao Ito[1], Tsutomu Ito[2], Rajiv Mehta[3], Seigo Matsuno[4], Makoto Sakamoto[5], Satoshi Ikeda[5]
([1]Hiroshima University, Japan, [2]Hino Motors, Ltd., Japan, [3]New Jersey Institute of Technology, U.S.A.,
[4]Ube National College of Technology, Japan. [5]University of Miyazaki, Japan)

After bubble economy, the relationship of all parts suppliers in the keiretsu have been changed from strong tie to weak tie. One typical thing is relationship of cross shareholdings does not contribute to the transactional relationship. The authors once proved that the relationship between cross share holdings and transactions still remained in Keiretsu of Kyohokai even after the bubble economy. This paper collected the data from Yokokai, a keiretsu of Mazda, and calculated the relationship between cross share holding and transaction to prove the correlationship between cross share holdings and transaction in Yokokai.

OS5-4 Technological Discontinuities and the R&D Strategy of Automobile Companies

Yousin Park[1], Iori Nakaoka[2], Yun-ju Chen[3]
([1]Prefectural University of Hiroshima,
[2]National Institute of Technology, Ube College,
[3]Shiga University, Japan)

This paper focuses on patterns of technological changes and the R&D strategy of automobile companies. Tushman and Anderson (1986) pointed out that there are two types of technological changes. One is incremental technological change which is often generated by existing companies, and the other one is radical technological change which makes great extension in business environment and destroys the order of existing companies. We use the patent information of three automobile companies (Toyota, BYD, Tesla) as the cases on these changes. And we examine our propositions by social network analysis and text analysis. The analysis in this paper include: 1) try to distinguish between the radical and incremental technological changes from R&D projects, and create heat-maps to visualize these changes, 2) make discussion on technological discontinuities and the R&D strategy of automobile companies. In this paper we suppose that patterns of corporate R&D strategy cope with the threat of radical technological changes.

The Network of Patent

OS6 Software Development Support Method (6)

OS6-1 Prototype of an Animated Graphics-Based Training Support Tool for Bug Fixing of Extended Place/Transition Nets

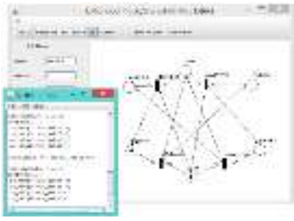
Tomohiko Takagi, Shogo Morimoto, Yuki Ue, Yoshiro Imai (Kagawa University, Japan)

An EPN (Extended Place/transition Net) is an executable formal model with high representation power for specifications definition and test case generation, but it would not be so easy for most of software engineers to learn and use the EPN efficiently. This paper describes an animated graphics-based training support method and prototype tool for bug fixing of EPNs. The prototype tool gives a trainee a faulty EPN and its animated graphics. The motion of the animated graphics is synchronized with the motion of the faulty EPN. Therefore, it is expected that a trainee can intuitively understand the faulty EPN, and smoothly try to fix a bug (a difference between the faulty EPN and software requirements). The result of bug fixing is checked by the prototype tool.

OS6-2 Prototype of a Modeling Tool to Convert between Extended Place/Transition Nets and VDM++ Specifications

Tomohiko Takagi, Ryo Kurozumi (Kagawa University, Japan)

In software modeling, engineers can use EPNs (Extended Place/transition Nets) to define the expected behavior of software. The guards and actions of EPNs are written in VDM++, and thus EPNs can be straightforwardly converted to VDM++ specifications. EPNs provide more abstracted and intuitive view than VDM++ specifications, and VDM++ specifications can be used to generate source codes and test cases. Therefore they give engineers a practical way for model-driven development. VDM++ specifications should be updated along with EPNs, and vice versa. However, it is not so easy for engineers due to their limited time. This paper shows a prototype of a modeling tool that converts (and keep the consistency) between EPNs and VDM++ specifications.



OS6-3 Application of Pairwise Testing to Test Cases by Boundary Value Analysis in BWDM

Futa Hirakoba*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, †Tokyo University of Technology, Japan)

In recent years, specifications using specification language become more important. It is necessary to test the developed software, but it takes much time and effort to design test cases manually. So, we developed BWDM(Boundary Value Vienna Develop Method). It generates test cases from VDM++ specifications. In BWDM, test cases are generated by boundary value analysis. However, it is possible to cause a combination explosion by the number of the test cases. In order to solve the above problem, this research extends BWDM so that the pairwise testing can be applied to boundary value analysis. The extended BWDM does not cause the combination explosion, because the pairwise testing only generates test cases which satisfy combinations of two pairs.

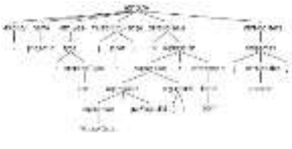
Please attach one typical figure in your paper here.

Boundary Value
BWDM

OS6-4 Development of Library Fescue Extracting Elements of Attributes and Operations of Class Diagram in UML

Keisuke Mori*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, †Tokyo University of Technology, Japan)

Many modeling tools and development support environments for UML have been developed. And some modeling tools have the function to convert the described model into programs. However, no existing tools can describe all the grammar defined in UML 2.0 specification. Or even if it can be described, the existing tools cannot analyze its meaning correctly. This paper develops library fescue (Feature Elements Section of Class in UML Extraction) extracting elements of attributes and operations of Class Diagram in UML to expand the analyzable range of the grammar defined in UML 2.0 specification. Fescue can parse character strings expressing attributes and operations based on the grammar defined in UML 2.0 specification, and can extract each element from the syntax analysis result. It is confirmed that fescue can parse the components of attributes and operations in a practical time that the existing tools cannot parse.



OS6-5 Tamias: a Syntax File Checker for Parsing Expression Grammar

Toshihiro Miyaji*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, †Tokyo University of Technology, Japan)

In recent years, Parsing Expression Grammar (PEG) is introduced by Bryan Ford. PEG is not ambiguous because it has ordered choice property. However, it causes “prefix capture”. “Prefix capture” is a problem of hiding the language to be accepted according to the order of choice. Checking syntax files that contain such mistakes confirms the behavior of the parser. However, in confirming the behavior of the parser, it is possible to check only the top level non-terminal symbols, and it is necessary to rebuild the parser for each change in the syntax file. This paper proposes Tamias: a syntax file checker to support checking the syntax files. Tamias has a PEG interpreter which can check all choices and any non-terminal symbols in production rules follows PEG.

OS6-6 Implementation of an Arduino Simulator to Support Circuit Design

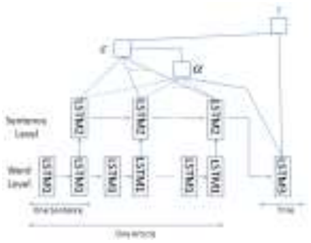
Tatsumi Nishida*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, and Naonobu Okazaki*
(*University of Miyazaki, †Tokyo University of Technology, Japan)

Embedded technologies are used everywhere and are indispensable in our daily life. One of the educational materials to learn embedded technology is Arduino. However, when a beginner designs circuit, it is possible to design circuit that damages Arduino itself or the modules on it. Therefore, this research implements an Arduino simulator that runs on iPad for supporting to design circuit. In this simulator, the circuit on iPad is analyzed to detect the voltage value on the circuit and the risk Arduino itself or the modules being damaged. This feature allows you to visually notify the risk of breakage of Arduino itself or the modules without damaging them. Consequently, this simulator can support to design circuit.

OS7 Media Information Processing and Artificial Intelligence (4)

OS7-1 Effectiveness of Data Augmentation in Automatic Summarization System

Tomohito Ouchi, Masayoshi Tabuse (Kyoto Prefectural University, Japan)



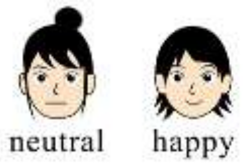
We propose a new data augmentation method in automatic summarization system. A large corpus is required to create an automatic summarization system using deep learning. However, in the field of natural language processing, especially in the field of automatic summarization, there are not many data sets that are sufficient to train automatic summarization system. Therefore, we propose a new method of data augmentation. We use an encoder decoder model with an attention model as automatic summarization system. First, we determine the importance of each sentence in an article using topic model. In order to extend the data, we remove the least important sentence from an input article and use it as a new article. We examine the effectiveness of our proposed data augmentation method in automatic summarization system.

OS7-2 A System for Posting on SNS Portrait Selected Using Facial Expression Analysis While Writing Message

Taro Asada[1], Yuiko Yano[2], Yasunari Yoshitomi[1], Masayoshi Tabuse[1]
([1] Kyoto Prefectural University, [2] Nara Guarantee Corporation, Japan)

We have developed a real-time system for expressing emotion as a portrait selected according to the facial expression while writing a message. The portrait is decided by a hair style, a facial outline, and a cartoon of facial expression. The user selects one hair style and one facial outline before writing a message. The image signal is analyzed by our real-time system using image processing software (OpenCV) and a previously proposed feature parameter. Then the system selects one cartoon expressing one of neutral and happy facial expressions using the facial expression intensity threshold previously decided between these facial expressions. We applied the system to post on an SNS a message and a portrait expressing the facial expression while writing the message. The experimental and questionnaire results suggest that our system can be useful for expressing emotions while writing messages.

Generated portraits



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OS7-3 A Method Using Wavelet Transform for Judging Character to be Inserted into Image

Yasunari Yoshitomi[1], Takashi Sato[2], Taro Asada[1], Masayoshi Tabuse[1]
([1] Kyoto Prefectural University, [2] Tokyo Institute of Technology, Japan)

There has been an increase in the number of images on the Internet that contain private information and/or the URL of an illegal Web site. This information might result in a violation of human rights and/or a crime. We previously proposed a method for extracting from an image the region(s) that contain characters. Based on the previously proposed method, we have proposed a method for judging character to be inserted into image using the discrete wavelet transform, the image compression characteristics, and the empirical knowledge that characters have strong vertical and/or horizontal elements. The experimental results show the usefulness of our method.

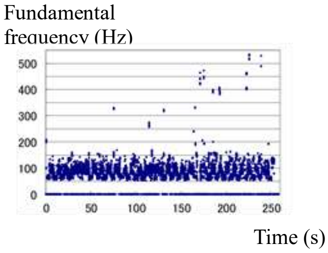
Original
Processed

JPG size
Upper:28→19(KB)
Lower:29→4(KB)

OS7-4 An Authentication Method for Digital Audio Using Wavelet Transform and Fundamental Frequencies

Yasunari Yoshitomi[1], Shohei Tani[2], Masaki Arasuna[3], Ryota Kan[4], Taro Asada[1],
Masayoshi Tabuse[1] ([1] Kyoto Prefectural University, [2] Fukuchiyama City Hall,
[3] Nissay Information Technology Co., Ltd., [4] Shimazu Business Systems Co., Ltd., Japan)

Recently, several digital watermarking techniques for audio files have been proposed for hiding data in order to protect their copyrights. In general, there is a tradeoff between the quality of watermarked audio and the tolerance of watermarks to signal processing methods, such as compression. For overcoming the inevitable tradeoff, we previously developed an authentication method for digital audio using a discrete wavelet transform. In the present study, we have improved the method by deciding the region to be authenticated in the audio file using the fundamental frequency characteristics. The experimental results show that the method has high tolerance of authentication to cutting small parts in the audio data.



OS8 Computational intelligence and cognitive science for human biosignals and human well-being (7)

OS8-1 Unified Approach to (1+1) EA on Discrete Linear Functions

Kenji Aoki, Makoto Sakamoto (University of Miyazaki, Japan)
Hiroshi Furutani, Satoru Hiwa, Tomoyuki Hiroyasu (Doshisha University, Japan)

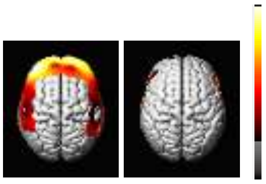
We consider the runtime property of discrete linear functions in (1+1) Evolutionary Algorithms. We analyze the process of evolution by means of Markov chain method. This study was motivated by the paper of Jansen treating the runtime property of (1+1) EA on monotonic functions by means of probabilistic theory. As linear functions are special case of monotonic function, we analyze their behavior by Jansen's model, PO-EA. We show that linear functions show almost the same runtime if mutation rate pm is small. On the other hand, in the case of strong mutation, the runtime shows the function specific magnitude. This fact means that higher order mutations play more important roles in the calculation process with stronger mutation.

PO-EA
(1+1) EA
Markov Chain Analysis
↓
Discrete Linear Functions.

OS8-2 A fNIRS study of brain state during letter and category fluency tasks

Akane Onishi, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu (Doshisha University, Japan)

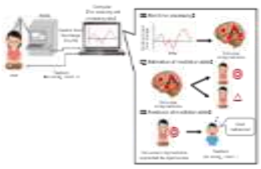
One of the practical issues concerning automated driving vehicles is identifying the state of the driver when switching between manual and automatic control. When switching, it is important to detect the wakefulness and awareness of the driver. In this study, we controlled a driving simulator based on driver state detection. Electrocardiogram (EKG) measurement was used for driver state detection. Heart rate variability analysis (HRV) is a widely known means for estimating sympathetic and parasympathetic activity. We created a Simulink model to calculate SDNN, RMSSD, and LF/HF in real time, which are indicators obtained from the HRV analysis. Based on the model, the state of the driver during the driving simulation was detected. We also created a Simulink model that switches between automatic operation and manual operation of simulated vehicles. By applying these models, construction of a system that safely switches between automatic operation and manual operation is expected.



OS8-3 Construction of a meditation practice support system leads to a good meditation state: an fNIRS study

Seika Fujii, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu (Doshisha University, Japan)

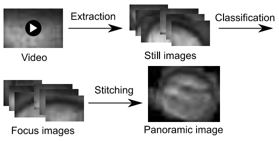
Meditation is one methods of realizing a state of mindfulness. By continuing meditation, an improvement of concentration and work efficiency is expected. However, when novices practice meditation, they find it difficult to judge improvements in their practice. Therefore, in this study, a system for supporting novices' meditation practices was formulated. In the proposed system, quantification of and feedback regarding the meditation state based on brain functional information was performed. Brain activity during meditation was measured using functional near-infrared spectroscopy. The brain activity could be measured using this method close to every day. A good brain state during meditation was defined based on previous research. The measured brain state was compared with this good state and the similarity was calculated. The state was then judged on the basis of the similarity and feedback was given when the meditator approached the goal state. The effectiveness of the constructed system was examined.



OS8-4 Automated panoramic image creation system for corneal endothelial cells

Keitaro Kobayashi, Naoki Okumura, Noriko Koizumi, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu
(Doshisha University, Japan)

The imaging area of the corneal endothelium imaged by current technology is narrow, mainly observing the central portion. A system for automatically creating a panoramic image based on an imaging video of the corneal endothelium of the mouse was developed. First, still images were extracted from the imaging videos and were convolved with a Laplacian kernel. With the variance of the response as a threshold value, focused images were extracted. By stitching the focus images, panoramic images of the corneal endothelium were created. The reason this method works is that the Laplacian kernel highlights regions of an image containing rapid intensity changes. If the variance is very high, there are huge edges in the image, that is, the image is focused. In this paper, automatically created panoramic images were evaluated by comparison with manually created panoramic images, which were defined as correct images. This system can be applied to the evaluation of the progression of symptoms.

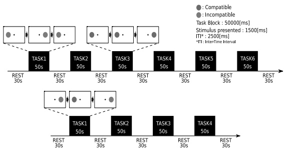


The proposed system

OS8-5 An fMRI study of the inhibitory effects of the random stimulus-response compatibility task on brain function

Kei Sahara, Satoru Hiwa, Hiroshi Furutani, Tomoyuki Hiroyasu (Doshisha University, Japan)

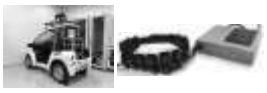
Our behavior is optimized by the brain to suppress unnecessary movement at particular moments. Here, we investigated the differences in inhibition during a spatial stimulus-response compatibility task. The stimulus-response compatibility task is used to investigate brain function while inhibiting movements to accomplish the optimized movements during the compatible and incompatible trials. A previous study investigated inhibitions in specific compatible and incompatible tasks. However, these studies did not consider the inhibition during random events, which is an everyday occurrence in human life. Therefore, in this study, we focused on the differences between specific inhibition and random effect inhibition using three stimulus-response compatibility tasks, comprising the compatible, incompatible, and random tasks. Twenty healthy participants were measured using 1.5-T functional magnetic resonance imaging (fMRI) and the results were analyzed by using activation, brain function network, and behavioral analyses.



OS8-6 Measurement of brain activity and problem discovery during actual driving

Seishiro Nakamura, Satoru Hiwa, Kenya Sato, Hiroshi Furutani, Tomoyuki Hiroyasu
(Doshisha University, Japan)

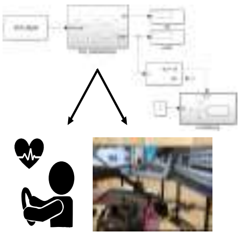
In this study, we focused on a system that provides driving support based on a driver's biological parameters. Brain function is one such biological parameter and functional near-infrared spectroscopy (fNIRS) was used to measure brain function. fNIRS is less susceptible to body movements and easier to measure than electroencephalography. In order to compare brain activities during actual vehicle operation and simulated operation, a task performed using a simple course was prepared. In order to quantify the change in cerebral blood flow obtained from each channel, the fractional amplitude low-frequency fluctuations (fALFF), which is an index of local spontaneous brain activity, was calculated. Furthermore, it was z transformed (zfALFF) to allow comparisons between subjects. In addition, to confirm the relationship between driving performance and brain activity, we compared the time series data for driving performance and cerebral blood flow change obtained from each channel. The measurement of brain activity during actual vehicle driving was performed and the results were analyzed. In addition, discussions of the findings and future directions are also included.



OS8-7 Control of driving simulator based on state detection of the driver using Electrocardiogram measurement

Koma Yoshioka, Satoru Hiwa, Kenya Sato, Hiroshi Furutani, Tomoyuki Hiroyasu
(Doshisha University, Japan)

One of the practical issues concerning automated driving vehicles is identifying the state of the driver when switching between manual and automatic control. When switching, it is important to detect the wakefulness and awareness of the driver. In this study, we controlled a driving simulator based on driver state detection. Electrocardiogram (EKG) measurement was used for driver state detection. Heart rate variability analysis (HRV) is a widely known means for estimating sympathetic and parasympathetic activity. We created a Simulink model to calculate SDNN, RMSSD, and LF/HF in real time, which are indicators obtained from the HRV analysis. Based on the model, the state of the driver during the driving simulation was detected. We also created a Simulink model that switches between automatic operation and manual operation of simulated vehicles. By applying these models, construction of a system that safely switches between automatic operation and manual operation is expected.

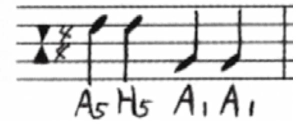


OS9 Natural Computing and Beyond (3)

OS9-1 Tactile Score: Development and Applications

Yasuhiro Suzuki (Nagoya University, Japan)

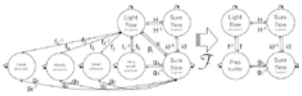
Unlike music, which can be described by means of a musical score, tactile sense does not have a standard method for transcription. Likewise, tactile sense has no developed principle of composition. Hence, this study developed a method for describing tactile sense, referred to here as the ‘tactile score’. We developed a mutual transformation method between tactile score and haptic vibrations, and then we verified that a hand massage performed according to a tactile score and haptic vibration from a tactile score evoked similar brain activities.



OS9-2 Tactileology; Haptic Informatics by using Tactile bit, T-bit

Yasuhiro Suzuki (Nagoya University, Japan)

Most of Internet of Things, IoT data is time series data, however the time series patterns of tactile sense have not been investigated. Tactile Score is a novel method for describing time sequences of different tactile senses, such as massages. It can not only describe the massages but also tactile senses in multimedia data such as locution, vocalism or rhetoric, etc.; multimedia time series data can be transformed into Tactile Score and we can display tactile senses denoted by Tactile Score by using Tactile Score players. Tactile Score enables us to compose and edit tactile senses. We extract composing principle of time series patterns of tactile senses though analyzing massages; extracted principle has been verified through examining biological responses.



OS9-3 Natural Computing and Formal Computing

Yasuhiro Suzuki (Nagoya University, Japan)

In natural computing, computing substances, such as DNA molecules, cells or ecosystems, observe the result of algorithm and verify it by themselves. Hence, natural computing is primitive in computing and throughout of the evolution from natural computing, it develops “external formal” system to observe and verify and evolve to formal computing system. In this talk, I will briefly address the evolution of computing from natural computing to formal computing and show a novel natural computing framework; thinking about nature by natural computing.

OS10 Mathematical Informatics (5)

OS10-1 A Study on Tourism Support Application Using the Virtual Technology

Masamichi Hori[1], Makoto Sakamoto[1], Takahiro Ishizu[1], Satoshi Ikeda[1], Amane Takei[1], Takao Ito[2], Yu-an Zhang[3]
([1]University of Miyazaki, [2]Hiroshima University, Japan, [3]Qinghai University, China)

Currently, the tourism industry in Miyazaki prefecture has various problems, and various measures are taken. On the other hand, in 2016, virtual technology attracted much attentions such as VR and AR technology. We thought that through the VR and AR technology experience, we could aim for an increase in tourists. Therefore, we will create new applications for smartphones using virtual technology and aim for tourism support. We propose unique features aimed at increasing tourists and creating repeaters. It is a function that allows you to reproduce the scenery anywhere with VR, and to feel the sightseeing experience by AR close.

OS10-2 Proposal for Interaction Techniques for Intuitive Virtual Objects Manipulation in Augmented Reality

Takahiro Ishizu[1], Makoto Sakamoto[1], Takaaki Toyota[1], Masamichi Hori[1], Satoshi Ikeda[1], Amane Takei[1], Takao Ito[2], Yu-an Zhang[3] ([1]University of Miyazaki, [2]Hiroshima University, Japan, [3]Qinghai University, China)

Recently, studies for realizing interaction between users and virtual objects using Augmented Reality (AR) have been actively conducted. However, few previous studies have realized that a user intuitively manipulates virtual objects like clay with their bare hands. In this study, we aim at user's intuitive virtual objects manipulation by realizing basic manipulation on virtual objects with their bare hands. In addition, it is considered that the user feels uncomfortable in the manipulation of the virtual objects because of the occlusion problem in AR, and cannot perform an intuitive manipulation. Therefore, in this study, we solve this problem by performing appropriate hidden surface processing within the range of the user's fingertips.

OS10-3 Two-Dimensional Image Based Body Size Measurement and Body Weight Estimation for Yaks

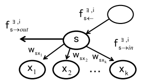
Zijie Sun[1], Chen Zhang[1], XiaoFeng Qin[1], Yu-an Zhang[1], Rende Song[2], Makoto Sakamoto[3]
([1]Qinghai University, [2]Yushu Prefecture Animal Husbandry and Veterinary Station, China
[3]University of Miyazaki, Japan)

In stock raising, non-contact and non-stress measurement of animal's body size parameters and body weight is a research highlight. Yak's body size parameters and body weight estimated based on body size can reflect yak's growth and development features, production performance and hereditary characters. Therefore, studying the body size measurement and body weight estimation of yaks is an effective approach to promoting scientific breeding and enhancing culture benefits. Traditional manual methods of measuring animal's body size and body weight have such disadvantages as heavy workload and potential safety hazards. This paper firstly acquires the color image of the yak by taking pictures of yaks in Sanjiangyuan. Then, the yak is extracted from the image with the method of foreground extraction based on grey level classified process; after that, the profile curve of the yak is extracted to obtain the temple point and ischium end of the yak with the method of calculating the image edge curvature. Based on that, the marked points for the yak's body height and body dip length are determined; weka based linear regression helps obtain the body weight estimation formula; finally, estimation about the yak's body weight is achieved. Experiments suggest this algorithm is effective to non-contact body size measurement and body weight estimation for yaks in Sanjiangyuan, Qinghai Province.

OS10-4 An efficient structure of organization with complete group guidance

Satoshi Ikeda[1], Mamoru Yoshimura[1], Makoto Sakamoto[1], Takao Ito[2]
([1]University of Miyazaki, [2]Hiroshima University, Japan)

The purpose of this paper is to show that the efficient organizational shape when the evaluation criteria is only one, is limited to the three types under the assumption of the communication style called the complete group guidance.


$f^{\exists,i}_{s\leftarrow}$
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w_{sx_1}
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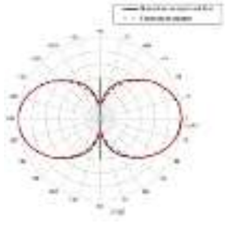
w_{sx_k}
x_1
x_2
…
x_k

OS10-5 Parallel finite element analysis for hyperbolic problems

Amane Takei,' Makoto Sakamoto (University of Miyazaki, Japan)

In this research, we propose a parallel finite element analysis for hyperbolic problems based on an iterative domain decomposition method. In a microwave analysis, the simplified Berenger's PML is developed in which these eight corners are given the average value of all PML's layers. As for accuracy verification of the analysis solver, the absorbing performance of the PML is evaluated by using reflection coefficient based on S parameter. In the accuracy verification, when the maximum side length is set to 1/20 of the wavelength, the error rate of the numerical solution and the theoretical solution is about 1.70 [%] with the PML of 9 layers. So, we have found that proposed method can calculate with high accuracy.

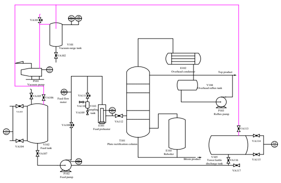


OS11 Recognition and Control (12)

OS11-1 Design of feed part control system for rectification process

Lingran An[1], Fengzhi Dai[1], Yujie Yan[1], Zhongyong Ye[1], Xia Jin[1], Yiqiao Qin[12], Chengcai Wang[3], Kaige Liu[1]
([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3] CETC Ocean Information Co., Ltd, China)

This paper completes the structure design of the feed process of the small rectification experimental unit. According to the process requirements, we design the overall scheme of the detection and control system of the main parameters and select the type of the instrument. The system hardware design is based on the CPU222 of Siemens s7-200 PLC and the corresponding input/output module. The lower computer adopts the ladder diagram to complete the program design such as parameter acquisition, scale transformation and PID operation. The monitoring interface of the upper computer adopts configuration the King monitoring software.



OS11-2 Ultrasonic range finder for vehicle collision avoidance system

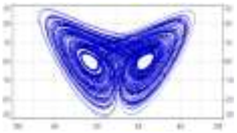
Ying Chen[1], Guowei Yang[1], Fengzhi Dai[1], Yuxuan Zhu[1], Di Yin[1], Yasheng Yuan[1],Yiqiao Qin[12], Ce Bian[12], Chengcai Wang[3], Xinyu Zhang[1] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd, China)

In recent years, highway rear-end collision accidents have occurred frequently, causing huge personal injury and property damage. Protective measures such as seat belts and airbags only serve to reduce damage afterwards and do not solve the problem from the source. Therefore, research on the system of vehicle collision avoidance, which actively avoids accidents, is of great significance. The ultrasonic range finder designed based on AT89C51 single-chip microcomputer utilizes the principle of sound wave reflection in the air. It can detect the distance between the vehicle and the obstacle in real time, and immediately alarms beyond the set threshold. Ultrasonic ranging is widely used in automotive anti-collision systems due to its non-contact detection method and simple structure.

OS11-3 Chaos synchronization method of Qi system and the circuit design

Xia Jin[1], Fengzhi Dai[1], Zhongyong Ye[1], Lingran An[1], Yujie Yan[1], Chenglin Zhao[1], Yiqiao Qin[12], Hao Li[3]
([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd,, China)

Chaos is a kind of uncertain and random phenomenon that appears in the system. Its dynamic characteristics are rich and interesting. The study of the dynamic characteristics and synchronization methods of Qi chaotic system has fascinated many researchers. In this paper, the dynamic characteristics of Qi chaotic system are analyzed, and the synchronization circuit of Qi chaotic system is designed based on the driving-response chaotic synchronous system and the single-variable feedback perturbation synchronous system, The synchronization circuits of Qi chaotic system are designed respectively, comparing the synchronization curves of the variables simulated by Multisim and the numerical simulation curves obtained by MATLAB, verifying the correctness of the built circuit, and analyzing the advantages and disadvantages between the above two synchronization methods.



OS11-4 Design of air quality monitoring platform based on Internet of Things

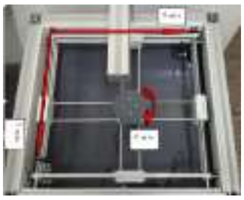
Yujie Yan[1], Fengzhi Dai[1], Kailun Zhang[1], Wei Wang[2], Jialin Han[1], Yang Li[3], Tianyi Zhang[1]
([1]Tianjin University of Science and Technology, [2]China Institute of Aerospace Engineering, [3]CETC Ocean Information Co., Ltd, China)

The air quality monitoring platform based on the Internet of Things (IoT) uses the STM32f407 main control module. Data such as temperature, humidity, PM2.5 and carbon monoxide concentration in the atmospheric environment are collected for a long time by each sensor module. Not only the system has the LCD display function, users can also log on to the ESLINK IoT cloud platform to remotely observe the data collection status. The upper limit of each parameter can be set in a specific environment. If the data monitored by the system exceeds the upper limit, the system will alarm. The system has a good application prospect in the environment of office, automobile, factory and so on.

OS11-5 Design of metal weld seam tracking equipment based on image processing

Yujie Yan[1], Fengzhi Dai[1], Lingran An[1], Xia Jin[1], Zhongyong Ye[1], Yufan He[2], Xinran Guo[3]
([1]Tianjin University of Science and Technology,
[2] CETC Ocean Information Co., Ltd, [3]Nanjing University, China)

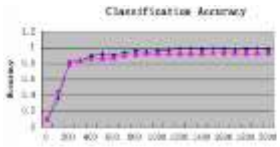
With the development of the intelligent industry, metal automatic welding technology needs to be more popular. The metal weld seam tracking device based on image processing includes two parts of image processing and motion control. The image processing part is developed by the Visual Studio 2013 platform, and the motion control part is controlled by the PID algorithm. Machine vision technology can be used to convert images captured by industrial cameras into vector graphics, which in turn drive the welding table to track metal welds. The device has good control effect and can be well applied in small and medium-sized enterprises.



OS11-6 The recognition and implementation of handwritten character based on deep learning

Zhongyong Ye[1], Fengzhi Dai[1], Xia Jin[1], Yasheng Yuan[1], Lingran An[1], Yujie Yan[1],
Yiqiao Qin[12], Hao Li[3] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, [3]CETC Ocean Information Co. Ltd, China)

For recognizing handwritten characters, especially the handwritten Chinese characters, this paper uses deep learning techniques to construct convolutional neural networks of different depths to identify character sets containing handwritten digits and Chinese characters, and compares the performance of networks with the same depth and different depths. In the end, the network structure that can be used for identification is finally obtained, and a handwritten character recognition system is implemented based on the network. The recognizing accuracy of the paper reaches 99.18% for the MNIST dataset and 92.02% for the subset of the Chinese dataset HWDB1.1. Compared with other handwritten character algorithms, this paper proves that the used network structure has the application value.



OS11-7 Cluster analysis of wine based on three-dim fluorescent spectra characteristic

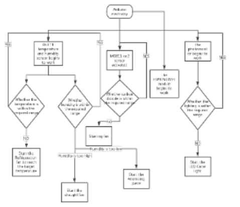
Di Yin[1], Fengzhi Dai[1], Yuxuan Zhu[1], Yasheng Yuan[1], Tingting Zhang[1], Ying Chen, Yiqiao Qin[12], Chengcai Wang[3] ([1]Tianjin University of Science and Technology, [2] Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, [3]CETC Ocean Information Co., Ltd, China)

The traditional sensory analysis method can not discriminate different kinds of wine objectively and accurately. The three-dimensional (3D) fluorescence technology has the advantages of strong selectivity, high resolution and direct access to the fluorescence characteristics of the sample. In this paper, the 3D fluorescence spectroscopy five brands of red wine samples. The five characteristic parameters (the mean value, standard deviation, center of gravity coordinates, first order center moment and correlation coefficient) of the 3D fluorescence spectra of these five dry red wine samples are extracted respectively. The results show that the difference of the samples can be distinguished intuitively by extracting the 3D spectral parameters of the different brands. On this basis, the clustering analysis shows that even the same raw material brewing wine is different from the raw material origin and the soil environment. The climate environment will cause an important impact on the composition of the wine.

OS11-8 The control design of the planting device for the hydroponic vegetable

Yasheng Yuan[1], Fengzhi Dai[1], Zhongyong Ye[1], Yuxuan Zhu[1], Di Yin[1], Tingting Zhang[1], Yiqiao Qin[12], Yang Li[3] ([1]Tianjin University of Science and Technology, [2] Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co., Ltd, China)

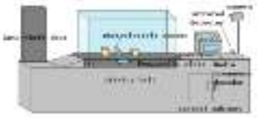
The equipment is designed to household indoor small hydroponic vegetable planting control device. The temperature, humidity, light and carbon dioxide concentration sensors are integrated to the Arduino UNO R3 microcontroller. It is used to detect various parameter data of planting environment. The WIFI module can send the real-time environment variables detected by the sensor to the mobile devices, such as the user's mobile phone, through the wireless network. Moreover, users can also change the corresponding control range of variables according to the planted vegetables through the WIFI module.



OS11-9 An anti -theft system based on the self-checkout

Yuxuan Zhu[1], Fengzhi Dai[1], Yasheng Yuan[1], Di Yin[1], Tingting Zhang[1], Ying Chen[1], Ce Bian[12], Yufan He[3] ([1]Tianjin University of Science and Technology, [2]Tianjin Tianke Intelligent and Manufacture Technology CO.,LTD, [3]CETC Ocean Information Co. Ltd, China)

Nowadays, the imperfection of the anti-theft system impedes the development of self-service cash registers. This paper designs an anti-theft system based on self-service cash registers, which can greatly reduce the theft rate in supermarkets. This anti-theft system adopts Siemens's LOGO!, which is the core of the controller. Moreover, it has massive facilities of anti-theft protection, including radio frequency detection, photoelectric counting, repeated scanning reminder, magnetic detection, video monitoring and anti-theft electronic door. Through the above technologies, the supermarket that uses the self-service cash registers can avoid to some problems, i.e. cash collection leakage, using low price goods to replace that of high price. Multiple facilities are set to jointly protect the safety of goods, effectively reduce theft and loss.



OS11-10 Case study on communication between embedded linux environment and microcontroller

Ziheng Gao, Yizhun Peng, Shuo Wang
(Tianjin University of Science and Technology, China)

In many embedded development scenarios, we need to combine the real-time microcontroller and non-real-time embedded Linux environment for collaborative development. In a high real-time environment (such as: vehicles, production lines), it can complete kinds of features relying on huge Linux ecosystem, such as hot fixable functional modules, improved network communication, easier OTA firmware updates, more efficient algorithm capabilities, and more objects. This paper aims to enumerate and explore several methods that can be used to implement similar duplex communications. For ease of understanding,a single-board computer called Raspberry Pi running Raspbian Linux and an STM32F103 32-bit ARM microcontroller are used in experiment.

OS11-11 Design and implementation of a baby care robot

Yizhun Peng, Zefan Ge, Kaixuan Geng, Zhou Yang,Rui Yang
(Tianjin University of Science and Technology, China)

Aiming at the shortcoming of single function of traditional pram, this paper proposes an embedded multi-functional intelligent baby care robot. With baby cradle as the carrier, the bionic cradle is realized by combining embedded controller, drive module, motor and various sensors. The babysitting robot has the functions of autonomous following and obstacle avoidance, voice play and real-time picture return, which not only improves the convenience and security of the baby carriage, but also can assist parents to take care of the baby , greatly reducing the burden of parents' parenting.

OS11-12 Research on intelligent shopping service robot design

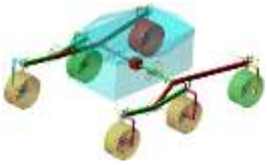
Shuo Wang, Yizhun Peng, Ruixiang Bai, Ziheng Gao
(Tianjin University of Science and Technology, China)

With the rapid development of the social economy, it’s good to help customers have more efficient and relaxed shopping experience through intelligent means in large commercial centers. In this paper, a shopping service robot project that uses machine vision, deep learning, and IoT is introduced. The robot can help customers complete shopping and complete indoor positioning navigation and autonomous movement intelligently. The robot product is designed to help all customers, especially people with mobility impairments. It will reduce their burden of action, thereby enhancing the user experience and doing special analysis of shopping behavior to help launch more efficient and personalized market planning.

OS12 Robot Design and Simulation (5)

OS12-1 Design and Research of Navigation and Dynamics Co- Simulation Platform for Planetary Rover

Huang Tie-qiu, Zhang Bo-wen, Huang Qian-li (Beijing Jiaotong University, P.R China)



In view of the difficulties in the design of the navigation control system for the exploration of complex and passing missions on Mars and other planets, the overall design idea of the co-simulation platform for the planetary rovers navigation and dynamics is proposed. On the basis of MSC.ADAMS software, the dynamic model of planetary rover in soft soil environment is established through two times of subprogram development. An interactive parallel simulation system is established by using C++, and the cooperative invocation dynamic model and navigation control model are solved to form the closed loop system of co-simulation, and the navigation control system and the dynamic model are realized. Seamless link and parallel efficient solution. Taking the co-simulation of Mars rover as an example, the simulation platform has completed the simulation of Mars rover cruising, crab line, steering, lifting wheel, body lifting and so on in the Martian environment, and can show the moving state of the rover, the contact force of the rover and the driving torque of each mechanism in real time. Due to the high efficiency of the wheel contact model algorithm and the application of parallel multi task processing method, co-simulation can almost achieve real-time. The platform lays an important foundation for the design of navigation control system.

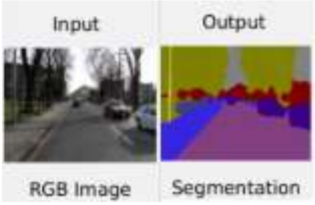
OS12-2 Research on Application of SFM Method in Virtual Reality Modeling

Jiwu Wang, Chenyang Li (Beijing Jiaotong University, China)
Min Li (Beijing Forestry University, China)

Simulation technology has become an important part of design and training. With the development of computer science, Virtual Reality（VR）technology can enable the experiencer to reach the immersion degree that other simulation technologies cannot achieve, and become the focus of military simulation research in various countries. But VR technology also has some shortcomings, such as long modeling period, certain differences between models and real objects. Based on the current technology, this paper proposes a VR technology combined with SFM which can greatly reduce the modeling period and improve the realism of the model to enhance the experience of simulation.

OS12-3 Visual SLAM System Design based on Semantic Segmentation

Jiwu Wang, Yafan Liu, Qinjian Zhang (Beijing Jiaotong University, China)



Visual SLAM is helpful for the development of unmanned platform. But only perceiving the geometric information of the environment is not enough. It is necessary to join the image semantic segmentation with SLAM, which helps to comprehend the scenes and improve the accuracy of pose estimation. Nowdays, the technique of deep learning brings new ideas into traditional SLAM by modeling this problem with convolution neural network.In this approach, we propose a pose estimation technique based on pixel-level multi-target detection, and 2D semantic information are transferred to 3D mapping via correspondence between connective Keyframes. Meanwhile,the semantic information is utilized in other modules for to optimize the visual SLAM system.

OS12-4 Spherical Mobile Robot Designed with Single Omnidirectional Wheels

Liu Wei, Lian Luo, Jiwu Wang (Beijing Jiaotong University, China)

This paper presents a new spherical mobile robot with a single omnidirectional wheels locating at the ends of the inside vertical diameter of the sphere shell, and the two wheel axes being in orthogonal position. The omnidirectional wheels can roll along the inner surface of the spherical shell, and then drive the spherical shell rolling. The lower omnidirectional wheel is responsible for walking drive, and the upper one for steering drive. The prototype shows the spherical robot moving well.

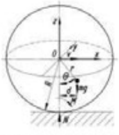


Fig. 1. Eccentric gravitational moment drive

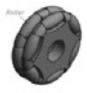


Fig. 2. Omnidirectional wheel

OS12-5 An augmented reality implementation method based on Unity3D

Weixin Zeng, Jiwu Wang (Beijing Jiaotong University, China)

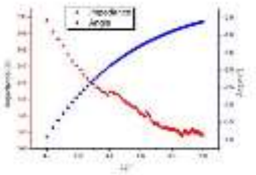
Augmented reality technology uses computer graphics and visual technology to achieve the superposition of virtual objects in real scenes, presenting the sensory effects of real-time interaction. It has broad application prospects and application value, and its popularity has been increasing in recent years. At present, there are two main ways to achieve augmented reality. One is the underlying code, which combines OpenGL and Open CV libraries to realize augmented reality. The second is the secondary development of related content through the corresponding software and SDK package. In this article, we will initially implement augmented reality through Unity 3D and Qualcomm's Vuforia SDK.

OS13 System and Control (10)

OS13-1 Research on a non-invasive measuring method of blood glucose concentration based on electrical impedance spectrum

Tong Yin, Xiaoyan Chen, Meng Du, Hongyi Yin (Tianjin University of Science and Technology, China)

Different from the traditional measurement approach and instruments of blood glucose concentration, we propose a novel measuring method related to electrical impedance spectrum without invasion. A serial experimentations are designed and carried out to detect the electrical impedance amplitudes and phases under 1Hz-10MHz frequencies. Considering the skin contacting impedance and cytomembrane conductivity feature, a simulate circuit is designed and connected in serial with the measuring loop. The measured data were analyzed by an improved Cole-Cole model to derive the relationship between the impedance value and the blood glucose concentration. The results show that the electrical impedance is strong negative correlation to blood glucose concentration, as the blood glucose concentration increases, the impedance value decreases. The conclusion of this research provides a theoretical basis for non-invasive blood glucose surface-measuring.



OS13-2 Synchronization of Novel 4D Chaotic Systems with Different Control Laws

Hong Niu (Tianjin University of Science and Technology, China)

In this paper, synchronization of novel four-dimensional(4D) autonomous chaotic systems is studied. Two different control laws are presented, which are based on the strictly positive realness of transfer function matrix and the center translation method respectively. The characteristics of the two control laws, as well as the differences between them, are proposed. Some relevant numerical simulation results, such as the curves of the corresponding synchronization state variables and the errors, are given to illustrate the feasibility and effectiveness of the two control laws.

$$\begin{aligned} \dot{x}_1 &= a(y_1 - x_1), \\ \dot{y}_1 &= c(x_1 + y_1) + z_1 - x_1 w_1, \\ \dot{z}_1 &= m x_1 - y_1 - h z_1, \\ \dot{w}_1 &= x_1 y_1 - b w_1. \end{aligned}$$

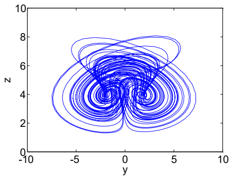
$$\uparrow$$

$$\begin{aligned} \dot{x}_2 &= a(y_2 - x_2) + u_{c1}, \\ \dot{y}_2 &= c(x_2 + y_2) + z_2 - x_2 w_2 + u_{c2}, \\ \dot{z}_2 &= m x_2 - y_2 - h z_2 + u_{c3}, \\ \dot{w}_2 &= x_2 y_2 - b w_2 + u_{c4}. \end{aligned}$$

OS13-3 Chaotic characteristics analysis of fractional-order Liu system

Wengxin Shi, Hongyan Jia (Tianjin University of Science and Technology, China)

The paper analyzes a newly reported fractional-order Liu system based on time-domain approximation and frequency-domain approximation, respectively, and chaotic characteristics of this system are investigated by the phase portrait diagram, Lyapunov exponents diagram and bifurcation diagram. The results of the two approximation methods are consistent, which not only shows chaotic dynamics of the system is reliable, but also is very convenient to utilize chaotic dynamics of the system with fractional-order 0.9.



OS13-4 Design and analysis of the multi-robot grouping aggregation algorithm

Huailin Zhao, Zhen Nie (Shanghai Institute of Technology, China)

In this paper, the grouping aggregation problem of multi-robot in simple environment is studied. The grouping algorithm and aggregation algorithm are mainly discussed. Based on two clustering algorithms, K-means and K-medoids, two grouping algorithms are designed. And the noise im-munity and grouping rapidity of these two grouping algorithms are analyzed. Aiming at the problem of aggregation, three kinds of aggregation algorithms are proposed. Taking the center aggregation control as an example, the cooperation and control of each group of robots are studied. Finally, the simulation results of MATLAB shows that the multi-robot grouping and aggregation algorithm is effective.

OS13-5 Research of the ARM-based multi-robot aggregation control

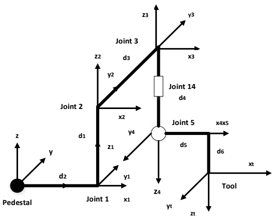
Huailin Zhao, Jingnan Zheng, Zhen Nie, Weiya Zhang, Zonglin Liu (Shanghai Institute of Technology, China)

This paper mainly analyzed the basic aggregation problem of multi-robot cooperative system. The algorithm design of multi-robot dynamic aggregation control was discussed. The multi-robot aggregation path planning method in simple environment was discussed. And the kinematics equation of the aggregation algorithm was given at last. Taking the center aggregation control as an example, the cooperation and control of multi-robot are studied. Then we designed a simulation control program on MATLAB for multi-robot system and analyzed the simulation results. Finally, the center aggregation experiment was carried out by using the three car robots. The results show that the multi-robot aggregation algorithm is effective.

OS13-6 Research on the Trajectory Planning Problem of Robots in Spherical Cutting

Jun Min, Wenping Jiang, Huailin Zhao (Shanghai Institute of Technology, China)

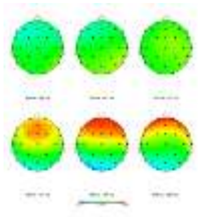
For cylindrical shape cutting of spherical surface vessel a kind of 5-DOF cutting method of cylin-drical shape for spherical surface is provided in this paper. Based on the kinematics model of cutting robot the mathematic relations between cutting tool cylindrical shape and spherical surface are built using Euler transformation and the intersection line model of cylindrical and spherical surface is presented. The robotic cutting trajectory is computed according to the position and attitude relation of robot and spherical sphere and simulations and experiments of cutting trajectory for robot are provided in the end. Experiments results verified the rightness of robot kinematics and cylindrical shape cutting algorithm, and will promote the robot-is application in cutting field.



OS13-7 Emotional processing between artificial voices and human voices

Qiang Wei[1], Xiaoyu Zhang[1], Xiao Yang[1], Yixin Lin[2], Qingming Liu[3]
([1]Jianghan University, [2]Huazhong University of Science and Technology,
[3]Wuhan Rayson School, China)

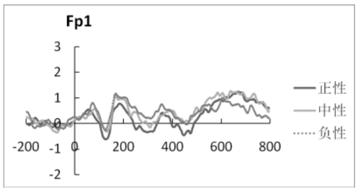
To evaluate the time course of changes in emotional processing between artificial voices and human voices (happy, angry, neutral), the present study examined behavior experience and event related potential component. The emotion arouse of artificial human voice and brain signal were evaluated while the presentation of audio from each conditions (happy, angry, neutral, and artificial voices). The results showed that there were differences in the intensity and the late processing between emotional processing induced by artificial voices and human voices.



OS13-8 How people are affected by emoticon icon: An ERP study

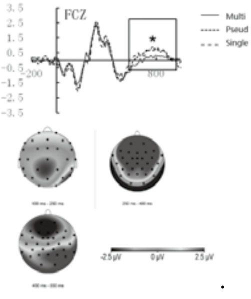
Qiang Wei[1], Jingxuan Huang[1], Yu Han[1], Yixin Lin[2]
([1]Jianghan University, [2]Huazhong University of Science and Technology, China)

The aim of this study was to investigate the ERP component evoked by emoticon with different attributes and the reaction times during the LDT task. The behavioral results showed that participants demonstrated a positive emotion with a shorter reaction time under both a positive emoticon and a negative emoticon compared to participants under a meaningless emoticon.The results of ERPs indicated the relationship between three ERP components and emotional processing of attention distribution, emotion arousal and emotion valence. Based on these results, we provide evidence for a better understanding of how emoticons improve atmosphere during daily communication.



OS13-9 Single Chinese character fragments: an ERPs study on orthographic neighborhood effect

Qiang Wei[1], Yunfei Wang[1], Chen Song[1], Yixin Lin[2]
([1]Jianghan University, [2]Huazhong University of Science and Technology, China)



The aim of study was to discuss family effects and brain activity during the processing of Chinese characters. The study observed the event-related potentials (ERPs) elicited by fragments of Chinese single-character words in Chinese character completion and naming experiment. The result showed that the "Multiple-solution" elicited greater N400 component than the "One-solution", which index a inhabitation effect. Multiple-solution-word analogy to large families, they are more intense than the false-words and single-words, which are in line with the interaction activation model and have more resources in the cognitive processing process. The glyph processing, the association process, and the memory phase of Chinese characters have an impact. The N400 component may not only mean the integration of the meaning of the word, but may also be related to the process of adjusting the information to adapt to the task.

OS13-10 Research on embedded electrical impedance measurement system

Tong Yin, Xiaoyan Chen, Hongyi Yin (Tianjin University of Science and Technology, China)

This paper develops an impedance measurement system based on S3C6410 processor. An OK6410 host board as the controller platform, and an AD5933 chip is used to collect impedance data, and the data is exchanged with the controller with IIC bus protocol. Comparing with the measuring result of the Wayne Kerr 6800B impedance analyzer with the accuracy of 0.05%. The system has the behaviors as lower relative error 0.422% and higher signal-to-noise (SNR) ratio 64.11dB. After calculation, the average absolute error of the impedance phase of the system is 0.527°. The tests results verified that the system is reliable and flexible with a wide application prospect.

OS14 Intelligent Control (4)

OS14 -1 Flock Guiding of Hybrid Agents via Root Block

Yunzhong Song, Ziyi Fu, Fuzhong Wang (Henan Polytechnic University, China)

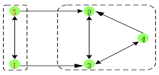
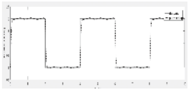


Fig.1 Network consists of 5 nodes

The convergent equilibrium of flocking agents is vital importance for their collective behavior, where flock guiding of hybrid agents, which are composed by both first order and second order agents, can only be boiled down to the root node agents, is touched upon here. Both the theoretical analysis and the simulation results are provided to verify the suggested scheme.

OS14-2 Multiple Model Adaptive Control of Flexible Arm

Yingzhao Zhang[1], Xiao Wang[1], Handong Li[1], Weicun Zhang[2]
([1]Guizhou University, [2]University of Science and Technology Beijing, China)

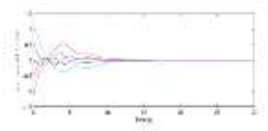

state of flexible manipulator under multiple model adaptive control

In this paper, dynamic model of flexible arm is built through Lagrange theory. Then, based on the software SIMULINK, model of flexible arm is established and the state of flexible manipulator under multiple model adaptive control is simulated. Finally, comparing the control effect (like stability, and accuracy) of multiple model adaptive control method with other control methods, Summarize the advantages of MMAC control method.

OS14-3 Time-Varying Lyapunov Function for Mechanical Systems

Bin Zhang[1], Yingmin Jia[2]
([1]Beijing University of Posts and Telecommunications, [2]Beihang University (BUAA), China)

In this paper, a general method for constructing time-varying Lyapunov functions is provided by using homogeneity theory. Sufficient conditions of uniform asymptotical stability are established for mechanical systems. Different from the existing results on this subject, we remove the periodic restrictions and persistency of excitation restrictions in our work. Robustness properties are also considered in this paper. It is shown that the mechanical systems remain stable after adding higher order perturbing terms. To illustrate the utility of our results, we provide detailed applications on practical systems and numerical results are given.

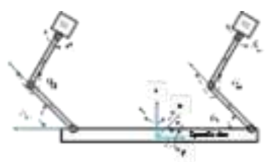


States of the Mechanical Systems.

OS14-4 Optimizing Control Parameters of Space Robot Manipulator for Pulsar X-ray Interference Measurement

Qiang Chen[1], Hengbin Zhang[1], Xiaomin Bei[1], Hanwen Zhang[2]
([1]Chinese Academy of Space Technology, [2]Beijing Institute of Control Engineering, China)

In paper, a pulsar X-ray observation plan of using two detectors installed in two sides of space station is given. Dynamic model of the space robot manipulators and an adapt control method are described. An orthogonal array experimental design method is developed to optimize the control parameters. Simulations are carried out by L_{81} (3^{40}) orthogonal array while fourteen adaptive control parameters are selected. The optimization results show that the parameters expected value could be acquired and computationally efficiency is promoted.



The composition of pulsar x-ray measurement system

OS15 Advanced Control (5)

OS15-1 Pulse Pose Follow Control and Simulation for a 4-DOF Pulse Diagnosis Robot

Qunpo Liu[1], Guanghui Liu[1], Hongqi Wang [1], Xianzhe Liu[1], Hanajima Naohiko[2]
([1]Henan Polytechnic University, China, [2]Muroran Institute of Technology, Japan)

Pulse diagnosis has been proved to have great practical value in the past dynasties. The quality of pulse diagnosis is related to the effect of “syndrome differentiation and treatment” in various clinical departments. The key of high-quality pulse diagnosis is how to dynamically adjust the vertical relationship between the pulse and the sensor. The design adopts a four-degree of freedom manipulator combined with a matrix sensor to form a diagnostic manipulator, which dynamically adjusts the posture of the end sensor of the manipulator by using the flexibility of the manipulator, so as to achieve rapid adjustment and keep the diagnostic pulse sensor perpendicular to the pulse. In this paper, the method of Denavit-Hartenberg is used in kinematics analysis of the manipulator, and Simulations are platformed based on the robot dynamics simulation software V-REP. The simulation results show that the design is feasible.

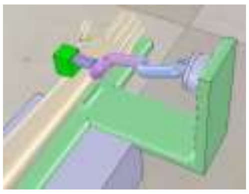
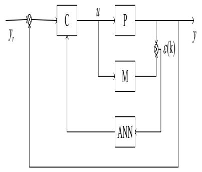


Fig.1 Pulse diagnosis robot

OS15-2 A New Adaptive Control System Design Method Based on Neuronetwork Prediction

Weicun Zhang, Sufang Wang, Yongnan Jia, Qing Li
(University of Science and Technology Beijing, China)

In this paper, a new control system design method is proposed, in which, the controller is designed according to a model with un-modeled uncertainties, an artificial neuronetwork (error back propagation neuronetwork) was adopted to predict the model output error, and the predicted model output error is considered in the control law. This control system design can be used to both linear and non-linear systems. The simulation results verified the effectiveness of the proposed method.



Block diagram of the proposed scheme

OS15-3 Mean-square quasi-composite rotating formation control of second-order multi-agent systems under stochastic communication noise

Lipo Mo[1], Xiaolin Yuan[1], Yingmin Jia[2], Shaoyan Guo[3]
([1]Beijing Technology and Business University, [2]Beihang University (BUAA),
[3]South China University of Technology, China)

This paper mainly concerns the mean-square quasi-composite rotating formation problem of second-order multi-agent systems (MASs) with stochastic communication noises. Firstly, the definition of mean-square quasi-composite rotating formation is proposed. Afterwards, a novel distributed control protocol with time-varying control gains is designed. And then, the origin closed-loop system is translated into an equivalent closed-loop system by taking a proper coordinate transformation. Under some mild assumptions, by means of stochastic differential equation theory, sufficient conditions are deduced for achieving mean-square quasi-composite rotating formation. Eventually, numerical simulations are provided to confirm the effectiveness of the proposed theoretical results.

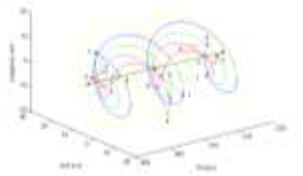
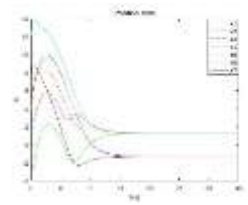


Fig. Local trajectories of the position and moving rotating centers of the MASs.

OS15-4 Distributed Energy Resource Control Based on Multi-Agent Group Consensus

Yize Yang[1,2], Hongyong Yang[1], Fan Liu [1], Yuling Li[1], Yuanshan Liu[1] ([1]Ludong University, China, [2]The University of New South Wales, Australia)

In this paper, a cooperative control strategy of distributed energy resources based on the group consensus of multi-agent systems is proposed. Combining with actual engineering needs, a multi-agent dispatch model of energy networks is designed. Considering the possible adverse effects that may be encountered in actual energy transportation, the matched disturbances and mismatched disturbances are added to simulate the modeling. A group control strategy of distributed energy resources applied to the distribution network is proposed to achieve precise control of energy distribution and safe transportation under multiple disturbances. Finally, the numerical simulation results verify the validity of the model and algorithm.

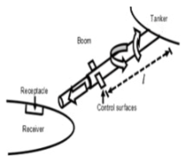


group consensus of distributed energy resources

OS15-5 Robust Adaptive Control of Air-to-air Refueling Boom with State-dependent Output Constraints

Liang Chang, Yingmin Jia (Beihang University (BUAA), China)

In this paper, a robust adaptive controller design method is presented for the uncertain air-to-air refueling boom system with output constraints and disturbance. One advantage of this design method is that the output constraints are state-dependent, which can extend the workspace of the boom while avoiding collision between the boom and the receiver. Backstepping method and barrier Lyapunov function(BLF) are used in this design method. Simulation results show the effectiveness of the proposed controller design method.



Aerial Refueling Boom

OS16 New development about Control Engineering Education (4)

OS16-1 Skill Model Estimation of Ability for Reading Drawings

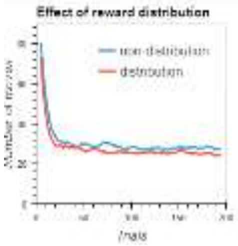
Kazuo Kawada, Tsukasa Hiyama (Hiroshima University, Japan）

In Japan, students are studying various drawing educations in junior high school technical education, high school industrial education and university engineering education. However, it is very difficult to read the drawing without understanding trigonometry. Moreover, it is also very difficult to draw wish parts. Because of this, there are many research studies, but these are before-after analysis, and none analysis by time-series data. Therefore, this study aims to develop a new quantitative evaluation method of 3D recognition ability.

OS16-2 Learning simulation based on a computational model of neuromodulators

Yuki Moriguchi, Masayasu Nagamatsu
(Hiroshima University, Japan)

Reinforcement learning, and its biological bases are key to understand human learning. Here we illustrate learning processes of the tower of Hanoi based on the computational model of neuromodulators(Doya, K.2002). The model assumes hypothetical roles for the following parameters of reinforcement learning. 1)Dopamine signals TD error, 2)Serotonin controls discount factor, 3) Noradrenaline controls the inverse temperature, and 4) Acetylcholine controls the learning rate. We have compared the two learning situations. Case a) the reward is given at the goal state only, and Case b) the reward is divided and placed at the intermediate state and goal state. The resulting learning curves shows that b) divided reward enhanced the learning. This result shows an example of learning simulation with a variety of learners who have their own learning characteristics.



OS16-3 Estimation of Programming Learning Achievement by Line Tracing Robot

Yoshihiro Ohnishi[1], Teruyuki Tamai[1], Shinnosuke Mori[1], Kawada Kazuo[2]
([1]Ehime University, [2]Hiroshima University, Japan)

It is an important problem how to estimate the learning achievement of the programming learning. However, the quantitative evaluation method according to the learning achievement is difficult. This research considers estimation method for the achievement value of the programming learning. The task is given as a course of the line tracing robot. There are multiple courses to be passed. The difficult program can go through a short route. In other words, it is possible to estimate the difficulty level program created by the goal time.

OS16-4 Development of Cultivate Computational Thinking using Finger Robot

Kaito Omata, Shinichi Imai (Tokyo Gakugei University, Japan)

Computational Thinking is one of the necessary skills for children who live in modern times. Therefore, in this research, we aim to design lesson that can cultivate Computational Thinking. In this research, design a lesson that cultivates Computational Thinking by moving a robot to the specified finger state using a finger robot. At that time the children can know that by using the notion of "binary" you can count many numbers by bending and extending your fingers. By using a finger robot, it is thought that children will motivate themselves to teach and to understand easily.

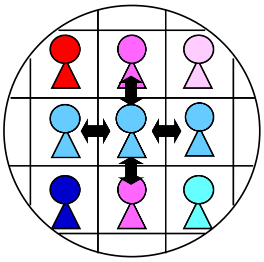
OS17 Multiagent and Complex Systems (3)

OS17-1 Different Type of Interaction or Decision Error contribute to Functional Differences

Saori Iwanaga[1], Masao Kubo[2]

([1]Japan Coast Guard Academy, [2]National Defense Academy of Japan, Japan)

There are many situations where interacting agents can benefit from coordinating their actions, that is, agents gain payoffs by taking the same action as others. These situations can be modeled as coordination games. Another situations is modeled as complementary game, asymmetric coordination games or minority games. In complementary game, agents gain payoffs by taking the different action from others. We deal with these coordination games and asymmetric coordination games as type of interaction and each agent can change the interaction type. And each agent can change the interaction partner. We show that population changes to a mixed population comprised of 80% cooperative agents and 20% complementary agents. A mixed population diversify the collective behavior, type of interaction and preference. There, opposite type of interaction plays a role of small decision error, and it is inefficient to adopt both.



OS17-2 Evaluation for the Synchronization of the Parade with OpenPose

Yohei Okugawa, Masao Kubo, Hiroshi Sato, Bui Duc Viet

(National Defense Academy of Japan, Japan)

In National Defense Academy, parade training is one of our daily training, and is reviewed regularly. However, although the synchronization level of each cadet in the parade is a major factor of the performance, we don't have any objective evaluation methods for the synchronization level. In this research, we propose an objective method focusing on the synchronization level of the parade with OpenPose. OpenPose is capable of measuring many kinds of postures from movies simultaneously, so it is much easier to acquire data than conventional motion analysis with motion capture, and it is suitable for parade analysis, which is a cooperative operation of multiple people. In order to measure the synchronization level, our method is based on the arm swing data of each cadet in the parade, and our results can contribute to objective evaluation methods for cooperative operation, not only parade.

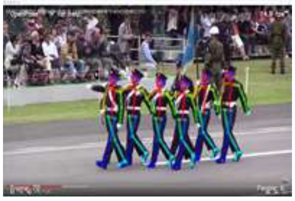


Fig. 1. Analysing a Parade with OpenPose.

OS17-3 Phase shift estimation of the bifurcating neuron from superimposed chaotic spike sequences

Akihiro Yamaguchi[1], Yutaka Yamaguti[1], Masao Kubo[2]
([1]Fukuoka Institute of Technology, [2]National Defense Academy of Japan, Japan)

For the bifurcating neuron, the phase shift value of background oscillation is one of the typical parameters that determine the shape of dynamics (Fig.1 (a)-(c)). In this research, we propose an estimation method of the phase shift value from superimposed chaotic spike sequences generated by the bifurcating neuron. The bifurcating neuron exhibits chaotic inter-spike interval dynamics that depends on the phase shift value of the background oscillation. Therefore, if we correctly estimate each phase shift values from the superimposed chaotic spike sequences, we can characterize the dynamics of the bifurcating neuron and identify each spike sequences from the other superimposed spikes. Fig. 1 (d) shows an example of estimated phase shift values for superimposed three chaotic spike sequences with different phase shift values. In this case, three different phase shift values were correctly estimated and more than 90% of superimposed spikes were also correctly identified.

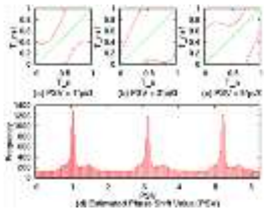


Fig. 1. Estimation of phase shift values.

OS18 Data-Driven Control and Diagnosis Control Systems (5)

OS18-1 A Design Scheme of a Data-driven Predictive-PI Controller

Yoichiro Ashida, Shin Wakitani, and Toru Yamamoto (Hiroshima University, Japan)

PID controllers have been widely employed in real processes. However, for processes with long dead time, the control performance obtained by a PID controller is limited. This is because prediction by a derivative element is not very effective for the processes. For such processes, some predictive controllers have been proposed. Among them, a predictive PI(PIP) controller has only three parameters. Although a PIP controller can be tuned by "trial and error", it is desired to determine control parameters automatically. In this paper, a data-driven design method for a PIP controller is proposed. In the proposed method, control parameters of the PIP controller are calculated automatically from one set of operation data.

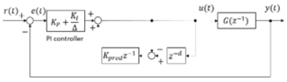
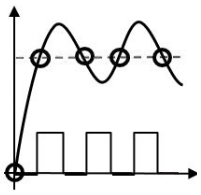


Fig. 1. Block diagram of the predictive PI controller.

OS18-2 Improvement in Intersample Response of Multirate Regulation Control

Takao Sato, Natsuki Kawaguchi, Nozomu Araki, Yasuo Konishi (University of Hyogo, Japan)

This study discusses a multirate regulator system, in which the sampling interval of a plant output is an integer multiple of the holding interval of a control input. A multirate control system is optimized based on a quadratic performance function. In order to improve intersample response, the derived control law is extended using the null-space and/or steady-state constraint. Furthermore, the original performance function is also modified, and the designed control systems are compared quantitively.



OS18-3 Design of a PID Controller using a Fictitious Exogenous Signal for a Fluctuation System

Masatoshi Kozui, Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

A lot of industrial machines realize the desired motions by the PID controller. In particular, it is possible to design PID parameters to achieve the desired behavior by the Fictitious Reference Iterative Tuning (FRIT). However, in the steady state, if characteristics of the target system are changed by the operating environment, the desired control performance can not be obtained by the FRIT. In this paper, it is assumed that a disturbance is input when system characteristics are changed by the system switching. The Fictitious Exogenous Signal is calculated by the operational data after the system change. A PID controller tuning by the Fictitious Exogenous Signal is proposed. Moreover, the effect has been verified by numerical example.

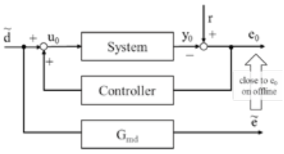
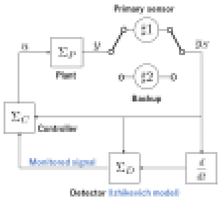


Fig. Block diagram of Fictitious Exogenous Signal.

OS18-4 Izhikevich Model Based Self-Repairing Control for Plants with Sensor Failures and Disturbances

Masanori Takahashi (Tokai University, Japan)

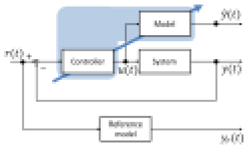
In the previous works, several types of the self-repairing control systems (SRCS) have been developed against unknown sensor failures. The SRCS can automatically detect the failure, and replace the failed sensor with the healthy backup so as to maintain the system stability. This paper presents a new SRCS, whose fault detector is constructed based on a spiking neuron model proposed by E. Izhikevich. In the detector of the SRCS, the sensor failure induces the spikes. Hence, only monitoring the output of the detector makes it possible to find the sensor failure. Also, in this paper, the robustness with respect to disturbances is theoretically analyzed, and it is shown that self-repairing control can be accomplished in the presence of unknown disturbances.



OS18-5 Design of a Data-Driven Controller with Evaluating Controller Performance

Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

Data-driven controllers have been proposed to achieve the desired control performance without using any system identifications. The effectiveness of these control schemes has been shown through experimental results. For time-variant and nonlinear systems, it is important to evaluate the controller performance and redesign controller when the performance is poor. According to the proposed scheme, the controller performance calculator and controller design are integrated using only input and output data. Furthermore, the controller can be assessed in the transient and steady state.

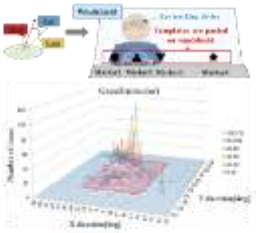


OS19 Advanced Technology on Sensing Technology, Devices, Application (3)

OS19-1 The Actual Car Driving Evaluation System using Combined with Eyeball and Face Angle

Keiko Sakurai, Hiroki Tamura, Koichi Tanno (University of Miyazaki, Japan)
Yukio Hattori (OFA SUPPORT INC, Japan)

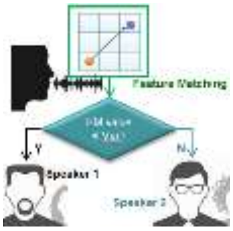
The lack of automobile driving standards of persons with brain dysfunction and the increase of car accidents by the elderly are problems. Therefore, research on gaze estimation necessary for vehicle driving evaluation is rapidly developing. In this paper, we proposed the actual car driving evaluation system which can be evaluated by combining eye movements using eye tracking device (TalkEyeLite) and face movement estimated using template matching. In order to the evaluate our proposal method, we carried out the actual car driving experiments. The subjects were one instructor of the car driving school, and five general drivers. We compare the gaze range of the five general subjects and the instructor. As a result, we confirmed that one male in the 40s and one elderly narrow the gaze range.



OS19-2 A Study on Speaker Identification Approach by Feature Matching Algorithm using Pitch and Mel Frequency Cepstral Coefficients

Barlian Henryranu Prasetio, Keiko Sakurai, Hiroki Tamura, Koichi Tanno
(University of Miyazaki, Japan)

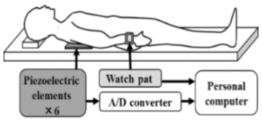
In this paper, we grouping the words based on the speaker in a sequence of speech in a conversation. There are two speakers in each conversation. The first speech assumed spoken by speaker-1. In recognizing the speakers, we use pitch detection and Mel Frequency Cepstral Coefficients feature extraction with 13 filters. Furthermore, we examine the distance of the second speech vector with the first speech vector using the Feature matching algorithm. Previously, we had experimented on each speaker to find out the mean and variance of the Feature matching. Based on the experimental results, the variance of Euclidean, Mahalanobis and Mahattan Distance are 0.0015, 0.00064, 0.0012. Hence, if the Feature matching value deviates is not more than variance value then the speech is assume spoken by speaker-1. Otherwise, the speech assume spoken by speaker-2.



OS19-3 A Study on Breathing and Heartbeat Monitoring System during Sleeping using Multi-Piezoelectric Elements

Praveen Nuwantha Gunaratne, Chika Yoshida, Keiko Sakurai, Hiroki Tamura, Koichi Tanno, (University of Miyazaki, Japan)

We propose a method to monitor breathing and heartbeat during sleeping using piezoelectric elements. First, the signal acquired from the piezoelectric elements during sleeping is separated into a breathing signal and a heartbeat signal using biomedical signal processing software. A method is then proposed to quantify breathing and heartbeat by applying fuzzy theory to the signals. This proposed method is experimentally demonstrated using the following procedure. In the experiment, two subjects slept for one and a half hours. The data from the piezoelectric elements during sleep were extracted. We compared the true value with the count results from these data using the proposed method. The error rate of the breathing count was 0–13%, and the error rate of the heartbeat count was 0–8.2%. The results were non-uniform, and the error rate depended on the subject.



OS20 Advances in Field Robotics and Sensing System (8)

OS20-1 Field Robot and Sensing system

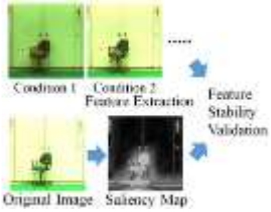
Eiji Hayashi (Kyushu Institute of Technology, Japan)

Labors in which forestry and agriculture and Factory, are working in severe circumstance. So, such workers are necessarily declines and decreases. However, it is important for us to keep going economy, life and nature. Therefore, to prevent a devastation of the forest, the safety and the lack of food and work in harsh environments, we are thinking alternative technologies that a part of severe and dangerous works are taken robot instead of such workers. Something changes are needed that they are seen innovation such as the generation of a new industry by new technologies using AI and intelligent to improve how to recognize and express more and more of the things that we have various desires.

OS20-2 Saliency Map Based on Maximization of Difference between Central and Surround Visions and Its Relationship with Image Feature Points

Ryuugo Mochizuki, Shinsuke Yasukawa, Kazuo Ishii (Kyushu Institute of Technology, Japan)

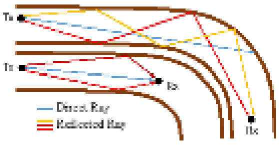
The Saliency map proposed by Itti is a human attention model considering the colors, edge orientations and intensity and designed to have high values in the curious area. In the model, the contrast of Saliency map is not so high and its parameters are adjusted heuristically. The problems to distinguish the front object from background is not suitable. In this research, a Saliency map is proposed to maximize the difference of two images by changing Gaussian filter sizes for the central vision, i.e., the small size Gaussian filtered image, and the surround vision, i.e., the big size Gaussian filtered image. As one of image processing techniques, feature-points extraction methods such as SIFT, SURF are often introduced into object detection and image mosaicking to generate the invariant features against scale and rotation changes. However, these feature points extraction methods have the effects of environments and lighting conditions. The relation between the Saliency map and the feature points extraction is discussed.



OS20-3 Dynamic Wireless Network System using Multiple Drones for Tunnel Applications

Raji Alahmad, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Tunnels requires inspection and maintenance as their age. Conventional methods depend on special ground vehicles that have many limitations in mobility. UAVs, on the other hand, can overcome these limitations. Communication is of the biggest challenges for UAVs, due to signal attenuation. In this paper, a wireless network system using multi-drones that act as repeaters is proposed. A number of measurements for Wi-Fi signals is conducted to find out the effect of five different scenarios on the signal in virtual tunnel and two scenarios in a real life tunnel. As a result, the signal strength with -64 dBm can provide five Mbps of bandwidth, which is recommended for video streaming. Also, placement of transmitter and receiver is essential for better connection.



OS20-4 Counting Crops under Cultivation using Drone

Yasunori Takemura[1], Yusuki Hirata[2], Eiji Mizoe[3], Masao Tashiro[4], Yousuke Nagai[5]
([1]Nishinippon Institute of Technology, [2]Kyushu Institute of Technology, [3]Sky Canvas Co. Ltd.,
[4]Joint Corp. Project Sky-eye, [5]Aruku Aguriculture Service LLC, Japan)

In recent years, agricultural workers in Japan are decreasing year by year. Also, rising the average age of agricultural workers is a problem in Japan. As a solution to this problem, there is promotion of new agriculture (smart agriculture) that realizes super-energy saving and high quality production by utilizing robot technology and IoT Technology. The authors are promoting technology by operating forest drone competeton and tomato havevesting robot competition. Throu robot competition, we are currently paying attention to the use of drone in the agriculturel field. In this research, we aim to automatic detect the number of agricultural crops by image processing from image data of aerial photographs taken by drone. In this paper, we will report a method to discriminate agricultural crops by color and to detect the number.

OS20-5 Soil Compaction and Rolling Resistance Evaluation of a Locomotion System with Adjustable Contact Patches for Applications in the Vineyard

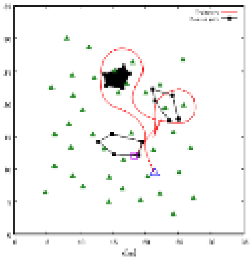
Enrico di Maria, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Soil compaction is a form of soil degradation which causes soil erosion, drainage difficulties, hardpan production and loss of nutrients. In order to mitigate this issue, different solutions have been proposed, such as: plough, low ground pressure tires, tracked tractors and controlled traffic farming (CTF). In this work the idea of using a locomotion system with adjustable contact patch is proposed. Two configuration modes are foreseen: wheel mode and track mode. The aim is to reduce the compaction but also optimize the rolling resistance and energy consumption depending on the payload of the robot and the soil conditions. The robot will be used for transporting the grapes harvested in the vineyard. A finite element method model is developed to evaluate the performance of the system in terms of compaction and rolling resistance and experiments in the field are carried out to confirm the model itself.

OS20-6 Robot Navigation in Forest Management Based on Graph

Ayumu Tominaga[1], Ryusuke Fujisawa[1], Eiji Hayashi[1], Abbe Mowshowitz[2] ([1]Kyushu Institute of Technology, Japan, [2]The City College of New York, USA)

This paper addresses the problem of using a mobile, autonomous robot to manage a forest whose trees are destined for eventual harvesting. We have constructed a robotic system enabling an autonomous robot to move between the trees without damaging them and to cut the weeds as it traverses the forest. We proposes the trajectory computation for guidance of the robot in the forest is carried out based on a weighted undirected graph G with trees as vertices. The line graph, L(G) of G will represent the safety paths for guidance of the robot. It is shown that using trees in a forest as environmental landmarks is effective in navigation of forestry autonomous robot.



OS20-7 Development of Autonomous Moving System for Field Robot

Kengo Kawazoe, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)

SLAM technology is applied to resource management in forestry in artificial forest. From this technology, mapping of trees in artificial forest and automation of growth amount measurement of trees have been realized. Meanwhile, forestry go into a decline by labor shortage in Japanese forestry. And, it has been expected that mechanization and automation of work. We have been developing autonomous moving robot with all-terrain vehicles (ATV). And we designed an obstacle avoidance behavior to move around in the forest. Moreover, by adding a pan angle control actuator to the visual system, we increased the degree of freedom in external situation recognition. This made it possible the robot to the target coordinates specified on the global map based on the obstacle avoidance behavior.

OS20-8 Development of the sense system that is combined force feedback and vision feedback-Improvement reproducibility of deformation simulation by using LEM-

Tamon Shigeyama, Eiji Hayashi , Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)

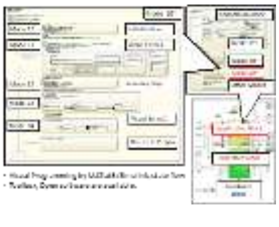
In the medical treatment and bio-technology field, doctors and researchers need technologies that can accurately perform small-size work. But there are some problems. The operators rely only on sight through the microscope. The operators cannot feel the sense of force. And the operators cannot see the all states of the sample. Our aim is to develop the combined system that that uses both force feedback from the manipulator and visual feedback on a deformation simulation. By reproducing force sense and visual sense of a sample, an operator can feel these sense of a virtual object. For this research, focus on a way to produce a force calculated in simulation of deformation using a haptic device. As the first stage, our simulation of deformation was improved by using LEM (Long Element Method) and evaluated accuracy of a virtual object’s deformation.

OS21 Advances in Marine Robotics and It’s Applications (5)

OS21-1 System Development of AUV’s Sampling Device Controller Employing MATLAB/Simulink Toolboxes

Takashi Sonoda[1], Shinsuke Yasukawa[2], Ahn Jonghyun[2], Yuya Nishida[2], Kazuo Ishii[2]
([1]Nishinippon Institute of Technology, Japan, [2]Kyushu Institute of Technology, Japan)

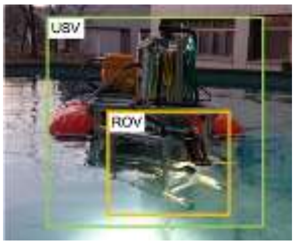
We have developed the sampling device control system for the AUV “Tuna-Sand2” by using MATLAB/Simulink and its toolboxes. The toolboxes are powerful, useful, and functional for developing the robot programming, especially Robotics System Toolbox supports the ROS so that the MATLAB and ROS programs are available for fast developing with high functions and the cloud data communication. Parallel Computing Toolbox can consist a multi-process and parallel computing on script base and Simulink model base program. Stateflow is a powerful tool for design of state transition control method. The toolboxes are employed in the sampling device control system of the AUV. This method with using the toolboxes of MATLAB/Simulink realize the rapid prototyping of the system designs, developments and system test. The developed system mounted on an AUV was powered in several real sea areas.



OS21-2 Inspection System for Underwater Structure of Bridge Pier

Takumi Ueda[1], Hiyoyasu Hirai[1], Kazuki Fuchigami[1], Ryoma Yuki[1], Ahn Jonghyun[1], Shinsuke Yasukawa[1], Yuya Nishida[1], Takashi Sonoda[1], Kazuo Ishii[1], Katsunori Higashi[2], Katsunori Tanaka[2], Tomomasa Ikeda[2]
([1]Kyushu Institute of Technology, [2]West Nippon Expressway Engineering Kyushu, Japan)

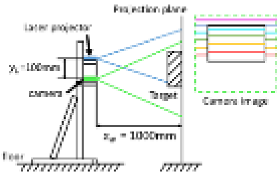
Inspection of underwater infrastructure of bridge pier is important for bridge maintenance, however, the underwater environment is dangerous and their observation is one of difficult problems. We have been developing the underwater inspection system which consists of an unmanned surface vehicle (USV) and a remotely operated vehicle (ROV). The concepts of the system are (1) Operation is executable with a small number of persons, (2) USV and ROV are controllable from land or bridge, (3) Build 3D model and images for crack detection. The ROV observes the status of whole infrastructure using cameras and control its posture using a depth sensor and IMU sensor. The USV vertically lifts up and down ROV by winch and remotely conduct ROV to infrastructure. USV is installed with GPS, LRF and IMU for horizontal positioning and direction control of the camera. In this paper, we report the results of the inspection operation test by the robot and present issues.



OS21-3 Three-dimensional measurement using laser pattern and its application to underwater scanner

Yuya Nishida, Tomoya Shinnoki, Shinsuke Yasukawa, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

There are many mineral resources on the seafloors energy resources such as methane hydrate, and biological resources such as fish and crustaceans. The accurate amount of the resources needs to be surveyed in detail for making effectiveness use of the resources. In order to measure an accurate volume of the resources, the authors developed a new three-dimensional instrument consisting of a laser projector and a camera. The laser projector irradiates a sharp two-dimensional laser pattern independent the distance to the target object. Our instrument is able to measure three-dimensional shape of the target object using the laser pattern and the principle of light cutting method which is one of active measurement methods.



OS21-4 Development of Dam Inspection Underwater Robot

Hiroyasu Hirai, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Maintenances of social infrastructures such as dam, bridge are important subjects. The more aging problem going on, the more the effective inspection methods have been expected. In the inspection of dams, divers observe the conditions of their surface manually, however underwater structure deeper than 30m is limited and their inspections are insufficient. In this paper, we propose the ROV whose functions are video capture, indirect measurement using laser, target depth keeping, heading keeping. The ROV is applied into the dam inspection and showed the effectiveness to find cracks.

OS21-5 Conceptual Design of Small ROV for Sky to Water System

Keisuke Watanabe, Koshi Utsunomiya, Kazumasa Harada, Nakajima Shuhei
(Tokai University, Japan)

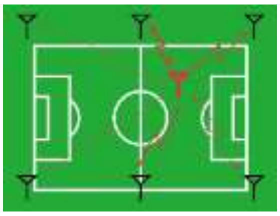
Long term monitoring of an area of coral reef is necessary for investigation of coral bleaching. The researchers usually use underwater cameras to record the reef's present condition using a ROV or diving by themselves. In those cases, they need to hire a boat whose port is not always near the target investigation site where sometimes near a beach. The researcher diving is effective from the viewpoint of precise investigation of a limited spot, however, it is impossible for a diver to investigate wide area simultaneously. To breakthrough these limitations we are considering a new method which uses a combined system of multicopter-USV(Unmanned Surface Vehicle)-ROV. We named this concept as Sky to Water System(SWS). In this paper, we introduce the conceptual design of our Small ROV which can be delivered with its mother USV by a multi-copter from the nearest beach and explain its hardware/software system.

OS22 Robot Competitions for Social Contribution (6)

OS22-1 Study on Position Estimation Using Small Size ZigBee Module

Atsushi Sanada (Nishinippon Institute of Technology, Japan)

The positional information can be used for navigation in controlling a robot, and it is very important information. In this research, we describe the development of a position estimation system using a ZigBee wireless module. GPS is often used for position detection, but high precision measurement is difficult. And also, GPS cannot be used indoors. Furthermore, for position detection by the camera, since it is necessary to analyze by coordinating a plurality of cameras, much cost is required. In this paper, we propose a position estimation system using a low-cost small wireless module. This is to estimate the position based on the radio field intensity with multiple antennas. Since the radio wave intensity is nonlinear with distance and it is difficult to calculate the distance, a neural network is used for distance estimation. As a result, it was confirmed that the distance can be estimated correctly.



OS22-2 The 4th Tomato Harvesting Robot Competition

Takayuki Matsuo[1], Takashi Sonoda[2], Yasunori Takemura[2], Kazuo Ishii[3] ([1]National Institute of Technology, Kitakyushu College, [2]NishiNippon Institute of Technology, [3]Kyushu Institute of Technology, Japan)

Tomato is one of important fruit vegetables and most tomatoes are produced in the greenhouses, or large-scale farms, where the high temperature and humidity, and long harvest age force the farmer heavy works. With an aim to promote the automation of tomato harvesting, we have organized the tomato harvesting robot competition from 2014. The tomato harvesting robot competition include two divisions which are senior division and junior division. In senior division, free-style robots and rail-style robots had matches. In junior division, robot competition using lego mindstorm was hold. In this paper, we report on the results of the 4th tomato harvesting robot competition.

OS22-3 End-effector for robotic harvesting of a tomato fruit with calyx

Binghe Li, Shinsuke Yasukawa, Takuya Fujinaga, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

Tomato fruit harvesting is a labor-intensive process, and therefore robotic automation is required. For tomato fruit harvesting robot, we developed three types of end-effectors (EEs): scissors type, cylinder type and suction-cutting type. It is necessary to harvest the tomato fruit with calyx especially in Japan. Therefore, the proposed EE has a cutter mechanism for cut the peduncle. The results show that the scissors type and the cylinder type EE can cut the peduncle; however, it is difficult to separate one fruit from the cluster. On the other hand, the suction-cutting type can separate and cut one fruit from the cluster and therefore it is useful for harvesting tomato fruit with calyx.

OS22-4 Evaluation for Ball Dribbling Mechanism of RoboCup Middle Size League Robot in The World Teams

Kenji Kimura, Shota Chikushi, Kazuo Ishii (Kyushu Institute of Technology)

RoboCup is a platform designed to promote such research fields as artificial intelligence (AI) and robotics. In recent years, the Middle size league soccer robot has a ball dribbling mechanism. This mechanism controls the ball with two driving rollers and in order to play soccer games well, ball control capability and holding capacity are indispensable. As the result of a survey at the 2017 World Cup, all teams in the world have determined the rollers arrangement heuristically, and no mathematical consideration has been made. In this research, we quantify the slippage between sphere and rollers in order to propose a mathematical model that allows for slippage and evaluate the optimality of the roller arrangement of the world teams.

OS22-5 Robot-control method based on personal space

Kota Kawamoto, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology)

In order for a robot to interact with people, it is necessary for the robot to recognize human emotions and express its own emotions by both verbal and nonverbal communication. Furthermore, in our daily life, we unconsciously adjust our personal space according to the intimacy with others. It is also said that personal space is classified into non-verbal communication. In this research, we analyzed the distance that a person can tolerate when the robot approaches to identify the minimum distance that the person is able to interact comfortably.

OS22-6 Recognition method of target objects for autonomous tomato harvesting robot

Keiji Kamei, Hiroyuki Moriyama (Nishinippon Institute of Technology, Japan)

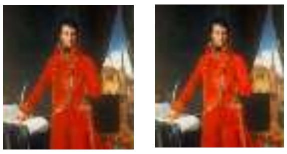
Recently, the shortage of agricultural workers and depression of its production efficiency have been said in Japan. To solve those problems, the researches that apply the information and robot technology are studied actively. The aim of our research, we focus on the autonomous tomato harvesting robot, and develop the recognition method for target objects. The color identification from a camera and distance measurement between target objects and a robot are key points. To solve those problems, we propose to identify the color based on HSV values and Look-Up-Table and measure the distance for target objects using Depth camera. From the experiments on real field, we succeeded in acquiring the target object from camera and measuring the distance.

OS23 Kansei and Information Engineering (4)

OS23-1 Color Image Arrangement Based on Histogram Matching Using Smoothed Brightness Histogram (I) --- Overall Smoothing ---

Yusuke Kawakami, Tetsuo Hattori, Yoshiro Imai, Koji Kagawa, Yo Horikawa (Kagawa University, Japan), R. P. C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

Although we have already reported that automated color image arrangement by Histogram Matching based on Gaussian Distribution (HMGD) gives good feeling impression if the brightness histogram of the original image has a single peak. However, if there are multiple peaks in the histogram, the HMGD processing does not always bring good results. In this paper, we propose a Histogram Matching method using overall smoothing over the brightness histogram of original image as the reference one instead of using Gaussian distribution. Also in this paper, we present the experimental results.

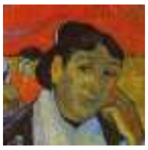


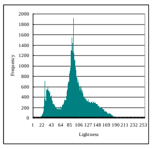
Left: original image
Right: processed image

OS 23-2 Color Image Arrangement Based on Histogram Matching Using Smoothed Brightness Histogram (II) --- Piecewise Smoothing---

Yusuke Kawakami, Tetsuo Hattori, Yoshiro Imai, Koji Kagawa, Yo Horikawa (Kagawa University, Japan), R. P. C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

Although we have already reported that automated color image arrangement by Histogram Matching based on Gaussian Distribution (HMGD) gives good feeling impression if the brightness histogram of the original image has a single peak. However, if there are multiple peaks in the histogram, the HMGD processing does not always bring good results. In this paper, we propose a Histogram Matching method using piecewise smoothing over the brightness histogram of original image as the reference one, after Histogram Analysis by curvature computation. Also in this paper, we present the experimental results.

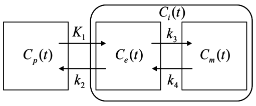




OS23-3 Parameter Estimation Method for Compartment Model - PET Inspection -

Tetsuo Hattori, Yusuke Kawakami, Yoshiro Imai, Koji Kagawa, Yo Horikawa (Kagawa University, Japan), Hiromichi Kawano (NTT Advanced Technology Company Ltd, Japan)

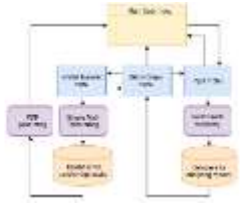
This paper proposes a new general method for parameters estimation in compartment model using DOC (Differentiation of Convolution). In this paper, we apply the DOC method to the parameters estimation in PET (Positron Emission Tomography) inspection especially. Pet inspection is done for getting physiological and biochemical information of organs. The PET camera acquires the image of radioactive distribution inside the human body. In this paper, we make a mathematical analysis of the PET compartment model and describe the DOC method.



OS23-4 Application and Trial Evaluation of Document Writing Support System to Avoid Emotional Misunderstanding

Shunsuke Doi, Yoshiro Imai, Koji Kagawa, Tetsuo Hattori, Yusuke Kawakami (Kagawa University, Japan)

This paper describes a newly developed system of document designing, handling and self-checking in order for writers to avoid their readers' unnecessary emotional misunderstanding and possible repulsion. It is realized as server-client computing system. The server can obtain user document through the client, scan and separate the regarding document into word-level expressions, check each word while matching it with our sentiment dictionary, calculate the relevant sentimental values for the document and then generate the corresponding radar chart based on emotional axis such as delight, anger, sorrow, pleasure etc. on the relevant user's Web. Document writers utilize such a system before transferring and/or archiving, they can check sentimental values for their documents and recognize how their ones have a lot of emotional feelings. With this facility, the user can check his/her document and recognize whether the document possibly generates readers' unnecessary emotional misunderstanding and moreover repulsion which may occur as a result.

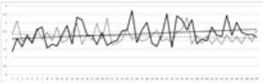


OS24 Automated content generation for narrative and cognitive contents (5)

OS24-1 A Method of Haiku Generation Using Deep Learning for Advertising Generation

Jumpei Ono (Vocational School of Digital Arts Sendai, Japan)
Takashi Ogata (Iwate Prefectural University, Japan)

We tried various approaches to generating story. One of them is haiku generation using deep learning. The method we tried has several tasks, one of which is that only the word time series data is used as learning data. Therefore, the result of learning can be a model similar to generation based on simple word transition probability. Therefore, we will organize the current tasks and try to study the features used for learning and generate by learning results. We also consider how to use the method tried in this paper for advertisement generation. In addition, we consider how to use the attempt in this paper for generating different types of stories.



OS24-2 The Usage Features of Onomatopoeias in the Recipes in Japanese

Hiroki Fukushima (Kyushu Womens' University, Japan)

In this study, the author analyzes the co-occurrence tendency of onomatopoeias in the online recipes in Japanese. In Japanese, onomatopoeias are often used to describe faint or vague senses. Especially, onomatopoeias have considerable power to express the sense of taste or sense of odor. Focusing co-occurrence relationships, the author has revealed the roles of onomatopoeias in the tasting description corpus of wine and Japanese sake. In this study, applying the "form-screening method", the author reveales the semantic functions of onomatopoeia in the recipe data. The protocol of form-screening methodology is: First, extract sound symbolic words from the corpus. On the next screening step, all the words extracted in the first step is changed to an screening word. This screening word must be the same word class as extracted words. And finally, analyze the co-occurrence relationships of the screened words using a coding soft.

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OS24-3 Storytelling in the Conversation of Aged People

Yuki Hayashi (Chiba University / Center for Advanced Intelligence Project, Riken, Japan)
Akinori Abe (Chiba University /Dwango Artificial Intelligence Laboratory, Japan)

In the conversation of aged people, some people well spoke about their experiences, which was able to attract others. In this paper, we will analyze their skills of storytelling from the viewpoints of the selection of theme, the construction of their story and their vocabulary. In addition, it is also important whether they can attract the other participants' interests. So we will also analyze the transition of topics during a conversation.

OS24-4 Expression of the taste of Japanese sake and metaphor

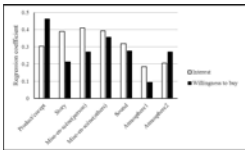
Akinori Abe (Chiba University / Dwango Artificial Intelligence Laboratory, Japan)

Seto explained "tasting expression" from the aspects of synesthetic expressions (both direction), which are metaphor, metonoymy, and synecdoche. When we express the taste of Japanese sake, we sometimes use the expression "Refreshing scent such as the scent of muskmelon and pear is elegant..." It is rather easy to express the taste by using the well known taste. However, how we controle the path of the metaphor flow? For instance, we frequently use the expression "cheek like apple." Why we assume the colour is red? Similarly, for the taste of the sake, we frequently use the expression "taste like apple." Which apple we assume? In this paper, we will discuss the flow of the metaphor from the aspect of discusion above..

OS24-5 An Analysis on Advertising Techniques of Beverages Using Positive Factors of Evaluation Database System

Yoji Kawamura (Kindai University, Japan)

In the advertising business, the CM Research Institute has constructed an exhaustive evaluation database system of commercial film representation with framework of positive factors. Several factors of positive factors are related to commercial film techniques. By utilizing data on positive factors, it is possible to analyze the outline of the commercial film techniques. In this research, based on the viewing experiment on the communication effect (positive factors, interests, willingness to buy) of 100 commercial films of beverages (can coffee, tea, beer), the characteristics (by brand, by category, history transition, relation between techniques and interest, relation between techniques and willingness to buy) of commercial film techniques are analyzed. This analysis method brings about a lot of knowledge and can be utilized for transient analysis and simultaneous analysis of commercial film techniques using the evaluation database system.



OS25 High-Performance Computing for Interactive Content Creation and Rendering

OS25-1 High-Performance Computing for Visual Simulations and Rendering

Jasmine Wu, Chia-Chen Kuo, Shu-Hsin Liu, Chuan-Lin Lai, Chiang-Hsiang Lien, Ming-Jen Wang, Chih-Wei Wang(National Center for High-performance Computing (NCHC), Taiwan)

Everyone who is involved in film or animation industry knows how rendering can be a nightmare. National Center for High-performance Computing (NCHC) built a render farm that provides a platform for the industry to render their work in a much more efficient timeframe. Over 100 films in Taiwan was rendered using our platform. The newest Render Farm was launched in March of 2018, which allows not only CPU rendering, but also GPU rendering. The throughput is also greatly improved to support complex and large scale simulations. Our Render Farm is currently being used by animation students in Taiwan, as well as companies from the industry. The main goal of this session is to introduce scientific discoveries and technical innovation through prospective computing technology and platform.

OS25-2 Virtual Reality as an Art Form

R.P.C. Janaka Rajapakse, Yi-ping Hung (Tainan National University of the Arts, Taiwan)

After introducing content creations in the immersive environments, the VR content creation process has been changed dramatically. It has enhanced the direct engagements of the artists and reduces the time it takes to get a part from the idea stage to the production stage. Time consuming VR content creation process has been reduced to hours or days. Not only is the time reduced, but the cost is also significantly reduced. The reduced time and cost allows artist to work in near real-time, with the design and production happening at nearly the same time. This section of the session is focused on VR content creation process and its artistic perspectives. Especially, not only concerning VR contents creation in immersive environment is an alternative to find new form of art. And the last part of the speech concerns about the role of VR in the live performance and new form of theater.

OS25 -3 Using Quill as a Tool for Real-Time Rendering

Jasmine Wu, Chia-Chen Kuo, Shu-Hsin Liu, Chuan-Lin Lai, Chiang-Hsiang Lien, Ming-Jen Wang, Chih-Wei Wang (National Center for High-performance Computing (NCHC), Taiwan)

Unity and Unreal are game engines that renders in real-time, and the super computers at NCHC not only supports both, but it also presents a faster frame rate. Rendering is indeed a time consuming procedure, the process of 3D animation takes even longer with more men-power. Quill is a VR illustration and animation tool for the Oculus Rift, which can shorten the traditional 3D animation process done in 3D software, because its 3D models are painted rather than having to go through the process of modeling, texturing, and rigging. This is a great tool to create content for Unity or Unreal, which can then be rendered in real-time by the super computers at NCHC. Another example to demonstrate NCHC's real-time render farm was by performance art. We have high data throughput that can help the performer to do a large scale VFX simulation and to create new kinds of cross-disciplinary performances. As we develop through time, more and more applications can be seen in the near future.

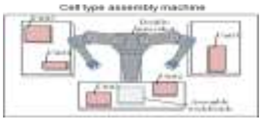
GS abstracts

GS1 Robotics I (4)

GS1-1 System to decide unit’s layout of cell assembly machine by GA (Big Mutation in mutation process)

Yoshiki Ito, Hidehiko Yamamoto, Takayoshi Yamada (Gifu University, Japan)

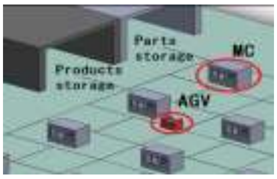
The purpose of this research is to develop a system to decide unit’s layout which automatically decides to place a lot of assembled parts, jigs and robot hands of a cell type Assembly Machine by genetic algorithm (GA). The system consists of two modules, the conditions module and GA module. The conditions module reads work data for robot, and sets various parameters required for GA.GA module decides the efficient arrangement place of parts, jigs and robot hands by GA, and outputs the acquired arrangement images. This system proposes the concept of Big Mutation that changes the mutation rate of GA every certain generation. By introducing Big Mutation , the possibility of searching an optimal unit placement increases and the system simulation time is shortened. It is ascertained that the system to decide unit’s layout including Big Mutation is useful.



GS1-2 Autonomous decentralized FMS that adopts priority ranking structure based on AGV’s lies

Kento Uejo, Hidehiko Yamamoto, Takayoshi Yamada (Gifu University, Japan)

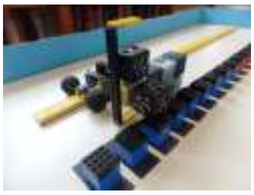
We introduce the model of AGV mind to eliminate path interferences between AGVs when running an autonomous decentralized FMS and carry out behavior controls. The conventional autonomous decentralized FMS believes all information sent by agents as correct. However, the information sent by some agents may be incorrect due to malfunctions. We define this incorrect information as a “lie” and carry out the AGVs action controls which doesn’t decrease the outputs of autonomous decentralized FMS even if lies occur. In order to do this, we propose a “priority ranking structure”. The proposed method is ①to give a ranking to each AGV according to a lie number, ②to give high ranking AGVs to share jobs. In order to prove the effectiveness, production simulations using priority ranking structure and the conventional research method were carried out. As a result, the productivity of propose method was higher than that of the conventional research method. It is ascertained that the priority structure is useful



GS1-3 CULET: Cubelet Lego Turing Machine

Ricardo Q. Figueroa, Daniel A. Zamorano, Genaro J. Martínez (Instituto Politécnico Nacional, México)
Andrew Adamatzky (University of the West of England, UK)

In this paper, we show the construction of CULET: a robot that simulates the execution of any 2-symbols Turing machine. CULET is constructed with Cubelets (small autonomous robot-cubes used for teaching basic robotics and programming for kids) and Lego bricks. Cubelets are a kind of high level programming where you do not use traditional code but rather achieves different robots trough the concatenation of blocks, i.e. robots assembled. CULET is designed to performance the read and write of a Turing machine.

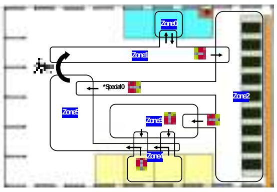


GS2 Robotics II (5)

GS2-1 Automated Guided Vehicle System Analysis in Foam Manufacturing Plant Using Petri-net

Amornphun Phunopas[1], Wisanu Jitviriya[1], Noppadol Pudchuen[1], Sutee Kumjaikong[1], Songklod Tunsiri[2], Eiji Hayashi[3] ([1]King Mongkut' s University of Technology North Bangkok, Thailand,[2]Urban Community Development College, Thailand, [3]Kyushu Institute of Technology, Japan)

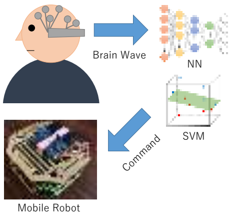
The logistic robot is very popular nowadays. The robots run in autonomous, reactive, and parallel situations. These kinds of work are defined as a stochastic problem. We focus on task distribution, routing, scheduling, and queueing. This paper presents a multi AGVs operational analysis in the foam manufacturing plant using the Petri-net. Each robot is designed a role-assignment supervisor with the role of a robot fixed in a zone. According to the work capacity, the supervisor assigns the role of high capacity work to another robot to help in a new zone. To monitor the work situation, the supervisor continually receives feedback information of the system. The analysis is necessary for preventing any failure that can make the central software go down. The results show system management for robotic assistants in the foam manufacturing process.



GS2-2 Preliminary Comparative Experiments of Support Vector Machine and Neural Network for EEG-based BCI Mobile Robot Control

Yasushi Bandou, Takuya Hayakawa, Jun Kobayashi (Kyushu Institute of Technology, Japan)

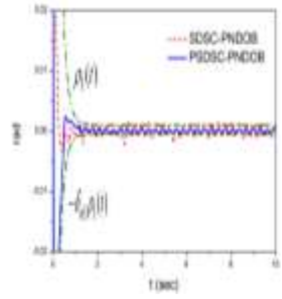
The authors have been developing an EEG-based BCI for mobile robot control, using neural networks that classifies their brain waves to recognize intention of a mobile robot operator. In order to achieve practical classification capability with them, we had applied some techniques, such as Bayesian Optimization for hyperparameters, to the neural network training; however, satisfactory performance of the neural networks has not been obtained yet. Support Vector Machine (SVM) is another machine learning method that demonstrated its usefulness in lots of other studies. In this study, for further development of practical EEG-based BCI for mobile robot control, we have experimentally employed SVM for brain wave classification and compared the performance with the neural networks. This paper presents the comparative results.



GS2-3 Position Tracking Error Constrained Super-Twisting Dynamic Surface Control with Disturbance Observer for Robot Manipulators

Seong Ik Han (Dongguk University, Korea Republic)

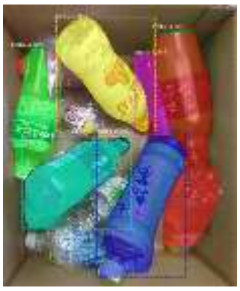
A tracking error constrained dynamic surface control (DSC) with a super-twisting algorithm (STA) and a nonlinear disturbance observer is proposed for robot manipulator systems, where the system dynamics are partially known. The stabilizing controls of the DSC were designed by combining the STA with the virtual tracking errors defined from the DSC design concept. A nonlinear disturbance observer was designed to estimate the unknown nonlinear function and external disturbance instead of using parameterization of the nonlinear function or adaptive law in the conventional STA and DSC schemes. Moreover, a simpler tracking error constraint method is also proposed. The proposed tracking error constrained STA-DSC scheme combined with a nonlinear disturbance observer has better tracking error performance and robustness to uncertainty of robot manipulator system than control systems with a conventional DSC and disturbance observer. The control scheme was evaluated through simulations with the articulated manipulator system.



GS2-4 Image Processing for Picking Task of Random Ordered PET Drinking Bottles

Chen Zhu, Takafumi Matsumaru (Waseda University, Japan)

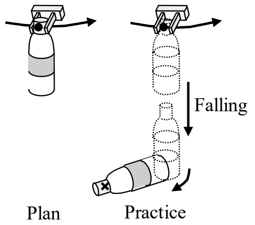
In this research, six brands of soft drinks are decided to be picked up by a 6 degree of freedom robot with a monocular RGB camera. The drinking bottles need to be located and classified with brands before being picked up. The Mask R-CNN, a mask generation network improved from Faster R-CNN, is trained with COCO datasets to detect and generate the mask on the bottles in the image. The Inception v3 is selected for the brand classification task. Around 200 hundred images are taken or found at first; then, the images are augmented to 1500 images per brands by using random cropping and perspective transform. The result shows that the masked image can be labeled with its brand name with at least 85% accuracy in the experiment.



GS2-5 The Use of Importance Ranks to Derive Suitable Timing of Visual Sensing in Manipulation Task Containing Error Recovery

Akira Nakamura[1], Kazuyuki Nagata[1], Kensuke Harada[2], Yukiyasu Domae[1]
([1]National Institute of Advanced Industrial Science and Technology (AIST), [2] Osaka University, Japan)

In general, a manipulation task can be composed of many skill primitives. It is desirable to perform plural visual sensing in most skill primitives as geometric modeling and task planning are performed before execution, and task achievement is confirmed after execution. However, the performance of sensing at all sensing points is difficult because of the restrictions of time and hardware. In this paper, we proposed the addition of importance ranks to the attribute of skill primitives to derive suitable timing to perform visual sensing. The use of the proposed method eases the selection of skill primitives in which visual sensing should be performed. Furthermore, we showed that skill primitives distinguished according to their high importance ranks considerably correlate with those in which error recovery is considered in advance. This characteristic can be used for selecting skill primitives in which error recovery is planned in advance.



GS2-6-1 Electronic Measurement and Gamification of Balance Tests

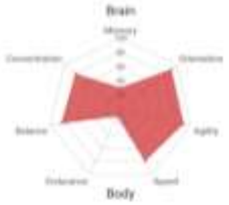
Yan-Xin Liu, Massimiliano Leggieri, Henrik Hautop Lund (Technical University of Denmark, Denmark)

We gamified three common balance tests for fall risk diagnosis, Timed Up & Go (TUG), Chair Stand (CS), and Four Square Step Test (FSST), by using the Moto Tiles. The embedded pressure sensor of the Moto Tile was used to detect the movement of subjects and to time the tests. The proposed Moto measurement was compared with traditional stopwatch measurement. A total of 51 samples were analyzed. The intraclass correlation coefficients of the TUG and CS tests were very high (0.98 and 0.94). The FSST was analyzed by Pearson's correlation coefficient and the result also indicated strong correlation (0.79). Based on the results, we concluded that the proposed Moto tests are as reliable as traditional tests.

GS2-6-2 Playful Body and Brain Test with the Moto Tiles

Yan-Xin Liu, Massimiliano Leggieri, Henrik Hautop Lund (Technical University of Denmark, Denmark)

We gamified three common balance tests for fall risk diagnosis, Timed Up & Go (TUG), Chair Stand (CS), and Four Square Step Test (FSST), by using the Moto Tiles. The embedded pressure sensor of the Moto Tile was used to detect the movement of subjects and to time the tests. The proposed Moto measurement was compared with traditional stopwatch measurement. A total of 51 samples were analyzed. The intraclass correlation coefficients of the TUG and CS tests were very high (0.98 and 0.94). The FSST was analyzed by Pearson's correlation coefficient and the result also indicated strong correlation (0.79). Based on the results, we concluded that the proposed Moto tests are as reliable as traditional tests. Further, we propose a novel playful body and brain test. The test includes a series of standardized Moto Tiles games, which cover both physical and cognitive abilities. Reference scores of the tests were modeled by data collected from a large number of participants of different ages. The reference scores can be applied to evaluate a user's body and brain abilities in comparison with the average performance at the same age.



GS3 Complexity (2)

GS3-1 Extracting Co-occurrence Feature of Words for Mail filtering

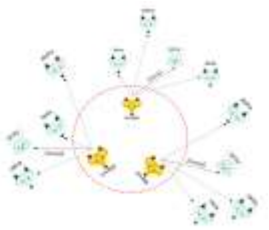
Seiya. Temma, Manabu. Sugii, Hiroshi. Matsuno (Yamaguchi University, Japan)

Spam mail filters often take advantage of appearance frequency of words in a text for mail classification. However the appearance frequency is one of the most important attribute information with which the mail can be characterized, not a few spam mails can not be distinguished with only the appearance frequency of words. In order to search new attribute information to characterize and classify the mails, we analyzed relationship between words in a text of mails by text data mining. Also we visualized the word network by the co-occurrence and multi-dimensional scaling analysis with the jaccard coefficient in real mails. Co-occurrence network analysis showed important word connections with noun and verb in the same kinds of mails. Multi-dimensional scale analysis showed some word clusters extracted from the same kind of mails. We'll plan to explore how to utilize the result of this study for mail classification.

GS3-2 Learning Style Classification with Weighted Distance Grey Wolf Optimization

Duangjai Jitkongchuen, Piyalak Pongtawevirat (Dhurakij Pundit University, Thailand)

The multiclass classification seems to be difficult to improve the performance of the built classification model. This research aims to improve the performance of multiclass classification by using grey wolf optimizer (GWO) algorithm. But in the original GWO, the evolutionary information of population has not been fully utilized, and it is easy to fall into local optimum. The proposed algorithm presents a solution to improve the grey wolf optimizer performance using weighted distance and immigration operation. The weight distance is used for the omega wolves movement is defined from fitness value of each leader (alpha, beta and delta). The proposed technique is based on learning style prediction which addresses multiclass classification problem. The results showed that the proposed technique obtained the higher accuracy rate than other classification techniques. This was implemented to application of learning style prediction which can provide the course materials suitable for learners regarding their learning style.

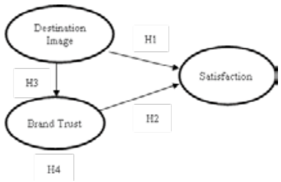


GS4 Poster (5)

GS4-1 Relevance Research among Destination Image, Brand Trust, and Satisfaction: Tainan Festival in Taiwan as Example

Shang-Hui Li, Shu-Fang Hsu, Yi-Tai Shang (Far East University, Taiwan)

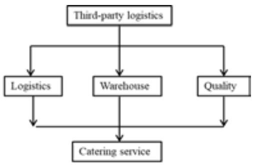
In recent years, all local governments of Taiwan have held sightseeing festivals to enhance their popularity, promote their economy, to establish their brand. Tainan, the second biggest city in southern Taiwan, also promotes the various agricultural products and sightseeing to serve customers as the region's annual event. This study took Tainan Festival as an example to explore the relevance of the destination image, brand trust, and satisfaction. The participants for those who took part in 2017 Tainan Festivals, from May to July, were the main subjects on this study. 500 questionnaires were issued, 465 valid questionnaires collected, 93%. The finding results showed that the destination image of Tainan festival activities had a positively effects on satisfaction, brand trust had a positive effects on satisfaction, destination image had a positive effects on brand trust, brand trust had the intermediary effect to the satisfaction and destination image.



GS4-2 Third-party Logistics Service Supply: Catering Service Trade as Example

Shu-Fang Hsu, Shang-Hui Li (Far East University, Taiwan)

With the development of third-party logistics, refrigeration technology, and transportation which made the food to obtain easily, and improve the quality of food preservation. Now, the catering chefs just ordered his needed foods by line, telephone, fax, or fill the order list etc., to inform the third-party logistics suppliers and there will be someone assigned to the designated location which could save purchasing time and catering chefs don't need to rush around to procure foods. This study analyzed the collected information through literature, in-depth interviews, and observation methods. Third-party logistics suppliers conducted the information, logistics, and cash flow by the different deal due to the different nature of suppliers. Third-party logistics suppliers could be exhaustive on the quality management, logistics activities, interactive mode of trust mechanism, which could not only win the good reputation by the catering chefs, but the professional core competence.



GS4-3 Pedal Scale Control Device for Weighing Food Ingredients or Chemical Materials

Shang-Hui Li, Shu-Fang Hsu, Yi-Tai Shang, Kuan-Ying Chen (Far East University, Taiwan)

Safety and hygiene is one of the most important elements when weighing ingredients or chemical materials. It may cause cross-contamination when preparing them if the operators conduct the scale button and hold the food ingredients or chemical materials by using both hands. The invention relates to a pedal scale control device comprising a scale body and a foot unit. The wireless signal on the foot unit can be connected to the scale body to zero and buckle the function without using of both hands. This invention has obtained Taiwan's invention patent, which is more hygienic and safety for the users when weighing the food ingredients or chemical materials.

GS4-4 Convolution Neural Network Based Fault Diagnosis of Induction Motors

Jong-Hyun Lee, In-Soo Lee (Kyungpook National University, Korea)

Induction motors are one of the most important components for machine and industrial equipment in modern industrial applications. Therefore, it is necessary to develop a fault diagnosis system that detects the operating condition and failure of the induction motor early. This paper presents a induction motor fault diagnosis system using CNN(Convolution Neural Network) model. In the proposed method, the fault diagnosis of the induction motor is performed by using vibration signal data obtained from the induction motor experiment as the input value of convolution neural network model. And then fault diagnosis was made using convolution neural network. In this paper, fault diagnosis of steady state, rotor and bearing failure of induction motor is performed. From the experimental results, it is confirmed that the proposed method is suitable for diagnosis of rotor and bearing failure of induction motor.

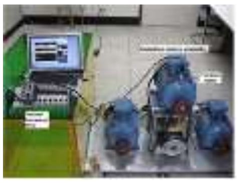
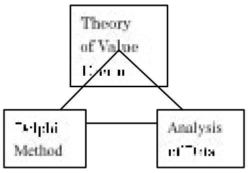


Fig. 1. Experimental environment for fault diagnosis of induction motors

GS4-5 Analysis of Value Chain on Food and Beverage Micro-enterprises: Mobile Diner as Example

Shu-Fang Hsu, Shang-Hui Li (Far East University, Taiwan)

This study was based on the theory of value chain proposed by Porter, 1985, in conjunction with the mobile diner industry from the value activities created in the value chain. The main activity was to analyze the competitive advantage of the mobile diner and the added value to meet customers' need. In this study, the Delphi method was used, and then conducted with interview and observation method on 10 homogeneous mobile diners to gain an in-depth understanding of the development and current situation in southern Taiwan. Exploring their competitiveness, and discovering that the businessmen purchased the necessary food by themselves, which could ensure safety. In terms of marketing and sales, due to the mobility and easy acceptance of customization, the relative value of products and services are relatively improved. This study could provide a practical reference for micro-entrepreneurs who want to invest in food and beverage in the future.

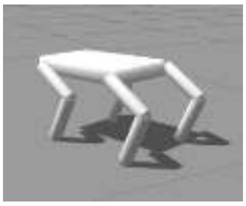


GS5 Others (8)

GS5-1 Suppression of Roll Oscillation in Turning of Quadruped Robot by Asymmetric Amplification of Central Pattern Generator Output Waveform

Makoto Kitani, Ryo Asami, Noritake Sato (Nagoya Institute of Technology, Japan),
Tomofumi Fujiwara, Takahiro Endo, Fumitoshi Matsuno (Kyoto University, Japan),
Yoshifumi Morita (Nagoya Institute of Technology, Japan)

One of control methods for walking of a robot is a central pattern generator (CPG). Using the CPG for a legged robot, it can walk on rough terrain. Kimura et al. developed a quadruped robot “Tekken”, which is controlled by the CPG. Tekken can turn by controlling the hip yaw joint. However, when the robot turns by controlling the hip yaw joint, there is a problem that the vibration in the roll direction is large. To solve this problem, we proposed a method of asymmetric amplification of CPG output waveform. We implemented the proposed method on the robot inside the simulator and verified the effectiveness at turning. As a result, we achieved a 43.7% decrease in the roll angle of the robot body than the conventional method. It is assumed that legged robots can turn stably using our proposed method.



GS5-2 Tumble avoidance system for rescue robot by estimating the contact points using a 3D depth sensor

Noritaka Sato, Kotaro Ohshima, Yoshifumi Morita (Nagoya Institute of Technology, Japan)

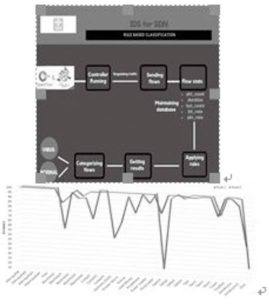
Rescue robots are expected to perform works in hazardous areas. However, when the robot runs on a rough terrain, fatal rollover falling sometimes occurs. Therefore, we propose a tumble-risk-assessment system, which reconstructs the environment, estimates the contact points between the ground and the robot, and calculates a normalized energy stability margin (SNE) by using a 3D depth sensor. Moreover, a control system to avoid the tumble situation by moving the sub-crawlers automatically is proposed. In the control system, the SNE is partially differentiated by the angles of the sub-crawlers and the sub-crawlers move to increase the SNE. We implemented the proposed systems to a real robot, carried out experiments, and confirmed the effectiveness of the proposed method.

KINECT
(3D Depth Sensor)

GS5-3 Rule based Intrusion Detection System by Using Statistical Flow Analysis Technique for Software Defined Network

Mahnoor Ejaz, Osama Sohail, Talha Naqash, Zain ul Abideen, Sajjad Hussain Shah
(Bahria University, Pakistan)

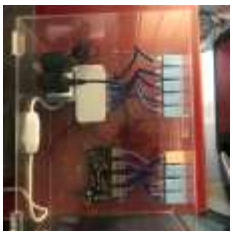
Network Security is a vast field making progress around the globe very fast. In every progressing year, developers have implemented different tools, which include Intrusion detection systems. Nowadays Intrusion Detection System (IDS) is one of the popular tools, which are drawing the attention of many researchers. Applying it in Software Defined Networking (SDN) facilitates network management and enables to enhance the productivity of network monitoring. Classifying packets based on their statistics and separating the forward process of network packets from the routing process is the main challenge. In this paper, rule-based classification is done in order to differentiate between viruses and normal packets. Statistical analysis of different network traffic flows are done through which segregation is made and intrusion is detected in Software Defined Networking. The proposed system is experimentally tested on UNB ISCX data,sets



GS5-4 Development of Testbed for SDN to Know Its Feasibility of Deployment on Access Layer

Rafay Shah, M Osama Shaikh, Talha Shaikh, Tanveer Hussain
(Mehran University of Engineering & Technology, Pakistan)

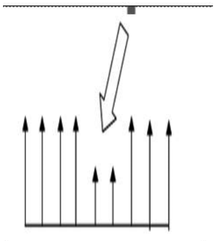
Today, the network requirement of organizations includes enhancing performance, realizing broader connectivity and security regulations. In order to comply with all of these criteria, networking protocols have been evolving significantly over the last few decades. Internet of Things (IoT) has shifted IT from server entity to the network entity. Software Defined Networking (SDN) is a solution of these all problems found in traditional networking. SDN separates control plane from data plane, which makes it easier for an IT Administrator to easily deploy and update regulatory policies. In this project, we have developed a testbed kit using Zodiac-FX Open- Flow Switch for SDN and have tested SDN feasibility on Access Layer. We have also simulated a network of Faculty of Electrical Electronics Computer Engineering (FEECE) of Mehran University of Engineering and Technology (MUET) and have found that SDN performs better than traditional network architecture of FEECE of MUET.



GS5-5 Spectrum Sensing using Unsupervised Learning for Cognitive Radio

Asmara Shaukat, Danish Khan, Talal Arshad, Haseeb Ahmad (PAF-KIET, Pakistan)

Cognitive Radio is the type of wireless communication which has the ability to learn from its surrounding and reconfigure its operating parameters. It uses radio spectrum efficiently by detecting which communication channels are in use and which are not, and instantly move into vacant channels while avoiding occupied ones. This optimizes the use of available radio-frequency (RF) spectrum while minimizing interference to other users. Spectrum sensing is one of the most important tasks performed by the CR. Spectrum sensing refers to the ability of a CR to measure the spectrum activities due to ongoing transmissions over different spectrum bands and to capture the related parameters, it tells us about spectrum usage and existence of primary users in a geographical area. In this work we perform Spectrum sensing using unsupervised learning algorithm (K- mean clustering) and find vacant spectrum.

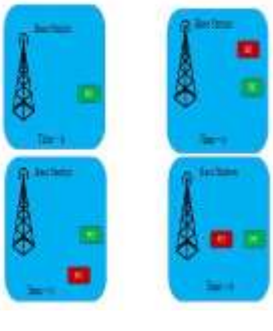


Spectrum Problem

GS5-6 Tracking Secondary User In Cognitive Radio For 5g Communication

Muhammad Adnan, Muhammad Umair, Sameed bin Junaid (PAF-KIET, Pakistan）

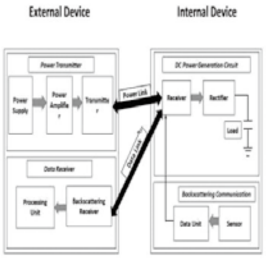
Cognitive Radio (CR) is a promising technology which resolves the spectrum scarcity issues and allows secondary user (SU) to use the vacant spectrum space. Many secondary users are allocated different spectrum bands to enhance spectrum utilization. SU co-exists with the PU in the CR network and continuously monitors PU activities in order to use vacant space of PU in the spectrum. The movement of SU in the CR network is random and therefore it is necessary to track the position of SU and measure radio signal strength indicator (RSSI) in order to avoid interference with the PU. In this work, we present the implementation and comparison of two algorithms KALMAN Filter and State Space Least Mean Square (SSLMS) to track the position of SU in the CR network under log distance and log normal shadowing path loss models. Both algorithms track the position of SU by measuring RSSI and Signal to Noise Ratio (SNR) from the PU; however SSLMS gives better performance as compared to KALMAN Filter.



GS5-7 Wireless Power Transfer and Data Communication For Biomedical Applications

Hammad Saleem, Muhammad Awais, Siraj Din, Attequa (PAF-KIET, Pakistan)

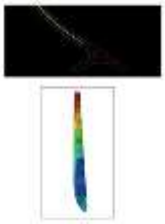
A technique of wireless power transfer (WPT) system for biomedical applications with backscattering communication, a rectifier use with active bias mechanism (dependent and independent stages) overcome the diode device losses has been presented in this paper. Apart from conventional and static Vth cancellation technique rectifiers, it achieves more than double efficiency and achieves power loss reduction in both forward and reverse biased conditions it decrease turn on voltage in forward bias condition along with decrease in reverse leakage current during reverse bias condition. Under the input conditions (Vin =1Vp-p coupling coefficient 'k'=0.01 at 200MHz frequency with transmitter and receiver inductance of 22nH), actively biased differential drive rectifier is able to achieve DC voltage of 880mv for 50kΩ load resistance in dependent stage and achieves DC voltages of 803.2mv for 50kΩ load resistance in independent stage. Regulated output DC voltage is provided under variable coupling conditions and becomes more efficient. Backscattering communication has been performed using switch by changing the resonance frequency of the receiver.


External Device
Internal Device
Power Transmitter
Power Supply
Power Amplifie r
Transmitte r
Power Link
DC Power Generation Circuit
Receiver
Rectifier
Load
Data Link
Data Receiver
Processing Unit
Backscattering Receiver
Backscattering Communication
Data Unit
Sensor

GS5-8 Feasibility Study of UAV Implementation In Route Surveying

D.Hazry, M A Azizan, Safwan Suhaimi, Zulaiha Ramli, Mohamad Syafiq A.K, Zainuddin Hat
(Universiti Malaysia Perlis, Malaysia)

Unmanned Aerial Vehicles (UAVs) are widely used in numerous field and the technology keeps growing. Generally, conventional method use in data collection for engineering work is tedious and requires a lot of manpower. This research focuses on the investigation of the suitability of UAV for route survey. There were three stages: data collection, data processing and data analysis. By using KAMA BETA, the data was collected. For data processing, Pix4Dmapper used for point cloud and AutoCAD 2014 for analysis stage. The result is mainly focused on extracting the road profile and test the point cloud data using RMSE. The result from both method, conventional and UAV from the point cloud data using RMSE show only the small difference.



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Ho	Chian C.	OS1-6	21/43
Hori	Masamichi	OS10-1	36/59
		OS10-2	36/59
Horikawa	Yo	OS23-1	32/83
		OS23-2	32/83
		OS23-3	32/83
Hsia	Kuo-Hsien	OS1-5	21/43
		OS1-7	21/44
		OS4-3	22/48
		OS4-7	22/50
Hsu	Shu-Fang	GS4-1	29/91
		GS4-2	29/91
		GS4-3	29/92
		GS4-5	29/92
Huang	Bo-Kai	OS1-2	21/42
Huang	Jingxuan	OS13-8	28/68
Huang	Qianli	OS12-1	33/65
Huang	Tieqiu	OS12-1	33/65
Hung	Chung-Wen	OS1-1	20/42
		OS1-2	21/42
Hung	Yi-ping	OS25-2	33/86
Hussain	Tanveer	GS5-4	38/94
Hwang	Do-Kyung	OS3-3	25/47

[I]

Ikeda	Satoshi	OS5-3	37/51
		OS10-1	36/59
		OS10-2	36/59
		OS10-4	36/60
Ikeda	Tomomasa	OS21-2	24/80

Ikeuchi	Yoshiho	OS2-5	24/46
Imai	Shinichi	OS16-4	30/73
Imai	Yoshiro	OS6-1	35/51
		OS23-1	32/83
		OS23-2	32/83
		OS23-3	32/83
		OS23-4	32/84
Ishii	Kazuo	OS20-2	20/77
		OS20-3	20/77
		OS20-5	20/78
		OS21-1	24/79
		OS21-2	24/80
		OS21-3	24/80
		OS21-4	24/80
		OS22-2	34/81
		OS22-3	34/82
		OS22-4	34/82
Ishizu	Takahiro	OS10-1	36/59
		OS10-2	36/59
Ito	Takao	OS5-1	36/50
		OS5-2	37/50
		OS5-3	37/51
		OS10-1	36/59
		OS10-2	36/59
		OS10-4	36/60
Ito	Tsutomu	OS5-1	36/50
		OS5-2	37/50
		OS5-3	37/51
Ito	Yoshiki	GS1-1	27/87
Iwanaga	Saori	OS17-1	30/73

[J]

Jheng	Li-Sheng	OS1-1	20/42
Jia	Hongyan	OS13-3	28/67
Jia	Yingmin	PS-3	35/39
		OS14-3	23/70
		OS15-3	31/71
		OS15-5	31/72
Jia	Yongnan	OS15-2	30/71
Jiang	Wenping	OS13-6	28/68
Jin	Xia	OS11-1	26/61
		OS11-3	26/61
		OS11-5	26/62
		OS11-6	26/62
Jitkongchuen	Duangjai	GS3-2	32/91
Jitviriya	Wisanu	GS2-1	31/88
Junaid	Sameed bin	GS5-6	38/94

[K]

Kagawa	Koji	OS23-1	32/83
		OS23-2	32/83
		OS23-3	32/83
		OS23-4	32/84
Kamei	Keiji	OS22-6	34/82
Kan	Ryota	OS7-4	23/54
Katayama	Tetsuro	OS6-3	35/52
		OS6-4	35/52
		OS6-5	35/53
		OS6-6	36/53
Katori	Yuichi	OS2-2	23/45
		OS2-6	24/46
Kawada	Kazuo	OS16-1	30/72
		OS16-3	30/72
Kawaguchi	Natsuki	OS18-2	25/74
Kawakami	Yusuke	OS23-1	32/83
		OS23-2	32/83
		OS23-3	32/83
		OS23-4	32/84
Kawamoto	Kota	OS22-5	34/82
Kawamura	Yoji	OS24-5	37/85

Kawano	Hiromichi	OS23-3	32/83
Kawazoe	Kengo	OS20-7	20/79
Khan	Danish	GS5-5	38/94
Khoyratee	Farad	OS2-5	24/46
Kim	Hyun-Hee	OS3-1	25/46
Kim	Ji-Hyeon	OS3-2	25/47
Kim	Soo Hyeon	OS2-5	24/46
Kimura	Kenji	OS22-4	34/82
Kinoshita	Takuya	OS18-3	25/75
		OS18-5	25/75
Kita	Yoshihiro	OS6-3	35/52
		OS6-4	35/52
		OS6-5	35/53
		OS6-6	36/53
Kitani	Makoto	GS5-1	38/93
Kobayashi	Jun	GS2-2	31/88
Kobayashi	Keitaro	OS8-4	19/56
Kohno	Takashi	OS2-1	23/44
		OS2-4	24/45
Koizumi	Noriko	OS8-4	19/56
Konishi	Yasuo	OS18-2	25/74
Kozui	Masatoshi	OS18-3	25/75
Kubo	Masao	OS17-1	30/73
		OS17-2	30/73
		OS17-3	30/74
Kumano	Minoru	OS5-1	36/50
		OS5-2	37/50
Kumjaikong	Sutee	GS2-1	31/88
Kuo	Chia-Chen	OS25-1	33/86
		OS25-3	33/86
Kurozumi	Ryo	OS6-2	35/52

[L]

Lai	Chuan-Lin	OS25-1	33/86
		OS25-3	33/86
Lai	Chun-Chi	OS4-1	21/48
Lee	In-Soo	GS4-4	29/92
Lee	Jang-Myung	OS3-2	25/47
		OS3-3	25/47
Lee	Jong-Hyun	GS4-4	29/92
Lee	Min Cheol	OS3-1	25/46
Lee	Roger CL	OS1-2	21/42
Lee	Soo-jeong	OS3-4	25/47
Leggieri	Massimiliano	IS1-1-1	18/40
		GS2-6-1	31/90
		GS2-6-2	32/90
Levi	Timothée	OS2-3	24/45
		OS2-4	24/45
		OS2-5	24/46
Li	Binghe	OS22-3	34/82
Li	Chenyang	OS12-2	33/65
Li	Hao	OS11-3	26/61
		OS11-6	26/62
Li	Handong	OS14-2	22/69
Li	Hongbing	OS4-5	22/49
Li	Jung-Shian	OS1-3	21/42
		OS1-4	21/43
Li	Min	OS12-2	33/65
Li	Qing	OS15-2	30/71
Li	Shang-Hui	GS4-1	29/91
		GS4-2	29/91
		GS4-3	29/92
		GS4-5	29/92
Li	Yang	OS11-4	26/62
		OS11-8	26/63
Li	Yuling	OS15-4	31/71
Liao	Guan-Lung	OS1-6	21/43
Lien	Chiang-Hsiang	OS25-1	33/86

Lien	Chiang-Hsiang	OS25-3	33/86
Lin	Chia-Jen	OS4-1	21/48
Lin	Chun-Chu	OS1-1	20/42
Lin	Yixin	OS13-7	28/68
		OS13-8	28/68
		OS13-9	28/69
Liou	Sheng-Jie	OS4-2	22/48
Liu	Chuan-Gang	OS1-4	21/43
Liu	Fan	OS15-4	31/71
Liu	Guanghui	OS15-1	30/70
Liu	I-Hsien	OS1-3	21/42
		OS1-4	21/43
Liu	Kaige	OS11-1	26/61
Liu	Qingming	OS13-7	28/68
Liu	Qunpo	OS15-1	30/70
Liu	Shu-Hsin	OS25-1	33/86
		OS25-3	33/86
Liu	Wei	OS12-4	33/66
Liu	Xianzhe	OS15-1	30/70
Liu	Yafan	OS12-3	33/65
Liu	Yanxin	GS2-6-1	31/90
		GS2-6-2	32/90
Liu	Yuanshan	OS15-4	31/71
Liu	Zonglin	OS13-5	28/67
Lund	Henrik Hautop	IS1-1-1	18/40
		IS1-1-2	18/40
		IS1-2-1	18/40
		IS1-2-2	18/41
		GS2-6-1	31/90
		GS2-6-2	32/90
Luo	Lian	OS12-4	33/66

[M]

Mehta	Rajiv	OS5-3	37/51
Magid	Evgeni	OS1-5	21/43
		OS4-1	21/48
		OS4-2	22/48
		OS4-3	22/48
		OS4-4	22/49
		OS4-5	22/49
		OS4-6	22/49
		OS4-7	22/50
Martínez	Genaro J.	GS1-3	27/87
Matsumaru	Takafumi	GS2-4	31/89
Matsuno	Fumitoshi	GS5-1	38/93
Matsuno	Hiroshi	GS3-1	32/90
Matsuno	Seigo	OS5-3	37/51
Matsuo	Takayuki	OS22-2	34/81
Min	Jun	OS13-6	28/68
Miyaji	Toshihiro	OS6-5	35/53
Mizoe	Eiji	OS20-4	20/78
Mo	Lipo	OS15-3	31/71
Mochizuki	Ryuugo	OS20-2	20/77
Mori	Keisuke	OS6-4	35/52
Mori	Shinnosuke	OS16-3	30/72
Moriguchi	Yuki	OS16-2	30/72
Morimoto	Shogo	OS6-1	35/51
Morita	Yoshifumi	GS5-1	38/93
		GS5-2	38/93
Moriyama	Hiroyuki	OS22-6	34/82
Mowshowitz	Abbe	OS20-6	20/78
Muto	Shohei	OS4-4	22/49

[N]

Nagai	Yousuke	OS20-4	20/78
Nagamatsu	Masayasu	OS16-2	30/72
Nagata	Kazuyuki	PS-1	29/39
		GS2-5	31/89

Nakajima	Shuhei	OS21-5	24/81
Nakamura	Akira	GS2-5	31/89
Nakamura	Seishiro	OS8-6	19/57
Nakaoka	Iori	OS5-4	37/51
Naqash	Talha	GS5-3	38/93
Nie	Zhen	OS13-4	28/67
		OS13-5	28/67
Nishida	Tatsumi	OS6-6	36/53
Nishida	Yuya	OS21-1	24/79
		OS21-2	24/80
		OS21-3	24/80
Nishikawa	Stephany Mai	OS2-5	24/46
Niu	Hong	OS13-2	27/67
Nonaka	Hirofumi	OS5-1	36/50
		OS5-2	37/50

[O]

Ogata	Takashi	OS24-1	37/84
Ohnishi	Yoshihiro	OS16-3	30/72
Ohshima	Kotaro	GS5-2	38/93
Okazaki	Naonobu	OS6-3	35/52
		OS6-4	35/52
		OS6-5	35/53
		OS6-6	36/53
Okugawa	Yohei	OS17-2	30/73
Okumura	Naoki	OS8-4	19/56
Omata	Kaito	OS16-4	30/73
Onishi	Akane	OS8-2	19/55
Ono	Jumpei	OS24-1	37/84
Ouchi	Tomohito	OS7-1	23/53

[P]

Pagliarini	Luigi	IS1-1-2	18/40
		IS1-2-1	18/40
		IS1-2-2	18/41
Pai	Shu-Li	OS1-5	21/43
Park	Chan Gook	OS3-4	25/47
Park	Woo-Jung	OS3-4	25/47
Park	Yong-Gonjong	OS3-4	25/47
Park	Yousin	OS5-4	37/51
Peng	Yizhun	OS11-10	27/64
		OS11-11	27/64
		OS11-12	27/64
Phunopas	Amornphun	GS2-1	31/88
Pongtawevirat	Piyalak	GS3-2	32/91
Prasetio	Barlian Henryranu	OS19-2	34/76
Pudchuen	Noppadol	GS2-1	31/88

[Q]

Qin	XiaoFeng	OS10-3	36/60
Qin	Yiqiao	OS11-1	26/61
		OS11-2	26/61
		OS11-3	26/61
		OS11-6	26/62
		OS11-7	26/63
		OS11-8	26/63

[R]

Rajapakse	R. P. C. Janaka	OS23-1	32/83
		OS23-2	32/83
		OS25-2	33/86
Ramirez-Alpizar	Ixchel G.	PS-1	29/39
Ramli	Zulaiha	GS5-8	38/95

[S]

Sagitov	Artur	OS4-3	22/48
		OS4-4	22/49
		OS4-5	22/49

		OS4-6	22/49
Sahara	Kei	OS8-5	19/56
Sakamoto	Makoto	OS5-3	37/51
		OS8-1	19/55
		OS10-1	36/59
		OS10-2	36/59
		OS10-3	36/60
		OS10-4	36/60
		OS10-5	36/60
Sakurai	Keiko	OS19-1	34/76
		OS19-2	34/76
		OS19-3	34/76
Saleem	Hammad	GS5-7	38/95
Sanada	Atsushi	OS22-1	34/81
Sato	Hirosh	OS17-2	30/73
Sato	Kenya	OS8-6	19/57
		OS8-7	19/57
Sato	Noritaka	GS5-1	38/93
		GS5-2	38/93
Sato	Takao	OS18-2	25/74
Sato	Takashi	OS7-3	23/54
Shabalina	Ksenia	OS4-3	22/48
		OS4-7	22/50
Shah	Rafay	GS5-4	38/94
Shah	Sajjad Hussain	GS5-3	38/93
Shaikh	M Osama	GS5-4	38/94
Shaikh	Talha	GS5-4	38/94
Shang	Yi-Tai	GS4-1	29/91
		GS4-3	29/92
Shaukat	Asmara	GS5-5	38/94
Shi	Wengxin	OS13-3	28/67
Shigeyama	Tamon	OS20-8	20/79
Shinnoki	Tomoya	OS21-3	24/80
Sohail	Osama	GS5-3	38/93

Song	Chen	OS13-9	28/69
Song	Jong-Hwa	OS3-4	25/47
Song	Rende	OS10-3	36/60
Song	Yunzhong	OS14-1	22/69
Sonoda	Takashi	OS21-1	24/79
		OS21-2	24/80
		OS22-2	34/81
Su	Kuo-Lan	OS1-7	21/44
		OS4-1	21/48
		OS4-2	22/48
		OS4-3	22/48
		OS4-7	22/50
Sugii	Manabu	GS3-1	32/90
Sugiyama	Masanori	PS-2	19/39
Suhaimi	Safwan	GS5-8	38/95
Sumi	Kaoru	IS-3	29/41
Sun	Zijie	OS10-3	36/60
Suzuki	Yasuhiro	OS9-1	33/58
		OS9-2	33/58
		OS9-3	33/58

[T]

Tabuse	Masayoshi	OS7-1	23/53
		OS7-2	23/54
		OS7-3	23/54
		OS7-4	23/54
Takagi	Tomohiko	OS6-1	35/51
		OS6-2	35/52
Takahashi	Masanori	OS18-4	25/75
Takaichi	Shohei	OS2-6	24/46
Takano	Tetsuo	OS4-4	22/49
Takei	Amane	OS10-1	36/59
		OS10-2	36/59
		OS10-5	36/60
Takemura	Yasunori	OS20-4	20/78

Takemura Yasunori OS22-2 34/81
Tamai Teruyuki OS16-3 30/72
Tamura Hiroki OS19-1 34/76
OS19-2 34/76
OS19-3 34/76
Tamura Hiroto OS2-2 23/45
Tanaka Katsunori OS21-2 24/80
Tani Shohei OS7-4 23/54
Tanno Koichi OS19-1 34/76
OS19-2 34/76
OS19-3 34/76
Tashiro Masao OS20-4 20/78
Temma Seiya GS3-1 32/90
Tominaga Ayumu OS20-6 20/78
Toyoshima Naoki OS2-1 23/44
Toyota Takaaki OS10-2 36/59
Tsoy Tatyana OS4-6 22/49
Tsuji Tokuo PS-1 29/39
Tunsiri Songklod GS2-1 31/88

[U]
Ue Yuki OS6-1 35/51
Ueda Takumi OS21-2 24/80
Uejo Kento GS1-2 27/87
Uenohara Seiji OS2-4 24/45
Umair Muhammad GS5-6 38/94
Utsunomiya Koshi OS21-5 24/81

[W]
Wakitani Shin OS18-1 25/74
Wan Weiwei PS-1 29/39
Wang Bo-Kai OS1-6 21/43
Wang Chengcai OS11-1 26/61
OS11-2 26/61
OS11-7 26/63
Wang Chih-Wei OS25-1 33/86
OS25-3 33/86
Wang Fuzhong OS14-1 22/69
Wang Hongqi OS15-1 30/70
Wang jie OS3-1 25/46
Wang Jiwu OS12-2 33/65
OS12-3 33/65
OS12-4 33/66
OS12-5 33/66
Wang Ming-Jen OS25-1 33/86
OS25-3 33/86
Wang Shuo OS11-10 27/64
OS11-12 27/64
Wang Sufang OS15-2 30/71
Wang Tse-Yao OS1-8 21/44
Wang Wei OS11-4 26/62
Wang Xiao OS14-2 22/69
Wang Yunfei OS13-9 28/69
Watanabe Keisuke OS21-5 24/81
Wei Qiang OS13-7 28/68
OS13-8 28/68
OS13-9 28/69
Wen Fu-Hsiang OS1-8 21/44
Wu Jasmine OS25-1 33/86
OS25-3 33/86

[Y]
Yamaba Hisaaki OS6-3 35/52
OS6-4 35/52
OS6-5 35/53
OS6-6 36/53
Yamada Takayoshi GS1-1 27/87
GS1-2 27/87
Yamaguchi Akihiro OS17-3 30/74
Yamaguti Yutaka OS17-3 30/74

Yamamoto	Hidehiko	GS1-1	27/87
		GS1-2	27/87
Yamamoto	Toru	OS18-1	25/74
		OS18-3	25/75
		OS18-5	25/75
Yamanobe	Natsuki	PS-1	29/39
Yan	Yujie	OS11-1	26/61
		OS11-3	26/61
		OS11-4	26/62
		OS11-5	26/62
		OS11-6	26/62
Yang	Bo-Jun	OS4-2	22/48
Yang	Guowei	OS11-2	26/61
Yang	Hongyong	OS15-4	31/71
Yang	Rui	OS11-11	27/64
Yang	Xia	OS2-4	24/45
Yang	Xiao	OS13-7	28/68
Yang	Yi-Chang	OS1-1	20/42
Yang	Yize	OS15-4	31/71
Yang	Zhou	OS11-11	27/64
Yano	Yuiko	OS7-2	23/54
Yasukawa	Shinsuke	OS20-2	20/77
		OS21-1	24/79
		OS21-2	24/80
		OS21-3	24/80
		OS22-3	34/82
Ye	Zhongyong	OS11-1	26/61
		OS11-3	26/61
		OS11-5	26/62
		OS11-6	26/62
		OS11-8	26/63
Yin	Di	OS11-2	26/61
		OS11-7	26/63
		OS11-8	26/63
		OS11-9	27/63
Yin	Hongyi	OS13-1	27/66
		OS13-10	29/69
Yin	Tong	OS13-1	27/66
		OS13-10	29/69
Yoshida	Chika	OS19-3	34/76
Yoshimura	Mamoru	OS10-4	36/60
Yoshioka	Koma	OS8-7	19/57
Yoshitomi	Yasunari	OS7-2	23/54
		OS7-3	23/54
		OS7-4	23/54
Yu	Shit-Ting	OS1-2	21/42
Yuan	Xiaolin	OS15-3	31/71
Yuan	Yasheng	OS11-2	26/61
		OS11-6	26/62
		OS11-7	26/63
		OS11-8	26/63
		OS11-9	27/63
Yuki	Ryoma	OS21-2	24/80

[Z]

Zakiev	Aufar	OS4-7	22/50
Zamorano	Daniel A.	GS1-3	27/87
Zeng	Weixin	OS12-5	33/66
Zhang	Bin	OS14-3	23/70
Zhang	Bowen	OS12-1	33/65
Zhang	Chen	OS10-3	36/60
Zhang	Hanwen	OS14-4	23/70
Zhang	Hengbin	OS14-4	23/70
Zhang	Hongyu	OS3-2	25/47
Zhang	Kailun	OS11-4	26/62
Zhang	Qinjian	OS12-3	33/65
Zhang	Tianyi	OS11-4	26/62
Zhang	Tingting	OS11-7	26/63
		OS11-8	26/63
		OS11-9	27/63

Zhang	Weicun	OS14-2	22/69
		OS15-2	30/71
Zhang	Weiya	OS13-5	28/67
Zhang	Xiaoyu	OS13-7	28/68
Zhang	Xinyu	OS11-2	26/61
Zhang	Yingzhao	OS14-2	22/69
Zhang	Yu-an	OS10-1	36/59
		OS10-2	36/59
		OS10-3	36/60
Zhao	Chenglin	OS11-3	26/61
Zhao	Huailin	OS13-4	28/67
		OS13-5	28/67
		OS13-6	28/68
Zheng	Jingnan	OS13-5	28/67
Zhu	Chen	GS2-4	31/89
Zhu	Yuxuan	OS11-2	26/61
		OS11-7	26/63
		OS11-8	26/63
		OS11-9	27/63

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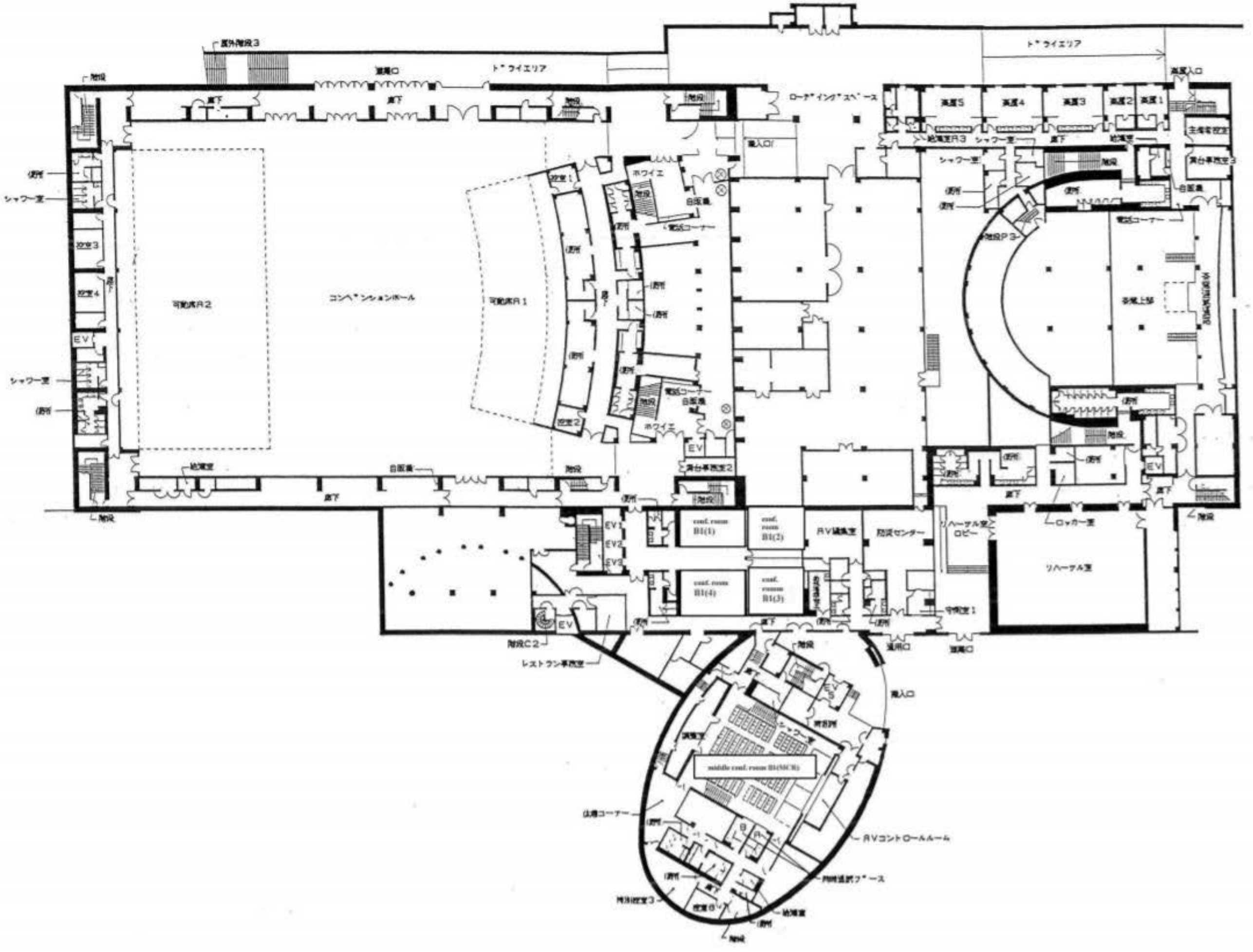
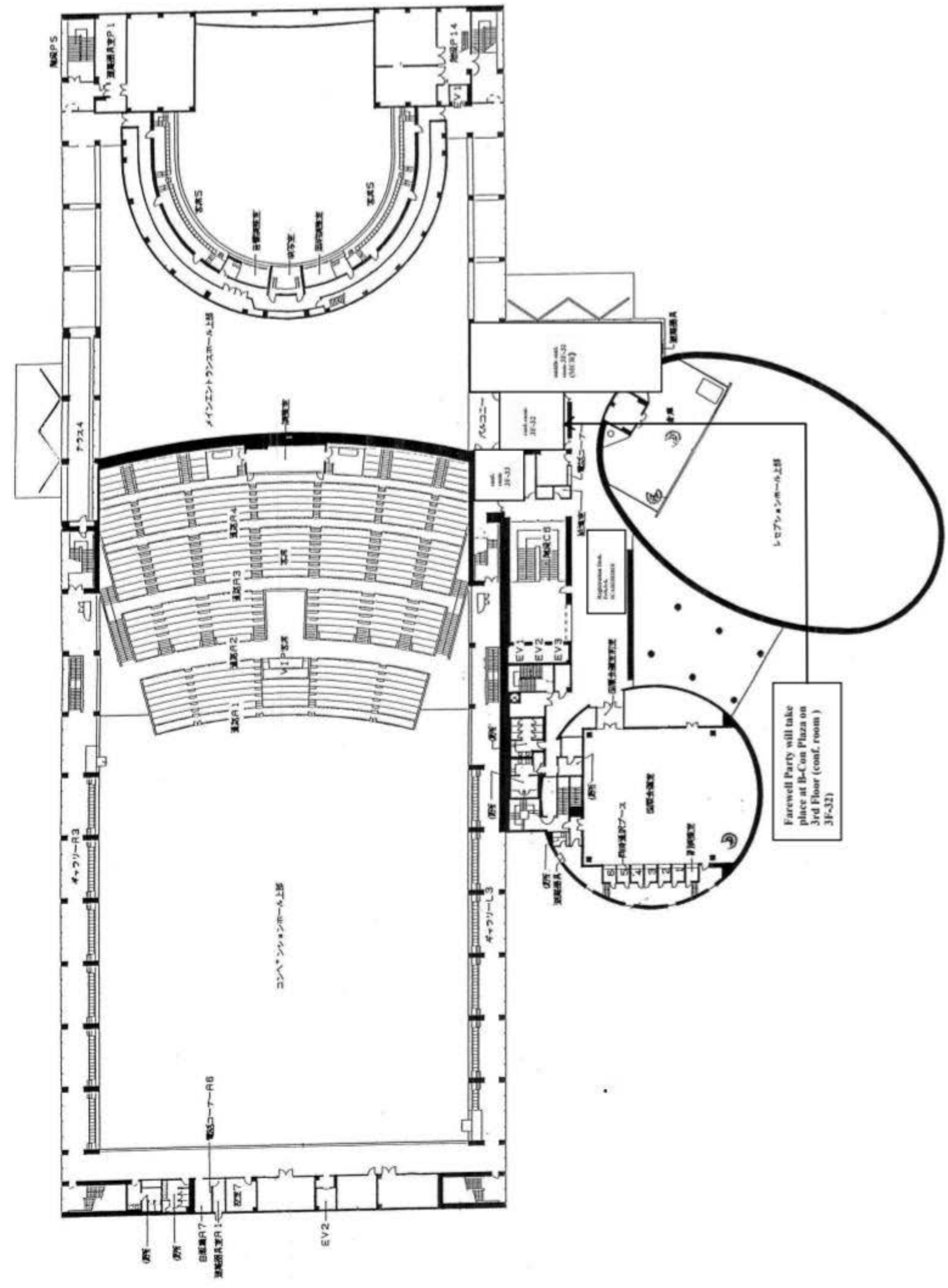
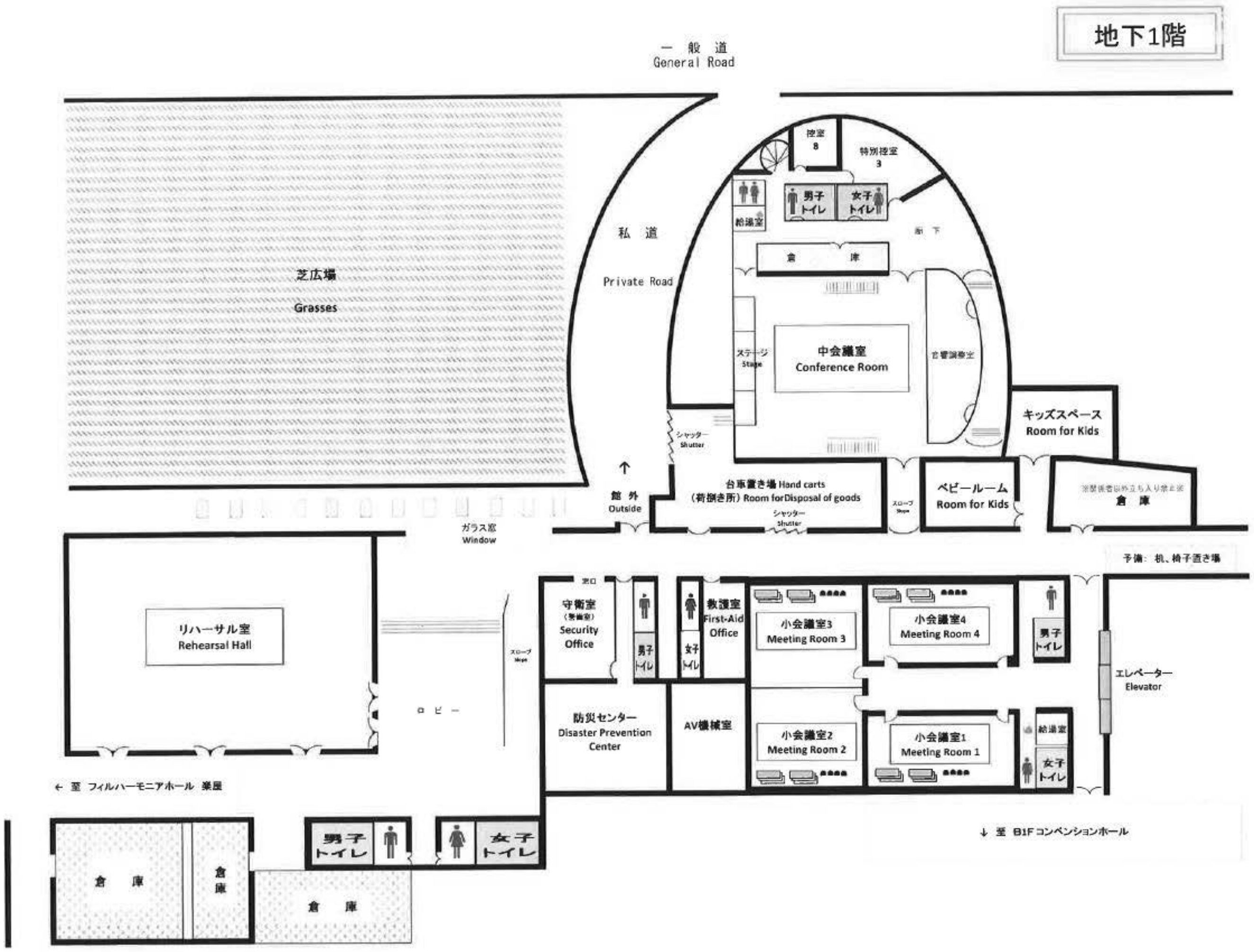
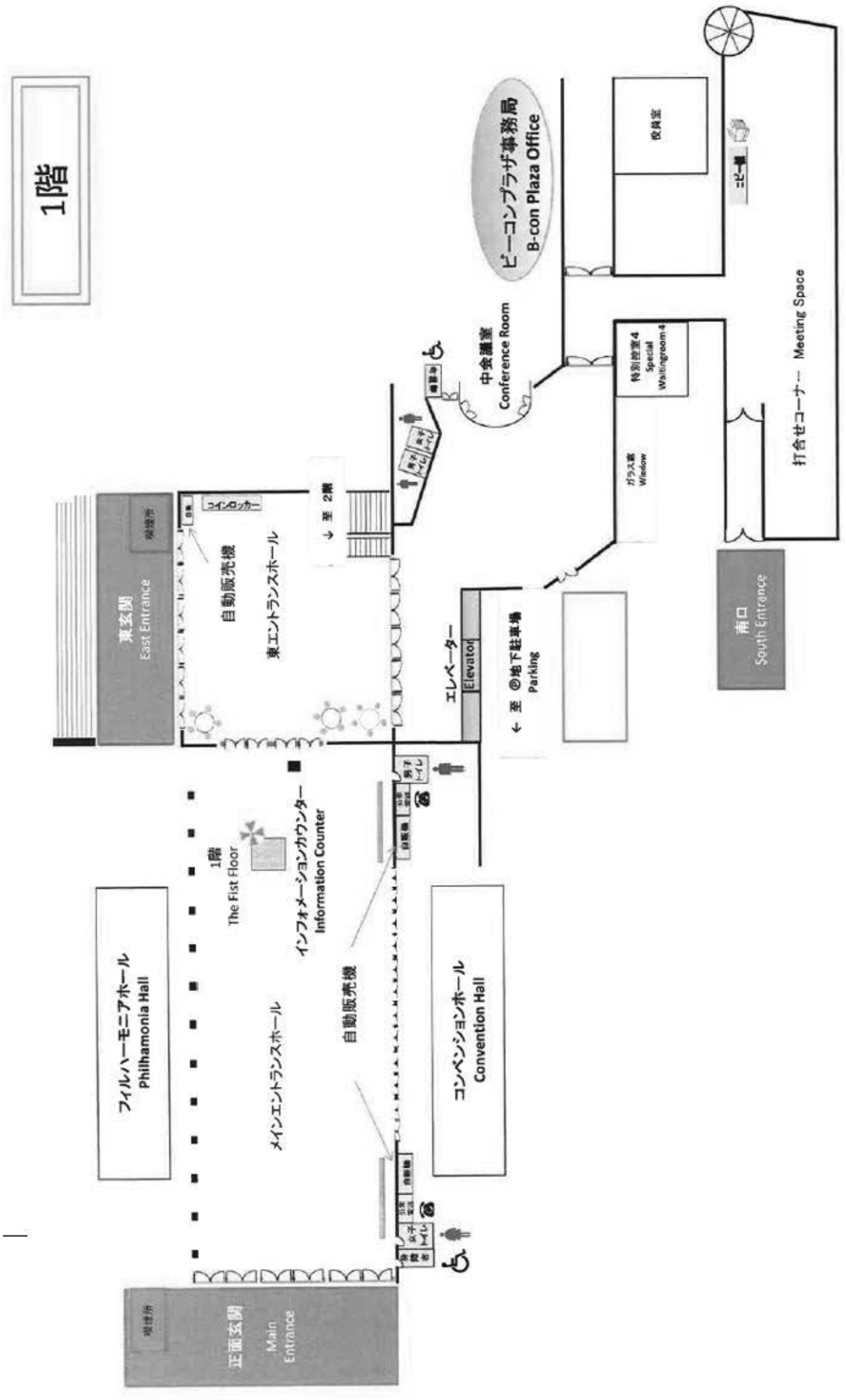

屋外階段3
ドライエリア
通用口
ドライエリア
楽屋入口
ローディングスペース
搬入口
楽屋5
楽屋4
楽屋3
楽屋2
楽屋1
主催者控室
舞台事務室3
舞台事務室2
給湯室R3
シャワー室
廊下
給湯室
階段
便所
自販機
電話コーナー
階段P3
舞台上部
ホワイエ
控室1
控室2
控室3
控室4
可動席R1
可動席R2
コンベンションホール
EV
EV1
EV2
EV3
conf. room B1(1)
conf. room B1(2)
conf. room B1(3)
conf. room B1(4)
RV編集室
防災センター
リハーサル室ロビー
ロッカー室
リハーサル室
守衛室1
通用口
搬入口
階段C2
レストラン事務室
middle conf. room B1(MCR)
RVコントロールルーム
給湯室

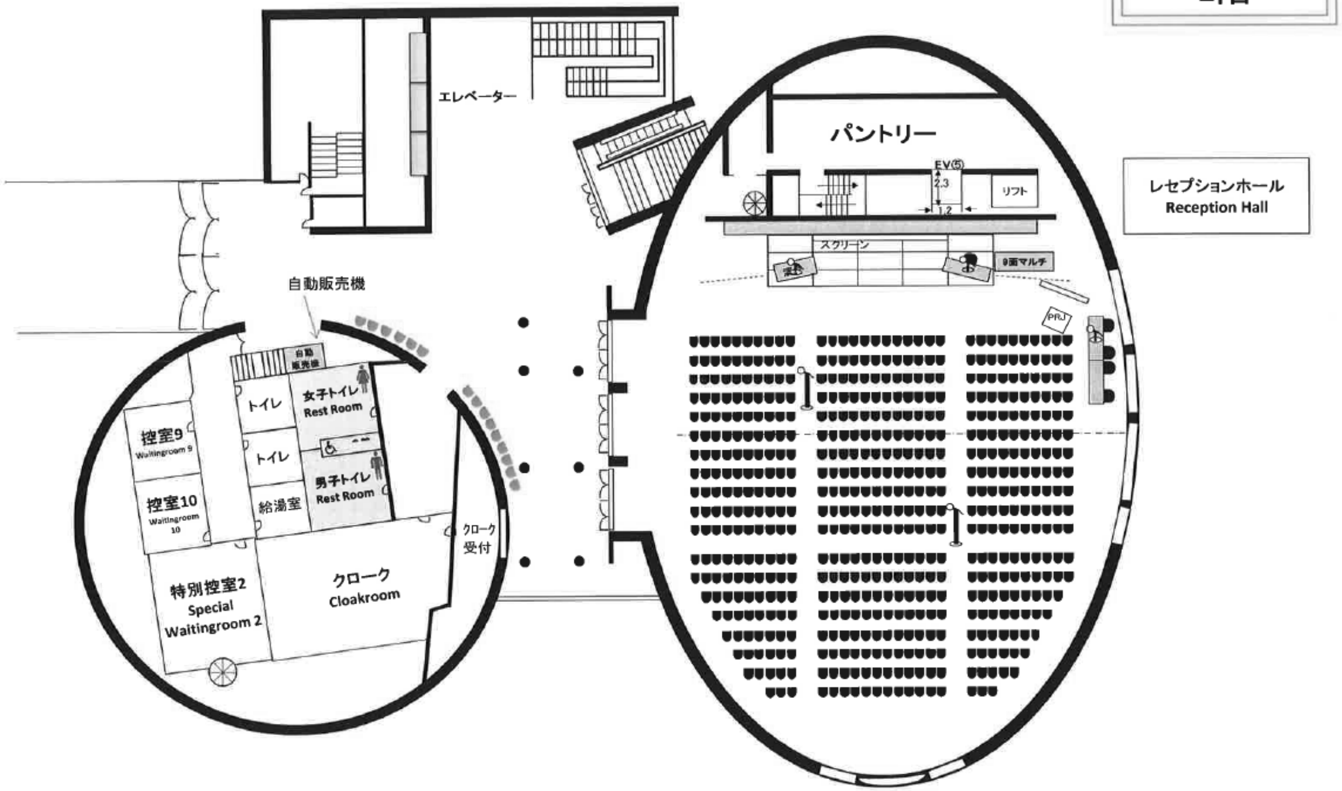

Farewell Party will take place at B-Con Plaza on 3rd Floor (conf. room) 3F-32)
メインエントランスホール上部
コンベンションホール上部
レセプションホール上部
ギャラリーR3
ギャラリーL3
テラス4
バルコニー
EV1
EV2
EV3

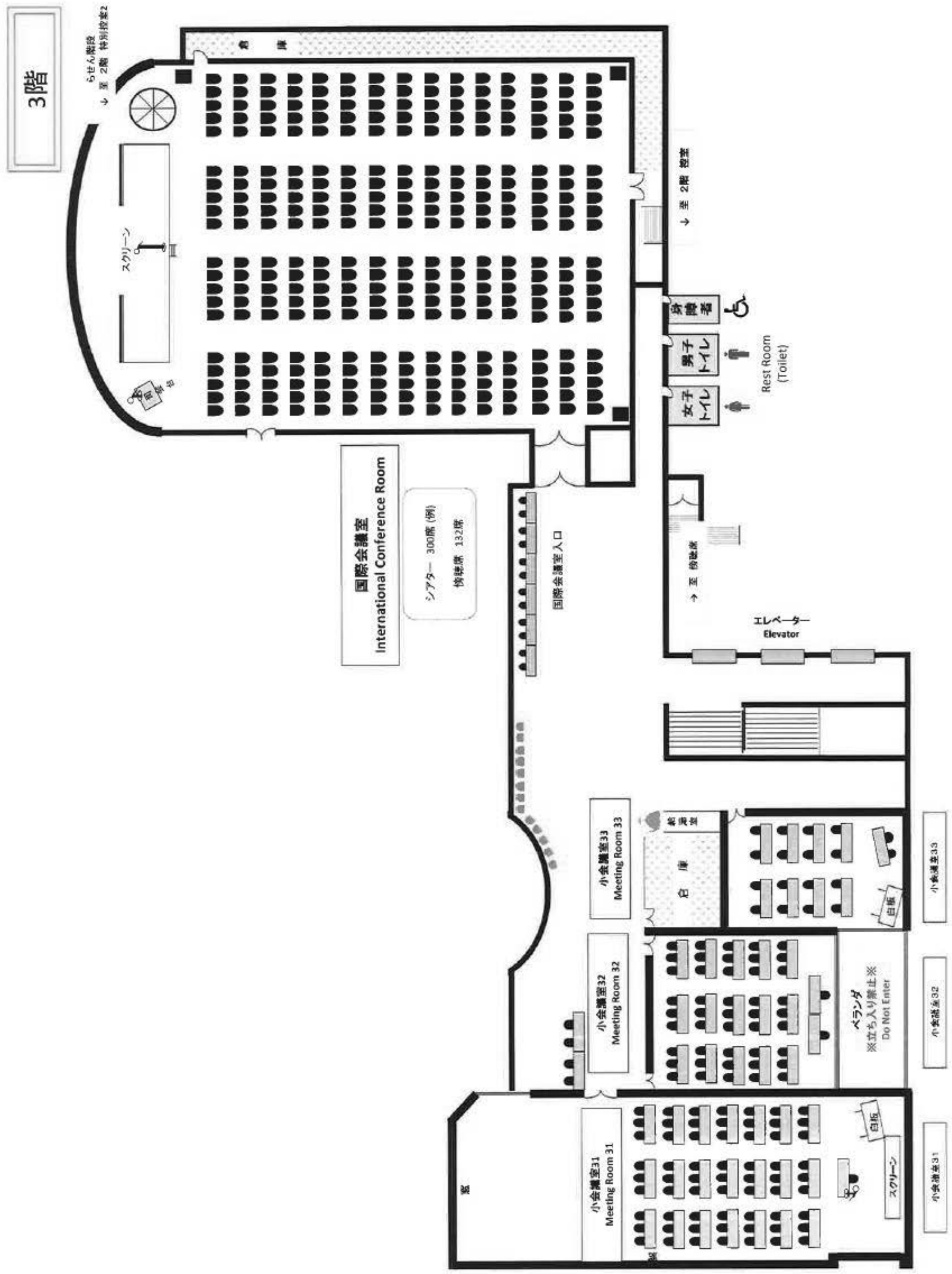
3F


地下1階
一般道
General Road
芝広場
Grasses
私道
Private Road
控室
8
特別控室
3
男子
トイレ
女子
トイレ
給湯室
廊下
倉庫
ステージ
Stage
中会議室
Conference Room
音響調整室
キッズスペース
Room for Kids
シャッター
Shutter
館外
Outside
台車置き場 Hand carts
（荷捌き所）Room for Disposal of goods
シャッター
Shutter
スロープ
Slope
ベビールーム
Room for Kids
※関係者以外立ち入り禁止※
倉庫
ガラス窓
Window
予備：机、椅子置き場
リハーサル室
Rehearsal Hall
窓口
守衛室
（受付室）
Security
Office
男子
トイレ
女子
トイレ
救護室
First-Aid
Office
小会議室3
Meeting Room 3
小会議室4
Meeting Room 4
男子
トイレ
エレベーター
Elevator
スロープ
Slope
ロビー
防災センター
Disaster Prevention
Center
AV機械室
小会議室2
Meeting Room 2
小会議室1
Meeting Room 1
給湯室
女子
トイレ
← 至 フィルハーモニアホール 楽屋
↓ 至 B1F コンベンションホール
男子
トイレ
女子
トイレ
倉庫
倉庫
倉庫


1階
ビーコンプラザ事務局
B-con Plaza Office
役員室
コピー機
中会議室
Conference Room
特別控室4
Special Waitingroom 4
打合せコーナー
Meeting Space
ガラス窓
Window
南口
South Entrance
東玄関
East Entrance
喫煙所
コインロッカー
自動販売機
東エントランスホール
↓ 至 2階
エレベーター
Elevator
← 至 ⓟ地下駐車場
Parking
男子トイレ
女子トイレ
1階
The Fist Floor
インフォメーションカウンター
Information Counter
フィルハーモニアホール
Philhamonia Hall
メインエントランスホール
自動販売機
コンベンションホール
Convention Hall
正面玄関
Main Entrance
喫煙所

2階


エレベーター
パントリー
EV⑤
2.3
1.2
リフト
スクリーン
9面マルチ
PRJ
レセプションホール
Reception Hall
自動販売機
自動販売機
トイレ
トイレ
給湯室
女子トイレ
Rest Room
男子トイレ
Rest Room
控室9
Waitingroom 9
控室10
Waitingroom 10
特別控室2
Special Waitingroom 2
クローク
Cloakroom
クローク受付


3階
らせん階段
↓至 2階 特別控室2
スクリーン
倉庫
↓至 2階 控室
身障者
男子トイレ
女子トイレ
Rest Room
(Toilet)
国際会議室
International Conference Room
シアター 300席 (例)
傍聴席 132席
国際会議室入口
→至 傍聴席
エレベーター
Elevator
小会議室33
Meeting Room 33
給湯室
倉庫
白板
小会議室32
Meeting Room 32
ベランダ
※立ち入り禁止※
Do Not Enter
小会議室31
Meeting Room 31
スクリーン
白板
小会議室33
小会議室32
小会議室31