

ICAROB 2020

PROCEEDINGS OF THE 2020 INTERNATIONAL CONFERENCE ON ARTIFICIAL LIFE AND ROBOTICS

January 13-16, 2020 B-Con Plaza, Beppu, Oita, JAPAN 25th AROB International Meeting Series

Editor-in-Chief

Masanori Sugisaka

Editors: Yingmin Jia, Takao Ito, Ju-Jang Lee
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January 13-16, 2020 B-Con Plaza, Beppu, Oita, JAPAN 25th AROB International Meeting Series

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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



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Ltd., Japan)
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University, UK)

Masanoti Lugicoka

Masanori Sugisaka

General Chair of ICAROB

It is my great honor to invite you all to The 2020 International Conference on Artificial Life and Robotics (ICAROB 2020).

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-Web of Science** now. From now on, ALife Robotics Corporation Ltd. is in charge of management. This year we have The 2020 International Conference on Artificial Life and Robotics (ICAROB2020) (25th 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 (ICAROB2020) 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

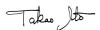
It is my great pleasure to invite you to The 2020 International Conference on Artificial Life and Robotics (ICAROB 2020), in B-Con Plaza, Beppu, Oita, Japan from January 13 to 16, 2020.

ICAROB develops from the AROB that was created in 1996 by Prof. Masanori Sugisaka and will celebrate her 25th birthday in 2020. So far many important results have been presented at the past meetings and have a profound impact on artificial life and robotics. Doubtless, it is really one of the most famous international conferences in the field of artificial intelligence 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

Co General Chair of ICAROB

It is my great honor to invite you all to the 2020 International Conference on Artificial Life and Robotics (ICAROB 2020), to the wonderful city of Beppu, Oita city, Oita Prefecture, Japan.

The ICAROB has its long history. First launched in 1996 as ISAROB, this former organization of ICAROB, was developed under the strong leadership and yeoman efforts of the President—the internationally famous Professor Masanori Sugisaka, who is widely acknowledged as the father of AROB. Our symposium has brought together many research scholar, faculty members, and graduate students from all over the world, and published many manuscripts in high-quality proceedings as well as highly-reputed journals every year.

Over the years, dramatic improvements have been made in the field of artificial life and its applications. ICAROB has provided a foundation for unifying the exchange of scientific information on the study of man-made systems that exhibit the behavioral characteristics 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, innovative ideas, and valuable information about artificial intelligence, complex systems theories, robotics, and management of technology.

The conference site is the 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. Do enjoy your stay and take your time to visit Beppu, Oita city.

I eagerly look forward to personally meeting you in Beppu, Oita city, during the ICAROB 2020 and to sharing a most pleasant, interesting and fruitful conference with you. Do come and make this conference a fruitful, productive as well as enjoyable event.



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 7th ICAROB 2020 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 7th ICAROB.

I'm looking forward to meeting you at the 7th ICAROB in Beppu, Oita Prefecture and wishing you all the best.

GENERAL SESSION TOPICS

GS1 Neural Networks (6)	GS2 Control Techniques (5)
GS3 Vision & Image Processing (4)	GS4 Robotics 1 (4)
GS5 Robotics 2 (4)	GS6 Application Techniques (9)
GS7 Poster (4)	

ORGANIZED SESSION TOPICS

OS1 Machine vision and Mobile robot (4)	OS2 Advanced Control (4)
OS3 Intelligent Control (4)	OS4 Intelligent Life and Systems (7)
OS5 Artificial Life and Robotics (7)	OS6 Theory and Implementation of Neuromimetic Systems (4)
OS7 Robotic Manipulation (4)	OS8 Advanced Research of Engineering and Management (4)
OS9 Recognition and Control (19)	OS10 Al Applications (8)
OS11 System and Control (16)	OS12 Advances in Theory and Education on Control (4)
OS13 Natural Computing (5)	OS14 Software Development Support Method (5)
OS15 Recognition and System (11)	OS16 Media Information Processing and Artificial Intelligence (4)
OS17 Machine Learning Technologies for Human Understanding (2)	OS18 Service Robotics (7)
OS19 Advanced Information Processing Applications (5)	OS20 Artificial Intelligence for Embedded Systems and Robotics (5)
OS21 Mathematical Informatics (4)	OS22 Robot Competitions for Social Contribution(5)
OS23 Advances in Field Robotics and Their Applications (5)	OS24 Robot Intelligence and Factory Automation (6)

The 2020 International Conference on Artificial Life and Robotics (ICAROB2020), B-Con Plaza, Jan. 13-16, Beppu, Oita, Japan, 2020

1/13(Mon.)	17:30-19:30	Welcome Party (Beppu Kamenoi Hotel)			
1/14(Tue.) -	1/16(Thu.)	ICAROB Secretariat			
1/16(Thu.)		Farewell Party (Conference Site: 3F, Meeting Room 32)			

TIME TABLE (1/14)

1/14(Tue.)	Conference Room	Meeting Room 31	Meeting Room 32	Meeting Room 33	Meeting Room 1	Meeting Room 4
8:40-	Registration (3F)					
9:00-10:00		OS5 Artificial Life and Robotics (7) Chair: Chung-Wen Hung Will be end at 10:45	OS22 Robot Competitions for Social Contribution(5) Chair: Yasunori Takemura Will be end at 10:15	OS6 Theory and Implementation of Neuromimetic Systems (4) Chair: Takashi Kohno	OS20 Artificial Intelligence for Embedded Systems and Robotics (5) Chair: Hakaru Tamukoh Will be end at 10:15	OS12 Advances in Theory and Education on Control (4) Chair: Takao Sato
10:00-10:20			Coff	fee break		
10:20-10:50			Opening Ceremo	ny (Conference Room)		
11:00-12:00	Chair: Evgeni Magid Plenary Speech PS-1(Conference room) Takashi Kohno					
12:00-13:00			ı	Lunch		
13:00-14:00	Chair: Ju-Jang Lee Plenary Speech PS-2(Conference Room) Eiji Hayashi					
14:00-14:20	Coffee break					
14:20-15:20	Chair: Jangmyung Lee Invited Speech IS-2, IS-3(Conference Room) Henrik Hautop Lund, Luigi Pagliarini					
15:20-15:40	Coffee break					
15:40-17:55		GS6 Application Techniques (9) Chair: Hazry Desa	OS4 Intelligent Life and Systems (7) Chair: Kuo-Hsien Hsia OS18-1 Service Robotics (2) Chair: Evgeni Magid	OS 23 Advances in Field Robotics and Their Applications (5) Keisuke Watanabe	OS13 Natural Computing (5) Chair: Marion Oswald	OS24 Robot Intelligence and Factory Automation (6) Chair: Eiji Hayashi

Meeting Room 31: Committee waiting room and Rest room

TIME TEBLE (1/15)

1/15(Wed.)	Conference Room	Meeting Room 31	Meeting Room 32	Meeting Room 33	Meeting Room 1	Meeting Room 4
8:40-	Registration					
9:00-10:00			OS7 Robotic Manipulation (4) Chair: Kensuke Harada	GS7 Poster (4) Chair: Jiwu Wang	OS18-2 Service Robotics (5) Chair: Evgeni Magid Will be end at 10:15	GS4 Robotics 1 (4) Chair: Noritaka Sato
10:00-10:15			Co	ffee break		
10:15-11:15			OS3 Intelligent Control (4) Chair: Yingmin Jia	OS8 Advanced Research of Engineering and Management (4) Chair: Takao Ito		GS5 Robotics 2 (4) Chair: Hidehiko Yamamoto
11:15-11:30			Co	ffee break		
11:30-12:30	Chair: Mohamed Rizon Plenary Speech PS-4 (Conference Room) Naoki Suganuma					
12:30-13:30	Lunch					
13:30-14:30	Chair: Marion Oswald Plenary Speech PS-3 (Conference Room) Jeffrey Johnson					
14:30-14:45	Coffee break					
14:45-16:15			OS10-1 Al Applications (6) Chair: Mohamed Rizon	OS16 Media Information Processing and Artificial Intelligence (4) Chair: Yasunari Yoshitomi		GS1 Neural Networks (6) Chair: Akira nakamura
16:15-16:30	Coffee break					
16:30-17:45			OS10-2 AI Applications (2) Chair: Mohamed Rizon	OS19 Advanced Information Processing Applications (5) Chair: Toru Hiraoka		GS2 Control Techniques (5) Chair: Chian C. Ho
18:30-20:30	Banquet: Beppu Kamenoi Hotel					

Meeting Room 31: Committee waiting room and Rest room (available from 9:00 a.m.)

TIME TABLE (1/16)

1/16(Thu.)	Meeting Room 31	Meeting Room 32	Meeting Room 33	Meeting Room 1	Meeting Room 4	
8:40-	Registration					
9:00-10:15		OS2 Advanced Control (4) Chair: Yingmin Jia	OS14 Software Development Support Method (5) Chair: Tetsuro Katayama			
10:15-10:30			Coffee break			
10:30-11:00	Chair: Yingmin Jia Invited speech IS-1(Meeting Room 31) Jangmyung Lee					
11:00-12:00			Lunch			
12:00-13:15	OS11 System and Control (16) Chair: Yizhun Peng	OS1 Machine vision and Mobile robot (4) Chair: Wei Liu	OS17 Machine Learning Technologies for Human Understanding (2) Chair: Masao Kubo			
13:15-13:30	Coffee Break					
13:30-14:45	OS9 Recognition and Control (19) Chair: Fengzhi Dai	OS21 Mathematical Informatics (4) Chair: Makoto Sakamoto	GS3 Vision & Image Processing (4) Chair: Joo Kooi Tan			
	l	Farewell Party (15:00)-15:30) Meeting Room 32		1	

Meeting Room 31: Committee waiting room and Rest room(available from 9:00 a.m.)

The 2020 International Conference on ARTIFICIAL LIFE AND ROBOTICS (ICAROB2020)

<u>January 13 (Monday)</u>

17:30-19:30 Welcome Party (Beppu Kamenoi Hotel)

January 14 (Tuesday)

10:20-10:50

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, China)3. Co-General Chairman of ICAROB TaKao Ito (Hiroshima University, Japan)

4. Co-General Chairman of ICAROB Ju-Jang Lee (KAIST, Korea)

January 15 (Wednesday)

Banquet: Beppu Kamenoi Hotel

18:30-20:30

Chair: Takao Ito (Hiroshima University, Japan)

Welcome Addresses

Prof. Yingmin Jia (Beihang University, China)

Prof. Ju-Jang Lee (KAIST, Korea)

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

Prof. Jangmyung Lee (Pusan National University, Korea)

Prof. Mohd Rizon (University of UCSI, Malaysia)

TECHNICAL PAPER INDEX

January 14 (Tuesday)

8:40-Registration

Conference Room

10:20-10:50 Opening Ceremony

Chair: Marion Oswald (Technische Universität Wien, Austria)

11:00-12:00

Plenary Speech PS-1

Chair: Evgeni Magid (Kazan Federal University, Russia)

PS-1 *Towards neuromimetic computing* **Takashi Kohno** (University of Tokyo, Japan)

13:00-14:00

Plenary Speech PS-2

Chair: Ju-Jang Lee (KAIST, Korea)

PS-2 Innovative Robot - Robot/AI for Factory Automation-**Eiji Hayashi** (Kyushu Institute of Technology, Japan)

14:20-14:50

Invited session IS-2

Chair: Jangmyung Lee (Pusan National University, Korea)

IS-2 Body and Brain Training with Big Data and AI **Henrik Hautop Lund** (Technical University of Denmark, Denmark)

14:50-15:20

Invited session IS-3

Chair: Jangmyung Lee (Pusan National University, Korea)

IS-3 PixelBeing

Luigi Pagliarini^{1,2,3}, Henrik Hautop Lund¹

(²Academy of Fine Arts of Macerata, ³ ISIA Design, Italy), (¹Technical University of Denmark, Denmark)

Meeting Room 31

9:00-10:45 OS5 Artificial Life and Robotics (7)

Chair: Chung-Wen Hung (National Yunlin University of Science and Technology, Taiwan)
Co-Chair: Ching-Chun Chuang (National Yunlin University of Science and Technology, Taiwan)

- OS5-1 An FSK based Industrial Analog Signal Transmission
 Po-Yun Shih, Chung-Wen Hung, Chau-Chung Song
 (National Yunlin University of Science and Technology, Taiwan)
- OS5-2 X-Y Platform Synchronous Control with CANopen
 Yu-Ming Guan, Chung-Wen Hung, Shih-Ting Yu, Yu-Kai Chen
 (National Yunlin University of Science and Technology, Taiwan)
- OS5-3 A PFC Converter with Voltage Double Characteristic for Universal Input Voltage Applications
 Ching-Chun Chuang, Hung-Chi Lee, Chih-Chiang Hua, Chih-Wei Chuang, Chuan-Ming Niu
 (National Yunlin University of Science and Technology, Taiwan)
- OS5-4 Design of a Low-pulse High-current LLC Resonant Converter for EDM Applications
 Yu-Kai Chen, Min-Feng Lee, Yung-Chun Wu, and Jui-Yang Chiu
 (National Formosa University, Taiwan)
- OS5-5 Networking Integration and Monitoring System with CANopen Controller for Intelligent Production Line of Tool Machine
 Chau-Chung Song, Yu-Wei Ho, Chen-Pang Chen, Yu-Kai Chen
 (National Formosa University, Taiwan)
- OS5-6 Illumination Manipulation and Specular Reflection Analysis of Still Image with Single Object
 Hsuan T. Chang, Chi-Jie Chen
 (National Yunlin University of Science and Technology, Taiwan)
- OS5-7 Robotics Education for the 2019 MakeX Robotics Competition
 Jia-Ming Hsiao (Far East University, Taiwan)

15:40-17:40 GS6 Application Techniques (9)

Chair: Hazry Desa (Universiti Malaysia Perlis, Malaysia)

- GS6-1 A Promoting Method of Role Differentiation Using the Learning Rate Getting Periodically Negative Value in Multi-agent Reinforcement Learning

 Masato Nagayoshi, Simon Elderton (Niigata College of Nursing, Japan),

 Hisashi Tamaki (Kobe Univ. Japan)
- GS6-2 Verification of a Combination of Gestures Accurately Recognized by Myo Using Learning Curves
 Kengo Kitakura, Hideyuki Tanaka (Hiroshima University, Japan)

- GS6-3 Augmentative and Alternative Communication Device Based on Head Movement to Aid Paralyzed Victims with Speech Disabilities

 Vihanga Ashinsana Wijayasekara, Torin Wirasingha
 (Informatics Institute of Technology, Sri Lanka)
- GS6-4 The research about editing system of performance information for player piano. —Make inferences about whole musical composition by using DP matching system-Mami Ezaki, Eiji Hayashi (Kyushu Institute of Technology, Japan)
- GS6-5 Evaluating Public Perception using Fuzzy Logic: A case study of Praeksa Mai dumpsite in Samut Prakan, Thailand
 Sun Olapiriyakul, Khemika Kongpetch
 (Sirindhorn International Institute of Technology, Thammasat University, Thailand)
- GS6-6

 A Development of a Model CubeSat with an Amateur Radio Transceiver for Education on Satellite Communication

 Masahiro Tokumitsu, Kentarou Konishi (National Institute of Technology, Yonago College, Japan),
 Taku Takada (National Institute of Technology, Kochi College, Japan)
 Fumio Asai (Member of the Radio Amateur Satellite Corporation)
 Makoto Wakabayashi (National Institute of Technology, Niihama College, Japan)
- GS6-7 Performance Evaluations on Data Estimation Technique with Statistical Properties of Telemetry Data for Corrupted Data in Amateur Satellite Communication
 Yusuke Teranishi, Masahiro Tokumitsu (National Institute of Technology, Yonago College, Japan)
 Taku Takada (National Institute of Technology, Kochi College, Japan)
 Fumio Asai (Member of the Radio Amateur Satellite Corporation)
 Makoto Wakabayashi (National Institute of Technology, Niihama College, Japan)
- GS6-8 Heritage Building Design Properties: Development of As Built Drawing by UAV Application via 3D Laser Scanner
 Hazry. D, Azizan. M. A, Noriman. N.Z, Romeli. N (Universiti Malaysia Perlis, Malaysia)
- GS6-9 A Virtual System for Measurements and Analysis of the Respiratory Sounds for Diagnosis of Respiratory System
 Ali S. AlMejrad (King Saud University, Kingdom of Saudi Arabia

Meeting Room 32

9:00-10:15 OS22 Robot Competitions for Social Contribution (5)

Chair: Yasunori Takemura (Nishinippon Institute of Technology, Japan)

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

OS22-1 Real-Time Self Localization for Autonomous Robot of RoboCup MSL Kaori Watanabe, Yuehang Ma, Tetsuya Yoshida, Hidekazu Suzuki (Tokyo Polytechnic University, Japan)

- OS22-2 Behavior Selection System for Soccer Robot Using Neural Network

 Moeko Tominaga¹, Yasunori Takemura², Kazuo Ishii¹

 (¹Kyushu Institute of Technology, ²Nishinippon Institute of Technology, Japan)
- OS22-3 Development of the Auto Measurement System for Cedars in a Forest Using a Drone Keiji Kamei, Masahiro Kaneoka, Ken Yanai, Masaya Umemoto, Hiroki Yamaguchi, Kazuki Osawa (Nishinippon Institute of Technology, Japan)
- OS22-4 Report on the 5th Tomato-harvesting Robot Competition
 Yasunori Takemura¹, Takayuki Matsuo², Takashi Sonoda¹, Kazuo Ishii³
 (¹Nishinippon Institute of Technology, ²National Institute of Technology, Kitakyushu College, ³Kyushu Institute of Technology, Japan)
- OS22-5 Reports on the 7th Underwater Robot Festival in Kitakyushu
 Yuya Nishida¹, Takashi Sonoda², Takayuki Matsuo³, Shinsuke Yasukawa¹, Masanori Sato⁴,
 Yasunori Takemura², Kazuo Ishii¹
 (¹Kyushu Institute of Technology, ²Nishinippon Institute of Technology, ³National Institute of Technology, Kitakyushu College, ⁴Nagasaki Institute of Applied Science, Japan)

15:40-17:25 OS4 Intelligent Life and Systems (7)

Chair: Kuo-Hsien Hsia (National Yunlin University of Science and Technology, Taiwan) **Co-Chair: I-Hsien Liu** (National Cheng-Kung University, Taiwan)

- OS4-1 Development of the IoT Module with AI Function Using STM32 Chip Jr-Hung Guo, Evgeni Magid*, Kuo-Hsien Hsia, Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan) (*Kazan Federal University, Russia)
- OS4-2 Markerless Indoor/Outdoor Augmented Reality Navigation Device Based on ORB-Visual-Odometry Positioning estimation and ORB-Visual-Mapping Image Registration
 Chian C. Ho, Guan-Jie Wang (National Yunlin University of Science and Technology, Taiwan)
- OS4-3 Apply Adaptive Control Approach for Mobile Robot Path Following Chun-Chi Lai, Chia-Jen Lin, Kuo-Hsien Hsia, Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan)
- OS4-4 Malware Classification Using Deep Learning
 Cheng-Hsiang Lo, Ta-Che Liu, I-Hsien Liu, Jung-Shian Li, Chuan-Gang Liu, Chu-Fen Li
 (National Cheng Kung University, Taiwan)
- OS4-5 Robust Control of Nonholonomic Wheeled Mobile Robot with Hybrid Controller Approach
 Ho-Nien Shou (National Yunlin University of Science and Technology, Taiwan)

OS4-6 Design and Implementation of Microsatellite Detumbling Control with PWPF: Verification Using

Ho-Nien Shou (Air Force Institute of Technology, Taiwan)

OS4-7 A Study of Applying Computer-assisted Language Learning to English Course for Junior College Students in Taiwan
Shu-Hua Huang, I-Hsien Liu (Air Force Institute of Technology, Taiwan)

17:25-17:55 OS18-1 Service Robotics (2)

Chair: Evgeni Magid (Kazan Federal University, Russia)

Co-Chair: Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan)
Co-Chair: Kuo-Hsien Hsia (National Yunlin University of Science and Technology, Taiwan)

OS18-6 Pick and Place of Large Object Based on 3D vision
Hsien-Huang P. Wu, Jia-Kun Xie (National Yunlin University of Science & Technology, Taiwan)

OS18-7 Application of the MyRIO Based Mobile Robot Using Vision System Bo-Jun Yang¹, Kuo-Hsien Hsia¹, Kuo-Lan Su¹, Evgeni Magid² (¹National Yunlin University of Science & Technology, Taiwan) (²Kazan Federal University, Russia)

Meeting Room 33

9:00-10:00 OS6 Theory and Implementation of Neuromimetic Systems (4)

Chair: Takashi Kohno (University of Tokyo, Japan)
Co-Chair: Timothée Levi (University of Tokyo, Japan)

- OS6-1 Real –time pattern recognition implementation on FPGA in multi-SNNs
 Xia Yang, Kazuyuki Aihara, Timothée Levi, Takashi Kohno (University of Tokyo, Japan)
- OS6-2 Experimental results of a biomimetic silicon synaptic circuit
 Ashish Gautam, Takashi Kohno (University of Tokyo, Japan)
- OS6-3 Towards Modeling Cholinergic Modulation for Neuromorphic Computing Naruaki Takano, Takashi Kohno (University of Tokyo, Japan)
- OS6-4 Bioelectrical Signal Analysis of Mouse Cardiomyocyte Culture recorded on Thin-Film-Transistor
 Sensor Arrays

Anne-Claire Eiler, Junichi Sugita, Satoshi Ihida, Hiroshi Toshiyoshi, Katsuhito Fujiu, Thimothée Lévi, Agnes Tixier-Mita (The University of Tokyo, Japan)

15:40-17:10 OS23 Advances in Field Robotics and Their Applications (6)

Chair: Keisuke Watanabe (Tokai University)

Co-Chai: Kazuo Ishii (Kyushu Institute of Technology)

OS23-1	Sea Trials for Benthos Sampling Using Autonomous Underwater Vehicle Yuya Nishida ¹ , Shinsuke Yasukawa ¹ , Takashi Sonoda ² , Keisuke Watanabe ³ , Kazuo Ishii ¹ (¹Kyushu Institute of Technology, ²Nishinippon Institute of Technology, ³Tokai University, Japan)
OS23-2	Field Experiments of Underwater Image Transmission for AUV Shinsuke Yasuakwa ¹ , Yuya Nishida ¹ , Jonghyun Ahn ² , Takashi Sonoda ³ , Kentaro Yanagise ¹ , Keisuke Watanabe ⁴ , Kazuo Ishii ¹ (¹Kyushu Institute of Technology, ²Hiroshima Institute of Technology, ³Nishinippon Institute of Technology, ⁴Tokai University, Japan)
OS23-3	Development of Subsea Creature Monitoring Station for AUV Exploration Assistance Keisuke Watanabe ¹ , Koshi Utsunomiya ¹ , Amir Sadiq ¹ , Daichi Hiramaki ¹ , Kyoko Takashima ¹ , Kazuo Ishii ² (¹ Tokai University, ² Kyushu Institute of Technology, Japan)
OS23-4	Consideration on Installation Method of In-situ Drilling Platform through Simulations(withdraw) Keisuke Watanabe (Tokai University, Japan)
OS23-5	Environment Map Generation in Forest Using Field Robot Noboru Takegami, Eiji Hayashi and Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)
OS23-6	Graph-Based Path Generation for Area Coverage Ayumu Tominaga, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)
	Room 1 5 OS20 Artificial Intelligence for Embedded Systems and Robotics (5) Karu Tamukoh (Kyushu Institute of Technology, Japan)

OS20-1	A Hardware-Oriented Echo State Network for FPGA Implementation Kentaro Honda, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)
OS20-2	Network with Sub-Networks Ninnart Fuengfusin, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)
OS20-3	A Study on Fast Pick-and-Place Method for Home Service Robots using 3D point clouds Tomohiro Ono, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)
OS20-4	Acceleration of training dataset generation by 3D scanning of objects and Evaluation of recognition accuracy Yushi Abe, Yutaro Ishida, Tomohiro Ono, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)
OS20-5	Anomaly Detection Using Autoencoder Trained with Reversed Color Models Obada Al aama, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

15:40-16:55 OS13 Natural Computing (5)

Chair: Marion Oswald (TU Wien, Austria)

Co-Chair: Yasuhiro Suzuki (Nagoya University, Japan)

OS13-1 Emergence of Adaptive Behavior in Simulations by Using Abstract Rewriting System on Multisets

Yasuhiro Suzuki (Nagoya University, Japan)

OS13-2 Implementing the Euler and Runge-Kutta Method by Using Abstract Rewriting System on Multisets

Yasuhiro Suzuki (Nagoya University, Japan)

OS13-3 Extracting Tactile Sensation from Body Movement and Converting it into Vibrotactile Using the Tactile Score Bit

Yasuhiro Suzuki (Nagoya University, Japan)

- OS13-4 A Tactile Sense Centered Virtual Reality Game by Using Biometric Feedback Yoshihito Ushida, Yasuhiro Suzuki (Nagoya University, Japan)
- OS13-5 A Method of Extracting Sensibility from Time Series Data and Converting it to Vibrotactile Yasuhiro Suzuki (Nagoya University, Japan)

Meeting Room 4

9:00-10:00 OS12 Advances in Theory and Education on Control (4)

Chair: Takao Sato (University of Hyogo, Japan)

Co-Chair: Masanori Takahashi (Tokai University, Japan)

- OS12-1 Proposal teaching materials the concepts and principles of machine learning for use in education Shinichi Imai, Yusuke Shiba (Tokyo Gakugei University, Japan)
- OS12-2 Objective Evaluation of the Educational Effects on the Feedforward, Feedback and PID Control Yugo Tokura, Takao Sato, Ryota Yasui, Natsuki Kawaguchi, Nozomu Araki and Yasuo Konishi (University of Hyogo, Japan)
- OS12-3 Programming Learning of Temperature Control for Science Class of Elementary School Yoshihiro Ohnishi¹, Takeshi Nakano², Teruyuki Tamai¹, Shinnosuke Mori¹, Kazuo Kawada³ (¹Ehime University, ²Ehime University Elementary School, ³Hiroshima University, Japan)
- OS12-4 Actuator Fault-Tolerant Control using a Spiking Neuron Model Masanori Takahashi (Tokai University, Japan)

15:40-17:10 OS24 Robot Intelligence and Factory Automation (6)

Chair: Eiji Hayashi (Kyushu Institute of Technology)
Co-Chair: Kazuo Ishii (Kyushu Institute of Technology)

- OS24-1 Deep Object 6-Dof Pose Estimation Using Semantic Pixel-wise Segmentation Victor Pujolle, Eiji Hayashi (Kyushu Institute of Technology, Japan)
- OS24-2 Autoencoder with Spiking in Frequency Domain for Anomaly Detection of Uncertainty Event Umaporn Yokkampon, Sakmongkon Chumkamon, Eiji Hayashi (Kyushu Institute of Technology, Japan)
- OS24-3 Evaluation of the Relationships Between Saliency Maps and Keypoints
 Ryuugo Mochizuki, Kazuo Ishii
 (Kyushu Institute of Technology, Japan)
- OS24-4 Robot Motion and Grasping for Blindfold Handover
 Jiraphan Inthiam, Sackmongkon Chumkamon, Umaporn Yokkampon, Eiji Hayashi
 (Kyushu Institute of Technology, Japan)
- OS24-5 Gait Learning Method for Quadrupedal Robot Using Chaos Time-series Analysis Yuehang Ma, Kaori Watanabe, Hidekazu Suzuki (Tokyo Polytechnic University, Japan)
- OS24-6 Development of Antagonistic High Power Joint Mechanism with Cams
 Katsuaki Suzuki¹, Yuya Nishida¹, Takashi Sonoda², Kazuo Ishii¹
 (¹Kyushu Institute of Technology, ²Nishinippon Institute of Technology, Japan)

January 15 (Wednesday)

8:40-Registration

Conference Room

11:30-12:30

Plenary Speech PS-4

Chair: Mohamed Rizon (UCSI University, Malaysia)

PS-4 Towards fully automated driving in urban areas

Naoki Suganuma (Kanazawa University, Japan)

13:30-14:30

Plenary Speech PS-3

Chair: Marion Oswald (Technische Universität Wien, Austria)

PS-3 Multidimensional Configurations and Strategy in Robot Soccer Ruggero Rossi, **Jeffrey Johnson** (Open University, UK)

Meeting Room 32

9:00-10:00 OS7 Robotic Manipulation (4)

Chair: Kensuke Harada (Osaka University, Japan)
Co-Chair: Tokuo Tsuji (Kanazawa University, Japan)

Co-Chair: Akira Nakamura (AIST, Japan)

- OS7-1 User Interface and Motion Planner for Task Database
 Tokuo Tsuji (Kanazawa University, Japan), Natsuki Yamanobe (AIST, Japan)
 Kensuke Harada (Osaka University/AIST, Japan)
- OS7-2 POMDP Action Planning for 6 DoF object recognition on Humanoid
 Masato Tsuru (Osaka University, Japan), Tomohiro Motoda (Osaka University, Japan)
 Adrien Escande (CNRS-AIST, Japan), Kensuke Harada (Osaka University/AIST, Japan)
- OS7-3 Cost-oriented Planning for Error Recovery in an Automation Plant
 Akira Nakamura¹, Natsuki Yamanobe¹, Ixchel Ramirez Alpizar¹,
 Kensuke Harada^{1,2}, Yukiyasu Domae¹ (¹ AIST, Japan, ² Osaka University, Japan)
- OS7-4 Real-time Planning Robotic Palletizing Tasks using Reusable Roadmaps
 Takumi Sakamoto (Osaka University, Japan), Weiwei Wan (Osaka University/AIST)
 and Kensuke Harada (Osaka University/AIST)

10:15-11:15 OS3 Intelligent Control (4)

Chair: Yingmin Jia (Beihang University (BUAA), China)

Co-Chair: Weicun Zhang (University of Science and Technology Beijing, China)

- OS3-1 No Free Lunch Principle in Agent Swarm Systems: One Case Study
 Yunzhong Song¹, Fengzhi Dai², Huimin Xiao³, Shumin Fei⁴
 (¹Henan Polytechnic University, ²Tianjin University of Science and Technology, ³Henan University of Economics and Law, ⁴South East University, China)
- OS3-2 Analyzing the Controllability and Observability of Discrete-Time Delayed LTI Systems with Data-Based Methods

 Zhuo Wang (Beihang University, China)

OS3-3 An Optimal Collective Control Strategy Based on Vicsek Model
Yongnan Jia, Weicun Zhang, Yue Liu, Qing Li
(University of Science and Technology Beijing, China)

OS3-4 Distributed Rotating Encirclement Control of Strict-Feedback Multi-Agent Systems Using Bearing measurements

Tengfei Zhang, Yingmin Jia (Beihang University (BUAA), China)

14:45-16:15 OS10-1 AI Applications (6)

Chair: Mohamed Rizon (UCSI University, Malaysia)
Co-Chair: Ang Chun Kit (UCSI University, Malaysia)

- OS10-1 Effects of Variable Arm Length on UAV Control Systems
 M. Rizon, CK. Ang, MI. Solihin (UCSI University, Malaysia)
 Zuradzman M. R, H. Desa, Shahriman A. B., Wan Khairunizam(UniMAP, Malaysia)
 I. Zunaidi (University of Sunderland, UK)
- OS10-2 EEG based drowsiness detection using relative band power and short time fourier transform Pranesh Krishnan, Sazali Yaacob, Annapoorni Pranesh Krishnan (UniKL, Malaysia)

 Mohamed Rizon, Ang Chun Kit (UCSI University, Malaysia)
- OS10-3 Mathematical Model Implementation of SPWM fed Three-phase Induction Motor Drive Using MATLAB Simulink
 Amir Rasyadan, Sazali bin Yaacob, Pranesh Krishnan (UniKL, Malaysia)
 Mohamed Rizon, Ang Chun Kit (UCSI University, Malaysia)
- OS10-4 Implementation of X-mean Clustering Algorithm for Wireless Sensor Networks
 Abdelrahman Radwan, Nazhatul Hafizah Kamarudin, Mahmud Iwan Solihin, Hungyang Leong,
 Chun Kit Ang (UCSI University, Malaysia)
- OS10-5 Robust H_∞ controller design for flexible link manipulator based on constrained meta-heuristics optimization algorithms

 Mahmud Iwan Solihin, Lim Wei Hong, Chun Kit Ang, Mohamed Rizon, Abdelrahman Radwan (UCSI university, Malaysia)
- OS10-6 Classification of Facial Nerve Paralysis Based on Regional Evaluation
 Wan Syahirah W Samsudin, Rosdiyana Samad (Universiti Malaysia Pahang, Malaysia)
 Kenneth Sundaraj (Universiti Teknikal Malaysia Melaka, Malaysia)
 Mohamed Rizon (UCSI University, Malaysia)
 Mohd Zaki Ahmad (Hospital Tuanku Ampuan Afzan, Malaysia)

16:30-17:00 OS10-2 AI Applications (2)

Chair: Mohamed Rizon (UCSI University, Malaysia)
Co-Chair: Ang Chun Kit (UCSI University, Malaysia)

OS10-7 Introduction of Forehead Lesion Assessment with House-Brackmann Score for Facial Nerve Paralysis Evaluation

Wan Syahirah W Samsudin, Rosdiyana Samad (Universiti Malaysia Pahang, Malaysia)

Kenneth Sundaraj (Universiti Teknikal Malaysia Melaka, Malaysia)

Mohamed Rizon (UCSI University, Malaysia)

Mohd Zaki Ahmad (Hospital Tuanku Ampuan Afzan, Malaysia)

OS10-8 Intelligent Wearable Biofeedback Fuzzy Logic Based Device for Monitoring and Treatment of Voice Loudness

Ali S. AlMejrad (King Saud University, Kingdom of Saudi Arabia)

Meeting Room 33

9:00-10:00 GS7 Poster (4)

Chair: Jiwu Wang (Beijing Jiaotong University, China)

- POS7-1 The Development and Evaluation of Fig's Leaf Syrup
 Shang-Hui Li, Pei Hi Zheng, I Chih Chiang, Yu Ting Su, Syue Sheng Lin (Far East University, Taiwan)
- POS7-2 The Research and Development of Fruit Puffed Rice
 Shang-Hui Li, Yi-Ru Wang, Yi Ting Liu, En-Yi Lu, Cheng Han Li, Fang Quan Zhang
 (Far East University, Taiwan)
- POS7-3 The Research of Heath Western Cusine A Study of Aloe in Cooking HsiYing Hsieh (Far East University, ROC Taiwan)
- POS7-4 The Influence of Attitude, Subjective Norm, Perceived Behavior Control on Purchase Intention

 A Study of the Green Restaurants in Taiwan

 HsiYing Hsieh (Far East University, ROC Taiwan)

10:15-11:15 OS8 Advanced Research of Engineering and Management (4)

Chair: Chair: Takao Ito (Hiroshima University, Japan)
Co-Chair: Ammar A. Al-Talib (UCSI University, Malaysia)

- OS8-1 A Rack and Pinion Driven Mechanical Footstep Power Generator Ammar A. Al-Talib, K S See (UCSI University, Malaysia)
- OS8-2 Table Tennis Using Arduino For Seniors' Healthcare
 Reem Ali Abdullah, Mastaneh Mokayef, Miad Mokayef, Sew Sun Tiang, Wei Hong Lim
 (UCSI University, Malaysia)
- OS8-3 A Study on Prevention of Predictive Failures using IoT Technology

 Tsutomu Ito¹, Hiroshi Sakai¹, Takao Ito², Seigo Matsuno³, Makoto Sakamoto⁴

 (¹Hino Motors Ltd, ²Hiroshima University, ³Ube National College of technology, ⁴University of Miyazaki, Japan)

OS8-4 Did a mismatch between the ASBJ's standard-setting and its organizational structure occur?

Kensuke Ogata (Osaka City University, Japan)

14:45-15:45 OS16 Media Information Processing and Artificial Intelligence (4)

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

- OS16-1 Effectiveness of Data Augmentation in Pointer-Generator Model
 Tomohito Ouchi, Masayoshi Tabuse (Kyoto Prefectural University, Japan)
- OS16-2 Mouse Cursor Control System Using Facial Movements

 Masayoshi Tabuse¹, Manase Mizobe², Yasunari Yoshitomi¹, Taro Asada¹

 (¹Kyoto Prefectural University, ²TORAY ENGINEERING Co.,Ltd, Japan)
- OS16-3 Facial Expression Synthesis Using Vowel Recognition for Synthesized Speech
 Taro Asada¹, Ruka Adachi², Syuhei Takada³, Yasunari Yoshitomi¹, Masayoshi Tabuse¹
 (¹Kyoto Prefectural University, ²Software Service, Inc., ³Seika Town Hall, Japan)
- OS16-4 Speech Synthesis of Emotions in a Sentence Using Vowel Features
 Rintaro Makino¹, Yasunari Yoshitomi², Taro Asada², Masayoshi Tabuse²
 (1SoftBank Corp., 2Kyoto Prefectural University, Japan)

16:30-17:45 OS19 Advanced Information Processing Applications (5)

Chair: Toru Hiraoka (University of Nagasaki, Japan)

Co-Chair: Masaharu Hirota (Okayama University of Science, Japan)

- OS19-1 Extraction of Irrelevant Sentences from Online Hotel Reviews
 Shogo Watanabe, Masaharu Hirota, Tetsuya Oda (Okayama University of Science, Japan)
- OS19-2 Inferring Home Location of Foreign Tourists Based on Travel Routes Extracted from Social Media Sites

 Lugasi Chen, Masaharu Hirota (Okayama University of Science, Japan)
- OS19-3 The IoT Solution to Archive and Play the Digital Library of Kamishibai Motohide Yoshimura, Ayumi Eikawa (The University of Nagasaki, Japan)
- OS19-4 A Research on Prediction of Inter-firm Relationships
 Takao Ito¹, Tsutomu Ito², Matsuno Seigo³, Rajiv Mehta⁴, Makoto Sakamoto⁵
 (¹Hiroshima University, Japan, ²Hino Motors Ltd, Japan, ³Ube National College of Technology, Japan, ⁴New Jersey Institute of Technology, USA, ⁵University of Miyazaki, Japan)
- OS19-5 Generation of Arbitrarily-Oriented Ripple Images Using Circular-Sector-Type Smoothing Filter and Inverse Filter

 Toru Hiraoka (University of Nagasaki, Japan)

Meeting room 1

9:00-10:15 OS18-2 Service Robotics (5)

Chair: Evgeni Magid (Kazan Federal University, Russia)

Co-Chair: Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan) **Co-Chair: Kuo-Hsien Hsia** (National Yunlin University of Science and Technology, Taiwan)

OS18-1 Modelling Autonomous Parallel Parking Procedure for Car-like Robot Avrora Unior in Gazebo Simulator

Dinir Imameev¹, Ksenia Shabalina¹, Artur Sagitov¹, Kuo-Lan Su², Evgeni Magid¹

(¹Kazan Federal University, Russia)

(²National Yunlin University of Science and Technology, Taiwan)

OS18-2 Traffic Sign Recognition Algorithm for Car-like Robot Avrora Unior
Nikita Nikiforov¹, Ksenia Shabalina¹, Artur Sagitov¹, Kuo-Hsien Hsia², Evgeni Magid¹
(¹Kazan Federal University, Russia)
(²National Yunlin University of Science and Technology, Taiwan)

OS18-3 Robotic palpation modeling for KUKA LBR IIWA using Gazebo Simulator
Artur Shafikov¹, Artur Sagitov¹, Hongbing Li², Natalia Schiefermeier-Mach³, Evgeni Magid¹
(¹Kazan Federal University, Russia), (²Shanghai Jiao Tong University, China)

(³Health University of Applied Sciences, Austria)

- OS18-4 Remote Control Application for "Servosila Engineer" Robot on Android Mobile Devices
 Daniel Kiryanov, Roman Lavrenov (Kazan Federal University, Russia)
- OS18-5 Network Failure Detection and Autonomous Return for PMB-2 mobile robot Dmitry Bereznikov, Aufar Zakiev (Kazan Federal University, Russia)

Meeting room 4

9:00-10:00 GS4 Robotics 1 (4)

Chair: Noritaka Sato (Nagoya Institute of Technology, Japan)

- GS4-1 Design and Modeling of an Automatic Cartesian Farming Robot
 Wisanu Jitviriya, Amornphun Phunopas
 (King Mongkut's University of Technology North Bangkok, Thailand)
 Eiji Hayashi (Kyushu Institute of Technology, Japan)
- GS4-2 K-APF Algorithm to Avoid Obstacles in Path Planning
 Dong-Kyo Jeong, Jang-Myung Lee (Pusan National University, Korea)
- GS4-3 Selection System of Robot type for cell assembly production (Production efficiency comparison of single arm robot and double arm robot)

 Takahiro Watanabe, Hidehiko Yamamoto, Takayoshi Yamada (Gifu University, Japan)

GS4-4 Curvature Surface Magnetic Wheel Climbing Robot with Adaptive Electromagnetic Adhesive Force

Richit Palangwatanakul, Apisit Thungsang, Kaned Thungod (Mahasarakham University, Thailand) Arsit Boonyaprapasorn, Wanachart Borisut (Chulachomklao Royal Military Academy, Thailand) Thavida Maneewarn, Suriya Natsupakpong

(King Mongkut's University of Technology Thonburi, Thailand)

Thunyaseth Sethaput

(Sirindhorn International Institute of Technology, Thammasat University, Thailand)

10:15-11:15 GS5 Robotics 2 (4)

Chair: Hidehiko Yamamoto (Gifu University, Japan)

- GS5-1 Intention Classification of a User of a Walking Assist Cart by Using Support Vector Machine Noritaka Sato, Tomoki Yokotani, Yoshifumi Morita (Nagoya Institute of Technology, Japan)
- GS5-2 Development of an Environmentally Adaptable Autonomous Mobile Robot
 Naokazu Iwata, Joo Kooi Tan (Kyushu Institute of Technology, Japan)
- GS5-3 Automated Task and Path Management for Industrial AGVs in Foam Manufacturing Plant
 Amornphun Phunopas¹, Wisanu Jitviriya², Noppadol Pudchuen³, Songklod Tunsiri⁴, Eiji Hayashi⁵
 (1,2,3</sup>King Mongkut's University of Technology North Bangkok, Thailand,

 4Urban Community Development College, Thailand, 5Kyushu Institute of Technology, Japan)
- GS5-4 Object Tracking Method Considering Time Series Information Using Re3 with Stochastic Depth Taichi Kitayama, Hyoungseop Kim (Kyushu Institute of Technology, Japan)

14:45-16:15 GS1 Neural Networks (6)

Chair: Akira Nakamura (AIST, Japan)

- GS1-1 Neural Network and Internal Resistance based SOH classification for lithium battery Jong-Hyun Lee¹, Hyun-Sil Kim², In-Soo Lee¹ (¹Kyungpook National University, Korea) (²Naval Combat Systems PMO Agency For Defense Development, Korea)
- GS1-2 Estimation of Self-Posture of a Pedestrian Using MY VISION and Deep Learning Tomoyuki Kurosaki, Joo Kooi Tan (Kyusyu Institute of Technology, Japan)
- GS1-3 Simultaneous Space Object Recognition and Pose Estimation by Convolutional Neural Network
 Roya Afshar, Zhongyi Chu (Beihang University, China)
 Shuai Lu (Beijing University of Chemical Technology, China)
- GS1-4 An error correction mechanism for reliable chemical communication systems
 Masashi K. Kajita (The University of Tokyo, Japan)

- GS1-5 A Reinforcement Learning-Based Path Planning Considering Degree of Observability Yong Hyeon Cho, Chan Gook Park (Seoul National University, Korea)
- GS1-6 A Performance Analysis of Pose Estimation Based on Two-View Tracking and Multi-State
 Constraint Kalman Filter Fusion
 Tae Ihn Kim, Jae Hyung Jung, Chan Gook Park (Seoul National University, Korea)

16:30-17:45 GS2 Control Techniques (5)

Chair: Chian C. Ho (National Yunlin University of Science and Technology, Taiwan)

- GS2-1 ORB-SLAM based Sensor Fusion Algorithm for Real-Time Precision Driving
 Yong-Jin Ock, Zhan-Ming Gu, Jang-Myung Lee (Pusan National University, Korea)
- GS2-2 Gait Control of A Four-Legged Robot with Fuzzy-PID Controller
 Arphakorn Kunha, Amornphun Phunopas, Wisanu Jitviriya
 (King Mongkut's University of Technology North Bangkok, Thailand)
- GS2-3 Hybrid Force/Position Teaching and Control Method for 6 DoF Manipulator utilizing f-PAWTED

 Quang-Trung Chu, Hiroki Tanaka, Hideki Inuzuka, Yoshifumi Morita (NITech, Japan)

 Masao Sakai (Aichi Pref., Japan)
- GS2-4 A Study on Generalized Predictive Control in Consideration of Noise Akira Yanou (Kawasaki University of Medical Welfare, Japan)
- GS2-5 Simulation Study on Emergency-Stopping Avoidance Control due to Singularity During Teaching Operation with Parallel Wire-Type Teaching Device
 Hideki Inuzuka (NITech, Japan), Masao Sakai (Aichi Pref., Japan), Yoshifumi Morita (NITech, Japan)

January 16 (Thursday)

8:40-Registration

Meeting Room 31

10:30-11:00

Invited session IS-1

Chair: Yingmin Jia (Beihang University (BUAA), China)

IS-1 Concurrent Localization of Multiple Unmanned Surface Vehicles Using Neural Networks **Jangmyung Lee** (Pusan National University, Korea)

12:00-13:15 OS11 System and Control (16)

Chair: Yizhun Peng (Tianjin University of Science and Technology, China)

Co-Chair: Huailin Zhao (Shanghai Institute of Technology, China)

- OS11-1 Design of Humanoid Soccer Robot Based on STM32
 Yuheng Zhang¹, Yulong Peng², Yizhun Peng¹, Lianchen Zhao¹, Zhou Zhang¹, Wanlong Peng¹
 (¹Tianjin University of Science and Technology, ² Tianjin Tianke Intelligent and Manufacture Technology Co., LTD, China)
- OS11-2 A Design and Implementation of Intelligent Cradle
 Ting Zhao¹, Qing He¹, Yulong Peng², Zhou Yang¹, Zhenjiang Chen¹, Shuo Jiang¹
 (¹Tianjin University of Science and Technology, ² Fenyang College of Shanxi Medical University, China)
- OS11-3 A Design and Implementation of Intelligent Networking Bookcase
 Zhou Zhang, Yajun Li, Yizhun Peng, Hucheng Wang, Yuqi Zhao
 (Tianjin University of Science and Technology, China)
- OS11-4 A Design and Implementation of Quad-rotor UAV
 Junjie Lin, Chunxia Zhang, Yizhun Peng, Ting Zhao, Zhengke Xu
 (Tianjin University of Science and Technology, China)
- OS11-5 Characteristic Analysis and Synchronization Control of a Non-equilibrium System Lianchen Zhao, Xinyu Zhang, Yizhun Peng, Yuheng Zhang, Hongyan Jia, (Tianjin University of Science and Technology, China)
- OS11-6 Classification and Recognition of Baby Cry Signal Feature Extraction Based on Improved MFCC
 Zhenjiang Chen, Yizhun Peng, Di Li, Zhou Yang, Nana Wang
 (Tianjin University of Science and Technology, China)
- OS11-7 Design of Space Remote Sensing Data Storage Platform Based on Distributed File System
 Di Li, Yizhun Peng, Ruixiang Bai, Zhenjiang Chen, Lianchen Zhao
 (Tianjin University of Science and Technology, China)
- OS11-8 Research on Semantic Map Establishment of Parking Lot Based on Deep Learning and Multi-sensor
 Shiqian Zhang, Yizhun Peng, Ruixiang Bai, Yuheng Zhang, Tianye Jian, Wanlong Peng
 (Tianjin University of Science and Technology, China)
- OS11-9 Survey on Kinematics Calibration Technology of Manipulator
 Zhou Yang, Yizhun Peng, Nana Wang, Yuheng Zhang, Tianye Jian
 (Tianjin University of Science and Technology, China)
- OS11-10 Visualization Analysis of Web Crawler Evolution Retrieval Research Based on KG Zhenjiang Chen, Jiamian Wang, Yizhun Peng, Di Li, Lianchen Zhao (Tianjin University of Science and Technology, China)

- OS11-11 Circuit Simulation of Synchronized Novel 4D Chaotic Systems
 Yuhan Zhang, Hong Niu (Tianjin University of Science and Technology, China)
- OS11-12 Crowd Counting Network with Self-attention Distillation
 Li Wang, Huailin Zhao, Zhen Nie, Yaoyao Li (Shanghai Institute of Technology, China)
- OS11-13 Path Planning Based on Improved Artificial Potential Field Method Feifan Xu, Huailin Zhao, Zhen Nie, Xin Zhou, Zheheng Tao (Shanghai Institute of Technology, China)
- OS11-14 Self-balancing Car based on Adaptive Fuzzy PID Control Zhen Nie, Huailin Zhao, Lu Sun, Xiongfeng Zhong (Shanghai Institute of Technology, China)
- OS11-15 Crowd Counting Method Based on Improved CSRnet
 Huailin Zhao, Shengyang Lu, Li Wang, Yaoyao Li (Shanghai Institute of Technology, China)
- OS11-16 Graph-based Global Reasoning Network for Crowd Counting
 Li Wang, Huailin Zhao, Zhen Nie, Yaoyao Li
 (Shanghai Institute of Technology, China)

13:30-14:45 OS9 Recognition and Control (19)

Chair: Fengzhi Dai (Tianjin University of Science and Technology, China)

Co-Chair: Qiang Wei (Jianghan University, China)

- OS9-1 A Design of Ocean Current Velocity Measuring Device
 Jichao Zhao¹, Fengzhi Dai^{1,3}, Xin Ma², Fengkun Wang¹, Haokang Wen¹, Hongbo Hao¹,
 Qianqian Zhang¹
 (¹Tianjin University of Science and Technology, ²National Oceanic Administration Beihai Marine
 Environmental Monitoring Center Station, ³Tianjin Tianke Intelligent and Manufacture
 Technology CO., LTD, China)
- OS9-2 Device Design Based on TDS Water Quality Detection
 Jichao Zhao¹, Fengzhi Dai^{1,2}, Di Yin¹, Yuhui Cheng¹, Fengkun Wang¹, Leixin Han¹, Qianqian Zhang¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture
 Technology CO., LTD, China)
- OS9-3 Design of Film Forming Rate Measuring Instrument based on Polyurethane Material Jichao Zhao¹, Fengzhi Dai¹,², Fengkun Wang¹, Haokang Wen¹, Hongbo Hao¹, Qianqian Zhang¹ (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-4 Research on the Intelligent Aircraft Design based on STM32
 Hongbo Hao¹, Fengzhi Dai^{1,2}, Haokang Wen¹, Jichao Zhao¹, Qianqian Zhang¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

- OS9-5 Research and Design of Gain Controllable System in RF Receiver
 Haokang Wen¹, Fengzhi Dai^{1,2}, Jichao Zhao¹, Hongbo Hao¹, Hong Niu¹, Qianqian Zhang¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-6 Design of Packaging Bottle Recycling System based on Internet of Things
 Yujie Yan¹, Fengzhi Dai^{1,2}, Shiwei Wu¹, Yuanyuan Xi¹, Huanhuan Li¹
 (¹Tianjin University of Science and Technology, ² Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China, China)
- OS9-7 Research on Image Super-Resolution Reconstruction Based on Deep Learning
 Lingran An¹, Fengzhi Dai ^{1,2}, Yasheng Yuan¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-8 Research on Fatigue Detection Method Based on Deep Learning
 Yasheng Yuan¹, Fengzhi Dai^{1,2}, Lingran An¹, Di Yin¹, Yuxuan Zhu¹, Yujie Yan¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-9 Fatigue Driving Monitoring System based on the EEG
 Yuxuan Zhu¹, Fengzhi Dai¹,², Di Yin¹, Yasheng Yuan¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-10 Research of the Control Strategy of Vienna Rectifier Circuit based on the Vector Control Yuxuan Zhu¹, Fengzhi Dai^{1,2}, Di Yin¹, Yasheng Yuan¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-11 Research on Emotion Classification based on EEG
 Di Yin¹, Fengzhi Dai^{1,3}, Mengqi Yin², Jichao Zhao¹
 (¹Tianjin University of Science and Technology, ²Hebei University of Chinese Medicine, ³Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-12 Identification of Synthetic Pigment based on Fluorescence Spectroscopy Combined with RBF Neural Network

 Di Yin¹, Fengzhi Dai^{1,2}, Yuxuan Zhu¹, Yasheng Yuan¹

 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-13 Simulation Study of 3D Reconstruction in Electromagnetic Tomography with Multi-layer Sensors
 Array
 Yuanli Yue, Ze Liu, Yu Miao (Beijing Jiaotong University, China)
- OS9-14 Visualized the Knowledge Map in Children's Minds: A Study on Cognitive Structure Measurement Qiang Wei, Hua Dong, Yi-tong Zhang, Ao-nan Zhang (Jianghan University, China)

- OS9-15 Escape Route of Subway under Fire Conditions: An Experimental Study in Virtual Reality Environment
 Hua Dong, Qiang Wei, Qing-qing Zhang, Lan-lan Fang (Jianghan University, China)
- OS9-16 Research on the Smart Home Design based on Single-chip Microcomputer
 Hongbo Hao¹, Fengzhi Dai^{1, 2}, Haokang Wen¹, Jichao Zhao¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS9-17 Design of a Portable Instrument for Measuring Heart Rate and Blood Oxygen
 Haokang Wen¹, Fengzhi Dai^{1,2}, Jichao Zhao¹, Hongbo Hao¹, Qianqian Zhang¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture
 Technology CO., LTD, China)
- OS9-18 Principal Component Analysis of Wine Based on Three-dim Fluorescence Spectra
 Di Yin, Fengzhi Dai, Yuxuan Zhu, Yasheng Yuan
 (Tianjin University of Science and Technology, China)
- OS9-19 Control Design of Intelligent Device for Living Environment of Senile Apartment
 YashengYuan¹, Fengzhi Dai^{1,2}, Shengbiao Chang³, Lingran An¹, Di Yin¹,
 Yuxuan Zhu¹, Yujie Yan¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture
 Technology CO., LTD, ³Dawning Information Industry Co., LTD, China)

Meeting Room 32

9:00-10:00 OS2 Advanced Control (4)

Chair: Yingmin Jia (Beihang University (BUAA), China)

Co-Chair: Weicun Zhang (University of Science and Technology Beijing, China)

- OS2-1 Multiple Model Adaptive Control Based on Switching/Weighting Intelligent Fusion Algorithm
 Weicun Zhang, Yongnan Jia, Qing Li
 (University of Science and Technology Beijing, China)
- OS2-2 Detection Algorithm of Porosity and Crack Defects on Surface of Micro-precision Glass Insulated Terminals

 Qunpo Liu¹, Gaowei Wang¹, Fuzhong Wang¹, Manli Wang¹, Hanajima Naohiko²

 (¹Henan Polytechnic University, P.R.China) (²Muroran Institute of Technology, Japan)
- OS2-3 Concept Drift Adaptation by Multi-stream Data Knowledge Transfer
 Hongpeng Yin, Chenglin Liao, Yi Chai (Chongqing University, China)
- OS2-4 Neuro-adapative Control of High-speed Trains under Uncertain Wheel-rail Relationship Zhechen Wang, Yingmin Jia (Beihang University (BUAA), China)

12:00-13:00 OS1 Machine vision and Mobile robot (4)

Chair: Wei Liu (Beijing Jiaotong University, China)

Co-Chair: Jiwu Wang (Beijing Jiaotong University, China)

- OS1-1 Route Planning of Teleoperation Mobile Robot Based on Virtual Reality Technique
 Jiwu Wang, Xuechun Yuan, Chenyang Li, Zhikun Song (Beijing Jiaotong University, China)
- OS1-2 Geometric Measurement Based on The Single Image with a Rectangle Structure Jiwu Wang, Bo Dai, Jiangyue Wang (Beijing Jiaotong University, China)
- OS1-3 Heavy-duty Spherical Mobile Robot Driven by Five Omnidirectional Wheels
 Wei Liu, Junyang Sun, Runjiao Wang, Guanwang Geng, Lian Luo
 (Beijing Jiaotong University, China)
- OS1-4 Robustness Analysis of Visual SLAM Based on Gazebo Simulation Environment Jiwu Wang, Yafan Liu (Beijing Jiaotong University, China)

13:30-14:30 OS21 Mathematical Informatics (4)

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

- OS21-1 Hidden Surface Removal for Interactions between User's Bare Hands and Virtual Objects in Augmented Reality
 Takahiro Ishizu, Makoto Sakamoto, Kenji Sakoma, Takahiro Shinoda, Amane Takei
 (University of Miyazaki, Japan), Takao Ito (Hiroshima University, Japan)
- OS21-2 Proposal of Interactive Projection Mapping using Human Detection by Machine Learning Takahiro Shinoda, Makoto Sakamoto, Takahiro Ishizu, Kenji Sakoma, Amane Takei (University of Miyazaki, Japan), Takao Ito (Hiroshima University, Japan)
- OS21-3 Fundamental Study on Control of CG Characters by Electroencephalography (EEG) Analysis
 Kenji Sakoma, Makoto Sakamoto, Takahiro Ishizu, Takahiro Shinoda, Amane Takei
 (University of Miyazaki, Japan), Takao Ito (Hiroshima University, Japan)
- OS21-4 Development of parallel microwave analysis code: ADVENTURE_Fullwave Amane Takei (University of Miyazaki, Japan)

Meeting Room 33

9:00-10:15 OS14 Software Development Support Method (5)

Chair: Tetsuro Katayama (University of Miyazaki, Japan) Co-Chair: Tomohiko Takagi (Kagawa University, Japan)

- OS14-1 Behavioral Modeling Technique for Multiple Objects of Software Using Extended Place
 /Transition Nets with Attributed Tokens
 Tomohiko Takagi, Ryo Kurozumi (Kagawa University, Japan)
- OS14-2 Learning Support Technique of Software Visual Modeling Using Place/Transition Nets Yuki Ue, Tomohiko Takagi (Kagawa University, Japan)
- OS14-3 Redundant Test Cases Elimination on Code Coverage with Distance and Correlation Measurement Method

 Mochamad Chandra Saputra¹ Tetsuro Katayama¹ Voshibiro Kita²

Mochamad Chandra Saputra¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, and Naonobu Okazaki¹ (¹University of Miyazaki, ²Tokyo University of Technology, Japan)

- OS14-4 The Measurement of Class Cohesion using Semantic Approach
 Bayu Priyambadha¹, Tetsuro Katayama¹, Yoshihiro Kita²,
 Hisaaki Yamaba¹, Kentaro Aburada¹, and Naonobu Okazaki¹
 (¹University of Miyazaki, ²Tokyo University of Technology, Japan)
- OS14-5 Proposal of an Algorithm to Generate VDM++ by Using Words Extracted from the Natural Language Specification
 Yasuhiro Shigyo¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹ (¹University of Miyazaki, ²Tokyo University of Technology, Japan)

12:00-12:30 OS17 Machine Learning Technologies for Human Understanding (2)

Chair: Masao Kubo (National Defense Academy of Japan, Japan)

- OS17-1 Customization of Contents for Acquisition of Skills of FPS without Trainer
 Masao Kubo, Takeshi Ueno, Hiroshi Sato (National Defense Academy, Japan)
- OS17-2 Visual Classification of Malware by Few-shot Learning
 Tran Kien, Masao Kubo, Hiroshi Sato (National Defense Academy, Japan)

13:30-14:30 GS3 Vision & Image Processing (4)

Chair: Joo Kooi Tan (Kyusyu Institute of Technology, Japan)

- GS3-1 Detecting Pedestrians and Moving Directions by a MY VISION System

 Kenta Hori, Seiji Ishikawa, Joo Kooi Tan (Kyushu Institute of Technology, Japan)
- GS3-2 Human Motion Recognition Using TMRIs

 Cao Jing, Youtaro Yamashita, Joo Kooi Tan (Kyusyu Institute of Technology, Japan)

GS3-3 Automatic Extraction of Abnormalities on Temporal CT Subtraction Images Using Sparse Coding and 3D-CNN

Yuichiro Koizumi, Noriaki Miyake, Huimin Lu, Hyoungseop Kim (Kyushu Institute of Technology, Japan) Takatoshi Aoki (University of Occupational and Environmental Health, Japan) Shoji Kido (Osaka University, Japan)

GS3-4 Design of a Data-Driven Multi Controllers Using VRFT and Ensemble Learning
Takuya Kinoshita, Yuma Morota, Toru Yamamoto (Hiroshima University, Japan)

OS15 Recognition and System (11)

- OS15-1 Efficient Detection Device for Wafer Physical Defects
 Jianyong Chen, Xiaoyan Chen, Chundong Zhao
 (Tianjin University of Science and Technology, China)
- OS15-2 Wafer Defect Detection Method based on Machine Vision Chundong Zhao, Xiaoyan Chen, Jianyong Chen (Tianjin University of Science and Technology, China)
- OS15-3 Analysis and Circuit Design of a Novel 4D Chaotic System
 Yan Sun, Yongchao Zhang, Jiaqi Chen (Tianjin University of Science and Technology, China)
- OS15-4 Research on Synchronous Control of a Novel 4D Dissipative Chaotic System

 Jiaqi Chen, Yongchao Zhang, Yan Sun (University of Science and Technology, China)
- OS15-5 EEG classification based on common spatial pattern and LDA
 Lei Wang¹, Zixuan Li² (¹Tianjin University of Science and Technology, China)
 (²Dongbei University of Finance & Economics, China)
- OS15-6 Dynamic Characteristics Analysis of the Shimizu–Morioka Chaotic System
 Wenxin Shi, Hongyan Jia (Tianjin University of Science and Technology, China)
- OS15-7 Research on the Motion Track of High-speed Objects
 Qianqian Zhang^{1,2}, Fengzhi Dai¹, Jichao Zhao¹, Haokang Wen¹, Hongbo Hao¹
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)
- OS15-8 Research on Surface Defect Detection of Aluminum based on Image Processing
 Xuemin Liu¹, Ce Bian³, Di Yin², Yuxuan Zhu², Yasheng Yuan²

 (¹China Petroleum Engineering and Construction Corporation, ² Tianjin University of Science and Technology, ³Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

- OS15-9 Research on the Control of Multi Position Production Line based on PLC
 Yong Hou¹, Hao Wang¹, Runhua Mao², Xuemin Liu³
 (¹Tianjin University of Science and Technology, ²Tianjin Tianke Intelligent and Manufacture Technology CO, LTD, ³China Petroleum Engineering and Construction Corporation, China)
- OS15-10 Research on acoustic source localization system based on acoustic holography
 Xiuqing Wang, Xiaoyun Jia (Tianjin University of Science and Technology, China)
- OS15-11 Anti-interference Method of Electrical Fast Transient for Fire Alarm of Substation Guo Wangyong, Ju Zhenfu, Chen Guang, Zhu Bo (Beijing NARI Yihe Environmental Protection Technology Co., Ltd, China)

Farewell Party

PS abstracts

PS-1 Towards neuromimetic computing

Takashi Kohno (University of Tokyo, Japan)

Deep neural network brought a new era of neuro-inspired machine learning. Its splendid performance in pattern recognition is attracting both scientific and industrial resources and accelerating the field of "AI". In these days, neuromimetic computing is developing its presence in this field as a potential approach to the post-deep neural network, the next-generation AI. Silicon neuronal network (SNN) is an approach to the neuromimetic computing, which tries to construct an electronic circuit version of the nervous system. Its strong potential to innovate the computing paradigm from digital computing to "brain-compatible" computing facilitated IBM and Intel to developed SNN chips, but it still stays in the embryonic stage because of a great hurdle. In this talk, we overview and discuss about trials in this field.



PS-2 Innovative Robot - Robot/AI for Factory Automation-

Eiji Hayashi (Kyushu Institute of Technology, Japan)

We have engaged in a regional revitalization project during the period from 2018 to 2022 as a subsidy grant which the Japan's government are promoting, by Yaskawa Electric Corporation, City of Kitakyushu and Kyushu Institute of Technology. In this project has been developed innovative robots combined Robot / Artificial Intelligence technologies. We think that AI and robots are already everywhere, especially not engineers due to the influence of the media. Certainly, their technologies have made enormous advances and progress in recent years like Siri, self-driving car system and so on as well as deeplearning neural network on image processing. The innovative robot for FA robot which means a revolution in productivity into next generation is described about what such a robot needs.



PS-3 Multidimensional Configurations and Strategy in Robot Soccer

Ruggero Rossi, Jeffrey Johnson (Open University, UK)

Recognizable structures appear repeatedly in robot soccer. Typically they involve configurations of one to five players from each team. Some structures are highly desirable as part of temporal sequences with the ball moving forwards towards the goal with the player structures, where some sequences ending in goals. A particular structure is the *defenders dilemma* when a red player attempts to win the ball from a blue player. If red attempts to tackle the blue player it passes the ball to another blue player. If red moves to prevent this the blue player with the ball dribbles past him. We illustrate these configurations and show that they give a tactical advantage. A winning strategy is to move to form these structures while denying them to the opposition.



PS-4 Towards fully automated driving in urban areas.

Naoki Suganuma (Kanazawa University, Japan)

In recent years, research on autonomous driving technology has been actively conducted. In our laboratory, research and development on autonomous vehicle started from 1998 aiming for autonomous driving in urban areas. Additionally, our laboratory started the first public road test among Japanese University in Japan from 2015, and it has already been conducted public road experiment over 14,000 km. In this presentation, we will outline the technologies required for autonomous driving based on the knowledge obtained from these achievements and describe the current state and issues of autonomous driving technologies.



IS abstracts

IS-1 Concurrent Localization of Multiple Unmanned Surface Vehicles Using Neural Networks

Jangmyung Lee (Pusan National University, Korea)

A concurrent localization of multiple USVs (Unmanned Surface Vehicle) has been proposed using neural networks in order to resolve the problems of the probability-based filters used in the existing USV localization. The multiple USVs are effective for port surveillance, ocean reconnaissance, and so on, when the concurrent localization is available. Several probability-based filters, such as, EKF, KF, and UKF have been utilized so far. Since these algorithms are externally affected by wind and waves on the sea surface, it becomes difficult to accurately control the navigation along the desired trajectory. Using the proposed neural network, the multiple USVs can be navigated to survey the under-water condition effectively



IS-2 Body and Brain Training with Big Data and AI

Henrik Hautop Lund (Technical University of Denmark, Denmark)

Utilizing a Big Data and AI approach, we developed a novel playful method for screening people for potential physical and cognitive shortages. The method creates a body and brain performance map for each individual, and the Big Data analysis provides a basis for automatically identifying the particular abilities, which may be underperforming in an individual. Further, several studies including randomized controlled trials with the Moto Tiles system have shown that particular Moto Tiles game play will increase performance of particular abilities, even after short-term play. Thereby, the proposed system can automatically generate personalized training protocols for the individual by selecting and providing the right Moto Tiles games for the individual to play to improve the underperforming abilities. The suitability of the method was tested in a small effect test with seniors with mild dementia at a care institution in Denmark. The results show that the seniors with dementia who were screened to be at high risk of falling, within the short period of training with the automatically generated personalized protocol increased their skills to no longer be at risk of falling.



IS-3 PixelBeing

Luigi Pagliarini^{1,2,3}, Henrik Hautop Lund¹ (¹Academy of Fine Arts of Macerata, Italy), (²ISIA Design, Italy) (¹Technical University of Denmark, Denmark)

In this conceptual paper, we describe and define the range of possible applications and the technical contours of a robotic biotechnological system to be worn on the body for playful interactions. Moving from earlier works on Wearable and Modular Robotics we described how, by using modular robotics for creating wearable, it is possible to explore a self-sustainable and flexible system, consisting of freely inter-changeable input/output modules that through the use of solar, mechanical, and other sources of renewable energy are able to suit some specific tasks. Here, we drive the attention on early prototypes to show the potentialities of such an approach, and focus on depicting possible application in the future of sustainable electronics domain. Indeed, our artistic experiment is a clear example of how to scale down electronics to an eco-friendly level, which can still create playful and useful interactions for many applications.



OS abstracts

OS1 Machine vision and Mobile robot (4)

OS1-1 Route Planning of Teleoperation Mobile Robot Based on Virtual Reality Technique

Jiwu Wang, Xuechun Yuan, Chenyang Li, Zhikun Song (Beijing Jiaotong University, China)

Mobile teleoperation robot is one of the effective methods to help operators to work in complex environments. However, the time delay by distance is a key factor that restricts its application. To solve this problem, the motion trajectory of the robot is simulated using virtual reality technology and the obtained optimization data are applied to control teleoperation robot. In order to improve the efficiency of simulation, a 3D simulation environment of the real world is built in the unity 3D platform, and the physical model and kinematic model of the robot are established. At the same time, the environmental conditions of various adjustable parameters such as illumination and material are simulated in the platform. The physics engine for the robot is added in the simulation platform and the physical properties of the robot are configured. Finally, the error between the simulated and real motion trajectories is analyzed, and the results show the developed method is effective to solve the time delay for the remote control.



OS1-2 Geometric Measurement Based on The Single Image with a Rectangle Structure

Jiwu Wang, Bo Dai, Jiangyue Wang (Beijing Jiaotong University, China)

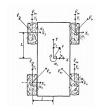
Image-based geometric measurement is getting more attention in machine vision field due to its contact-less and low-cost characteristics. Here the measurement of single image with the rectangle structure is studied, in which only one side length of the rectangle is known, and the coordinates of points in the measured plane are obtained. The intrinsic parameters of the camera are calibrated firstly by using the three vanishing points of mutually orthogonal directions. Then the homography between the image plane and the model plane which the rectangle structure belongs to is derived, and the plane measurement method of the latter is described in details. Furthermore, the measurement experiment is done with the single image taken by the industrial camera, and the validity of the proposed method is verified by comparing with real data.



OS1-3 Heavy-duty Spherical Mobile Robot Driven by Five Omnidirectional Wheels

Wei Liu, Junyang Sun, Runjiao Wang, Guanwang Geng, Lian Luo (Beijing Jiaotong University, China)

This paper presents a heavy-duty spherical mobile robot with 5 omnidirectional wheels. The chassis is supported by four drive omni-directional wheels, and they touch the internal spherical shell. The omni-directional wheel arranged above can prevent the chassis from overturning. Four omnidirectional wheels are driven by two motors so that both forward and steering motions can be achieved simultaneously. The four omni-directional wheels can support heavy load. The mechanism of the robot is described in detail, and its motion and dynamics are built to analysis. Preliminary multi-body dynamics simulation and analysis show that it has good function and dynamic characteristics etc.



OS1-4 Robustness Analysis of Visual SLAM Based on Gazebo Simulation Environment

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

The visual SLAM technology applied to mobile robots is mostly for complex and variable unknown environments. Therefore, in order to reduce the experimental cost and improve the robustness of the technology, it is necessary to test the SLAM technology in the virtual simulation environment before the robot enters the actual working conditions. The Gazebo simulation software used in this paper is a three-dimensional multi-robot dynamics simulation system, which can provide high-fidelity physical simulation environment and a complete set of robot sensor models for SLAM testing. In this paper, we respectively perform simulation tests on advanced technology such as ORB-SLAM2, DSO, and Vins-mono, and obtain experimental data and compare them. Then, based on the test results, we propose corresponding improvement suggestions for these SLAM technology.

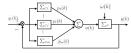


OS2 Advanced Control (4)

OS2-1 Multiple Model Adaptive Control Based on Switching/Weighting Intelligent Fusion Algorithm

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

A multiple model adaptive control scheme based on switch/weighting intelligent fusion algorithm is presented with the following contributions: 1) switching/weighting intelligent fusion algorithm against disturbances and noises of the system; 2) stability and convergence analysis of the corresponding closed-loop control system.



OS2-2 Detection Algorithm of Porosity and Crack Defects on Surface of Micro-precision Glass Insulated Terminals

Qunpo Liu¹, Gaowei Wang¹, Fuzhong Wang¹, Manli Wang¹, Hanajima Naohiko² (¹Henan Polytechnic University, P.R.China), (²Muroran Institute of Technology, Japan)

A micro-precision glass insulated terminal made of glass powder and metal wire sintered by a special process. Aiming at the defects of the pores and cracks on the surface of the glass-insulated terminal, this paper proposes a method for surface defects inspection based on image processing. Pre-processing operations such as background removal, noise filtering, and G-channel feature extraction are performed on the acquired image with defects. The global threshold segmentation algorithm is used to divide it into some regions. And the feature parameters are established based on the factors such as circularity, aspect ratio, tightness, the length of the contour extract area etc.. The identification of defects is realized based on feature vectors and defect determination algorithms of each region. The test samples are selected including simples with pores, cracks and no defects on the surface. The experimental results show that the algorithm can identify the samples with pores and cracks correctly.



Pore and crack defect test results

OS2-3 Concept Drift Adaptation by Multi-stream Data Knowledge Transfer

Hongpeng Yin, Chenglin Liao, Yi Chai (Chongqing University, China)

The classifier of new concept cannot be retrained after concept drift unless massive new concept instances gathered. To handle this issue, this paper proposed a multi-stream data knowledge transfer approach when just few new concept data are collected. Multi-stream data are represented by labeled source data streams and one unlabeled target data stream. Several sub-classifiers learnt from source data streams individually are composed to an ensemble to predict the target. Empirical studies indicate the effectiveness comparing with other state-of-the-art methods.

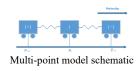


Multi-stream data knowledge transfer approach

OS2-4 Neuro-adapative Control of High-speed Trains under Uncertain Wheel-rail Relationship

Zhechen Wang, Yingmin Jia (Beihang University (BUAA), China)

Traditional automatic controller designing in train systems is almost based on urban rail transit where the influence of changing wheel-rail relationship caused by the variation of speed and environment is ignored. However, high-speed railway operates in more open environment and higher speed, which leading to a more complex variation of wheel-rail relationship occurring. In this paper, we design an automatic train controller in high-speed railway which can realize the automatic velocity tracking even if the uncertain and nonlinear variation of complex wheel-rail relationship happens. First of all, the train dynamic model is established where the wheel-rail relationship is expressed as an uncertain unknown function and the train operation system is expressed as a third-order nonlinear system. Then, a neural network adaptive controller is designed by using the backstepping method and barrier Lyapunov function. Bade on this controller, position and velocity tracking errors are semi-globally uniformly ultimate boundedness. Finally, the effectiveness of the algorithm is verified by simulation experiments.



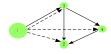
OS3 Intelligent Control (4)

OS3-1 No Free Lunch Principle in Agent Swarm Systems: One Case Study

Yunzhong Song¹, Fengzhi Dai², Huimin Xiao³, Shumin Fei⁴

(¹Henan Polytechnic University, China), (²Tianjin University of Science and Technology, China), (³Henan University of Economics and Law, China), (⁴South East University, China)

This note comes with information flooding of the control action of the leader in leader follower framework. In this situation, even observer for the leader velocity is built in a distributed style, the agent swarm system in a whole could not be classified into distributed one. One case study example will be borrowed to demonstrate the truth of the no free lunch principle in agent swarm systems.



OS3-2 Analyzing the Controllability and Observability of Discrete-Time Delayed LTI Systems with Data-Based Methods

Zhuo Wang (Beihang University, China)

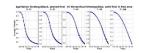
This paper presents a series of novel data-based methods to analyze the state/output controllability and state observability of discrete-time delayed linear time-invariant (LTI) systems. The parameter matrices are assumed to be unknown. In order to analyze the above system characteristics, we first augment the system into a high dimensional LTI model, then employ the measured state/output data to directly construct the state/output controllability and state observability matrices of this high dimensional model, whose ranks play the role of the criteria of corresponding characteristics of the original discrete-time delayed LTI system. These data-based methods have two merits: first, it is not necessary to identify the unknown parameter matrices for characteristics determination, which thus reduces the computational effort greatly; second, the calculation complexity of them is lower because of the relatively simple data-based matrix construction methods.



OS3-3 An Optimal Collective Control Strategy Based on Vicsek Model

Yongnan Jia, Weicun Zhang, Yue Liu, Qing Li (University of Science and Technology, China)

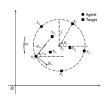
Vicsek model is one of the most famous models taking advantage describing the collective behaviors of self-propelled particles by using simple interaction rules. These particles update their directions according to the average value of their neighbors, who located in its communication range. However, as we all know, individual difference exists widely among social animals. Different individuals may have different influence on the same particle. Therefore, we propose an optimal method considering the individual difference when updating the directions of each particle. According to the simulation results, compared with the standard Vicsek model, the optimal model is more efficient under specific conditions.



OS3-4 Distributed Rotating Encirclement Control of Strict-Feedback Multi-Agent Systems Using Bearing measurements

Tengfei Zhang, Yingmin Jia (Beihang University (BUAA), China)

This paper investigates the distributed multi-target rotating encirclement formation problem of strict-feedback multi-agent systems using the targets' bearing angles and the agents' known positions, where all agents are forced to achieve even circular formation around the targets' geometric center. Firstly, an estimator is proposed for each agent to localize the neighbor targets. Secondly, based on the trajectory planning method, a reference trajectory is constructed by three estimators, which are used to obtain the targets' geometric center, the reference rotating radius and angular. Then, the proposed adaptive neural dynamic surface control law forces each agent to move along the reference trajectory. Finally, the performance of our proposed control scheme is verified by a numerical simulation example.



OS4 Intelligent Life and Systems (7)

OS4-1 Development of the IoT Module with AI Function Using STM32 Chip

Jr-Hung Guo, Evgeni Magid*, Kuo-Hsien Hsia, Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan) (*Kazan Federal University, Russia)

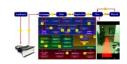
The applications of the Internet of Things (IoT) have been widely used in our daily lives with the advancement of related software and hardware technologies. In order to make these IoT modules more intelligent, many IoT modules are incorporated with artificial intelligent algorithms. In this paper, an IoT module with STM32 chip as the main controller is developed. This module uses fuzzy Analytic Hierarchy Process (fuzzy-AHP) and Adaptive Fusion Method to improve the correctness and self-learning ability of the sensor. In terms of communication, the IoT module has Ethernet, Wi-Fi, and LoRa communication interfaces. And we also built a web server on this module, so that the IoT module can operate directly in the browser. Finally, we also developed a monitoring system. Through this monitoring system, multiple IoT modules can be constructed into a sensor network. This monitoring system can also use the same algorithm to correct and isolate data from modules or sensors in the network. These make this IoT module more intelligent and applicable in different areas.



OS4-2 Markerless Indoor/Outdoor Augmented Reality Navigation Device Based on ORB-Visual-Odometry Positioning estimation and ORB-Visual-Mapping Image Registration

Chian C. Ho, Guan-Jie Wang (National Yunlin University of Science and Technology, Taiwan)

For markerless indoor/outdoor 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. Based on Oriented FAST and Rotated BRIEF (ORB) feature with descriptors, this paper proposes ORB-visual-odometry positioning estimation and ORB-visual-mapping image registration to improve camera pose estimation and floor plane detection for making ARN more precise and reliable with real-time performance. Experimental results show both ORB-visual-odometry positioning estimation and ORB-visual-mapping image registration have higher accuracy and reliability than conventional well-known camera-pose-based positioning estimation and floor-plane-based image registration methods, respectively, for ARN. On the other hand, markerless indoor/outdoor ARN technology with proposed two methods have seamlessly been implemented on the portable Android platform and have smoothly been verified to co-work well on the portable Android platform.



OS4-3 Apply Adaptive Control Approach for Mobile Robot Path Following

Chun-Chi Lai, Chia-Jen Lin, Kuo-Hsien Hsia, Kuo-Lan Su (National Yunlin University of Science and Technology, Taiwan)

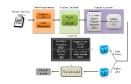
The state of the art of mobile robot autonomous navigation is composed with global path planning and local path follower. For example, the global path planning majorly applies the shortest path A* algorithm in an occupancy map. And the local path follower such as Dynamic Window Approach (DWA) which computes the velocity commands from the objective function that includes obstacle clearance and progress towards the goal. However, with the obstacle interference, DWA will often lead robot with a great deviation from the global path and non-smooth trajectory. In this work we apply adaptive control method to feed the goals for DWA's computing. The experimental result shows that DWA will follow the global path smoothly.



OS4-4 Malware Classification Using Deep Learning

Cheng-Hsiang Lo, Ta-Che Liu, I-Hsien Liu, Jung-Shian Li, Chuan-Gang Liu, Chu-Fen Li (National Cheng Kung University, Taiwan)

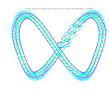
We'll display two different kinds of experiments, which are NIDS-based and Dynamic-based analysis shows how artificial intelligence (AI) helps us detecting and classify malware. On the NIDS-based intrusion detection, we use CICIDS2017 as a research dataset, embedding high dimensional features and find out redundant features in the raw dataset by Random Forest algorithm, reach 99.93% accuracy and 0.3% of the false alert rate. We extract the function calls in malware data by the method proposed in this paper to generate text data. The algorithm n-gram and TF-IDF are used to process text data, converts them into numeric features, and by another feature selection methods, we reduce the training time, achieve 87.08% accuracy, and save 87.97% training time in Dynamic-based analysis.



OS4-5 Robust Control of Nonholonomic Wheeled Mobile Robot with Hybrid Controller Approach

Ho-Nien Shou (National Yunlin University of Science and Technology, Taiwan)

This study proposes a control strategy to solve the nonholonomic mobile robot trajectory tracking problem on the basis of Cerebellar Model Articulation Controller (CMAC). Mobile robot needs two controllers to provide the control demands. One controller is mathematically described in terms of robot's kinematics; while the other is given by dynamics equations. To implement the speed control to track the reference trajectory, we apply the Lyapunov theory to obtain the virtual speed control command. Our simulation is performed in Matlab/Simulink environment, and the results verify the effectiveness of the controller algorithm.



OS4-6 Design and Implementation of Microsatellite Detumbling Control with PWPF: Verification Using PIL

Ho-Nien Shou (Air Force Institute of Technology, Taiwan)

The micro-satellites due to the limits of weight and power, this kind of micro-satellite with low design cost and high precision requires reducing unnecessary attitude sensors and controllers to ensure the precision of attitude control. In this article, an estimating technology about measuring angle speed with a gyro-less is mentioned. This technology is based on the period change in which the earth's magnetic field gets along the track. Only by using a three-axis magnetometer, it can produce the data from the micro-satellite measuring the earth magnetic field. Besides, the measures of the three-axis angle speed and attitude angle can be gotten through Kalman filtering. The purpose of this article is mainly to explore the problem of attitude stumbling control of micro-satellites departing away a carrier to enter a track. It is realized by a thruster to proceed with the confinement of the satellite moving, the attitude stable control and processor-in-the-loop (PIL).



OS4-7 A Study of Applying Computer-assisted Language Learning to English Course for Junior College Students in Taiwan

Shu-Hua Huang, I-Hsien Liu (Air Force Institute of Technology, Taiwan)

This study aims to explore the impact of the integration of Computer-assisted language learning (Call) into traditional English course on the learning effectiveness at Junior college in Taiwan. To achieve the above purpose, this study adopts the pre-experimental design with one-group pretest-posttest design. This study adopts quantitative and qualitative methods for data analysis and obtains the following conclusion: The application of Computer-assisted English learning has positive and significant progress on students' English learning effectiveness. And students have positive comments on English blended learning, which can enhance students' English learning motivation.

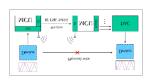


OS5 Artificial Life and Robotics (7)

OS5-1 An FSK based Industrial Analog Signal Transmission

Po-Yun Shih, Chung-Wen Hung, Chau-Chung Song (National Yunlin University of Science and Technology, Taiwan)

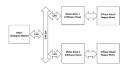
An FSK based industrial analog signal transmission is proposed in this paper. Due to the advantage of digital transmission, such as noise immunity and error check, FSK based digital transmission are popular. Although the analog signal modulation already is well-known and mature, but it is easily interfered by the noise, especially in industrial environment. When the carry frequency is occupied, changing frequency is necessary but tough work for sure. The FSK based wireless transmission is used to perform the wireless transmission of analog signal in the industrial. It also had good effects of saving the wiring between device to device and breaks the restriction of the device movement. Experiment results show that the proposed method could translate wirelessly the analog signal under 16kHz bandwidth.



OS5-2 X-Y Platform Synchronous Control with CANopen

Yu-Ming Guan, Chung-Wen Hung, Shih-Ting Yu, Yu-Kai Chen (National Yunlin University of Science and Technology, Taiwan)

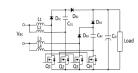
An X-Y platform consisting of three-phase hybrid stepper motor driver and a controller that supports the CANopen protocol is proposed in this paper. And the communication network of the X-Y platform is based on CAN-bus. In addition, the system is provided with the synchronization signal which meets the CiA301 communication protocol and CiA402 motion control protocol. The interpolation mode which meets CiA402 standard is implemented to improve the precision of position control. Compared with interpolation mode, the other control method, cross-coupling control is also implemented to decrease the synchronization error of biaxial motion control.



OS5-3 A PFC Converter with Voltage Double Characteristic for Universal Input Voltage Applications

Ching-Chun Chuang, Hung-Chi Lee, Chih-Chiang Hua, Chih-Wei Chuang, Chuan-Ming Niu (National Yunlin University of Science and Technology, Taiwan)

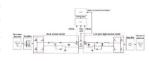
In this paper, a current-fed bridgeless power factor correction rectifier with voltage-double is proposed for a hybrid electric vehicle charging system. The proposed PFC rectifier was simulated on a 3.4-kW prototype. The differences of the simulated THD and PF between the proposed converter and the conventional interleaved PFC converter are insignificant. The proposed rectifier shows an improved low-line efficiency compared to its conventional counterpart under 1.5-kW output power.



OS5-4 Design of a Low-pulse High-current LLC Resonant Converter for EDM Applications

Yu-Kai Chen, Min-Feng Lee, Yung-Chun Wu, Jui-Yang Chiu (National Formosa University, Taiwan)

In this paper, we have developed and improve the technology of performance equalization control of Electric discharge machining (EDM) applications. We change the output current and control the current waveform of the EDM. To control the current and the loss of the electrodes and increased the processing speed and the processed object will not be too Rough we have designed a smoothly rising current to let the electrode lossless; to processing the super-hard alloy we have designed a low pulse high output current. These two converters are designed to operate with three-phase three-line ac input voltage and output will be controlled two different dc voltages during the EDM process, the method employed magnitude and frequency control to enable the converter to operate at zero voltage and zero current transitions. During the EDM process will have two different output current first is the base current, the base current is to reduce the electrode the current will be smoothly rising to the base current, when the base current has risen to the stable state, the second LLC will be started output the low pulse high current waveform of the new circuit for the EDM applications.



OS5-5 Networking Integration and Monitoring System with CANopen Controller for Intelligent Production Line of Tool Machine

Chau-Chung Song, Yu-Wei Ho, Yu-Kai Chen (National Formosa University, Taiwan)

In this paper, the development of CANopen node controller and the integration of intelligent production line is focused and studied by applying the CANopen protocol. The CAN bus is used to serve as the communication backbone by using CANopen as the high application-layer protocol. With regard to intelligent production line, the SCADA system is established with real-time monitoring and data acquisition functions to achieve the real-time communication between the operator and the tool machines. The node controller with CANopen is mainly applied to control the movements of each axis motor of measurement modules for tool machine. While the basic network management and data transmission is followed by the dictionary objects in the CANopen CiA301 protocol, the controller needs to implement with the motor motion control specification subjected to the CiA402 protocol. This proposed controller is also additionally equipped with a motor-specific incremental encoder to receive the motor feedback signal, so as to realize the motor speed control and high-precision positioning control. The SCADA system communicates with each node through CAN Bus to complete the task of constructing and managing the entire network. Further, the control commands are released and the effective data transmission and reception processing is performed on all the nodes, so that the operator can immediately monitor the condition of the production line. In the side of data collection, the real-time data is received for data analysis and processes, and displayed on the computer interface for monitoring and facilitating the safety decision-making of the field operator. Finally, the functional testing and system performance of the entire system network monitoring and management will be evaluated and implemented in this paper.



OS5-6 Illumination Manipulation and Specular Reflection Analysis of Still Image with Single Object

Hsuan T. Chang, Chi-Jie Chen (National Yunlin University of Science and Technology, Taiwan)

A lighting manipulation scheme for still images is proposed in this paper. By using the dichromatic-based model, the reflection component can be resolved through a single-image specular reflection removal method based on the characteristics of color constancy. Finally, we can generate a virtual illumination through the recombination of the reflection component. The scenes illumination can be estimated using the proposed automatic method without knowing the illumination spectra, three-dimensional object modeling, or texture databases. Experimental results show that the method is useful for handling the single or multicolor objects in scenes. However, the proposed method suffers some limitations in producing realistic simulation on the dichromatic reflection model. The future work will focus on relaxing the limits so that more lighting effects can be achieved.



OS5-7 Robotics Education for the 2019 MakeX Robotics Competition

Jia-Ming Hsiao (Far East University, Taiwan)

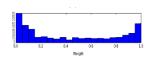
This paper is proposed to illustrate the robotics education experience for 2019 MakeX Robotics Competition in Taiwan. It is promoted in the class to make us of multidisciplinary learning within the fields of science and technology. Students are passionate about innovation by engaging them in exciting Robotics Competition. The spirit of creativity, teamwork, fun and sharing is appreciated in the competition. Alliance competition and cooperation strategy in competition is another topic in teaching and learning.



OS6 Theory and Implementation of Neuromimetic Systems (4) OS6-1 Real –time pattern recognition implementation on FPGA in multi-SNNs

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

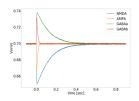
By mimicking or being inspired by the nervous system, Neuromorphic systems are designed to realize robust and power-efficient information processing by highly parallel architecture. Spike timing dependent plasticity(STDP) is a common method for training Spiking Neural Networks (SNNs) for pattern recognition. Here, we present a real-time STDP implementation on FPGA in SNN. Equipped with Ethernet Interface, FPGA allows online configuration as well as data input and output all in real-time. We show that this STDP implementation can achieve pattern recognition task.



OS6-2 Experimental results of a biomimetic silicon synaptic circuit

Ashish Gautam, Takashi Kohno (University of Tokyo, Japan)

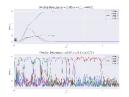
We present the experimental results of a biomimetic silicon synaptic circuit capable of exhibiting both excitatory and inhibitory dynamics, all the synaptic circuits proposed till date have either excitatory or inhibitory dynamics alone. This single circuit is capable of emulating the dynamics of the major synaptic populations received by a neuron. The first order dependence of the synaptic current on the instantaneous value of the membrane potential is also taken into account, with the synaptic current being proportional to the difference between a tunable synaptic reversal potential and membrane potential of the postsynaptic neuron.



OS6-3 Towards Modeling Cholinergic Modulation for Neuromorphic Computing

Naruaki Takano, Takashi Kohno (University of Tokyo, Japan)

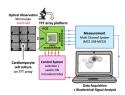
Digital Spiking Silicon Neuron (DSSN) model is a qualitative neuron model specifically designed for digital circuit implementation which exhibits high biological plausibility. In this study we introduced an additional slow negative feedback variable which corresponds to a slow potassium current (3-variable DSSN model) and constructed an autoassociative network. We observed the network dynamics by altering the magnitude of the slow negative feedback current which is known to be controlled by cholinergic modulation, and the strength of neuronal interaction. By altering these parameters, we obtained various pattern retrieval dynamics, such as chaotic transitions within stored patterns or stable and high retrieval performance. We will also briefly discuss potential applications of these results for neuromorphic computing.



OS6-4 Bioelectrical Signal Analysis of Mouse Cardiomyocyte Culture recorded on Thin-Film-Transistor Sensor Arrays

Anne-Claire Eiler, Junichi Sugita, Satoshi Ihida, Hiroshi Toshiyoshi, Katsuhito Fujiu, Thimothée Lévi, Agnes Tixier-Mita (The University of Tokyo, Japan)

Bio-electricity is at work in our body and the living world around us all the time. A problem occurring in the cardiac cell network can range from minor to fatal inconvenience. However, the mechanism of cardiac signaling network is still poorly understood. In this work, the electrical potentials generated by cardiomyocytes cultured on an array of microelectrodes have been measured using Thin-Film-Transistor (TFT) sensor arrays. The electrical signals have then been analyzed using a Matlab program developed for the bioelectrical processing of electrogenic cells. The recorded signals were filtered for the detection of bioelectric spikes, and grouped into clusters according to their similar features. Our analysis revealed the change of spike amplitudes and durations with modulation of cell culture conditions such as the temperature. Through this analysis, we thus demonstrated the possibility of obtaining accurate spike sorting and analysis from extracellular recordings on TFT array.



OS7 Robotic Manipulation (4)

OS7-1 User Interface and Motion Planner for Task Database

Tokuo Tsuji (Kanazawa University, Japan), Natsuki Yamanobe (AIST, Japan) Kensuke Harada (Osaka University/AIST, Japan)

In this paper, we present a GUI tools for handing task motion data on robotic manipulation. The data covers robot motion, human motion and object information, We especially present its data structure, data registration, data search, GUI, and API.



OS7-2 POMDP Action Planning for 6 DoF object recognition on Humanoid

Masato Tsuru (Osaka University, Japan), Tomohiro Motoda (Osaka University, Japan) Adrien Escande (CNRS-AIST, Japan), Kensuke Harada (Osaka University/AIST, Japan)

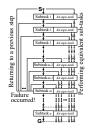
In this research, we plan the action of a humanoid robot to find a model given object. For humanoid robot automation, deciding next actions by itself is desired. Because of various noises or occlusions in observation data, robot cannot recognize objects easily. To overcome this problem, our robot walks around and observes target area from various directions. In deciding a next observation position, we use POMDP (Partially Observable Markov Decision Process) and we can obtain a merged point cloud effectively. From that point cloud, we estimate a target object's position and orientation by using 3D model file. Totally, we implemented POMDP, functions of dealing with point cloud data, and controller of whole body of humanoid robot HRP-2, and we tried it on real world, real robot.



OS7-3 Cost-oriented Planning for Error Recovery in an Automation Plant

Akira Nakamura¹, Natsuki Yamanobe¹, Ixchel Ramirez Alpizar¹, Kensuke Harada^{1,2}, Yukiyasu Domae¹ (¹AIST, Japan, ² Osaka University, Japan)

In an automation plant where robots play an active part, not only simple repetition tasks but also complicated tasks are carried out. An error is more likely to occur in such difficult work. That is why the improvement of the technique to perform recovery of an error is necessary. The task often is re-executed after returning to previous step, in the case of a big error. Therefore, it becomes the important problem to decide both the past step that it should return to and the recovery planning after returning. In this paper, cost-oriented planning of error recovery taking account of these two subjects is proposed.



OS7-4 Real-time Planning Robotic Palletizing Tasks using Reusable Roadmaps

Takumi Sakamoto (Osaka University, Japan), Weiwei Wan (Osaka University/AIST) Kensuke Harada (Osaka University/AIST)

This paper focuses on robotic motion planning for performing the palletizing or depalletizing tasks. When a robot performs such tasks, a robot usually iterates similar pick-and-place again and again. Taking into account such feature of the palletizing or de-palletizing task, we propose a robotic motion planning approach re-using the previously constructed roadmaps. We propose two methods, R-PRM and R-RRT*, utilizing the previously constructed roadmaps in the PRM and RRT*, respectively. We experimentally confirm that both methods significantly reduce the calculation time compared with the conventional methods on motion planning.



OS8 Advanced Research of Engineering and Management (4) OS8-1 A Rack and Pinion Driven Mechanical Footstep Power Generator

Ammar A. Al-Talib, K S See (UCSI University, Malaysia)

Kinetic energy from human footsteps during locomotion is generally wasted. It is possible to convert this energy into electrical energy in a non-conventional way. Due to the increase in population, the energy consumption had reached its crisis level as the fossil fuel is depleting drastically over the years. Hence, the waste energy from human footsteps can provide a promising solution to this issue. In this project, some modifications have been made to refine the performance and efficiency of power generation from mechanical footstep generators of previous works. A prototype consists of only rack and pinion mechanism had been fabricated to justify and evaluate the feasibility of the proposed concept. The power is to be generated in this system when force is applied due to the weight of a person stepping on the top plate and will cause a rack and pinion combination to rotate two DC generators. The individuals with weight ranging from 35kg to 75kg have been invited to participate in the experiments by stepping onto the top plate in the first set of experiments and then by jumping in the second set of experiments. The results obtained have been compared with the theoretical results.

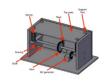
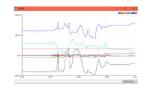


Fig. 1: The Proposed assembly for the mechanical footstep power generator used in the current study.

OS8-2 Table Tennis Using Arduino For Seniors' Healthcare

Reem Ali Abdullah, Mastaneh Mokayef, Miad Mokayef, Sew Sun Tiang, Wei Hong Lim (UCSI University, Malaysia)

Virtual reality (VR) has been shown to function well as an assistive technology to physical therapy for senior users. Seniors, from retirement home residents, form a unique user group in this field, due to their characteristics and demands. A VR controller was implemented using Arduino, MPU9565 and OpenCV to control a Table Tennis game made on Unity3D. The satisfactory results have been obtained in terms of tracking accuracy.



OS8-3 A Study on Prevention of Predictive Failures using IoT Technology

Tsutomu Ito¹, Hiroshi Sakai¹, Takao Ito², Seigo Matsuno³, Makoto Sakamoto⁴(¹Hino Motors Ltd, Japan, ²Hiroshima University, Japan, ³Ube National College of Technology, ⁴University of Miyazaki, Japan)

As main power of conveyor and drop lift in manufacturing systems, especially in car manufacturing factory, electric motors play important role in industries. Many electric motors equipped brake system to determine where they should stop. This brake system need to be maintained to keep proper brake gap. Measuring the brake gap of electric motors is one of the main job of maintenance department, but most of the motors located in unsafe spaces, like upper end of the lift or under pit. In this study, we introduced new approach to measure the brake gap of motor to reduce maintenance risk and cost. The method is using vibration acceleration to measure the motor gap in running production system based on mechanical model and IoT technology. Experience results suggested the effectiveness of our research.

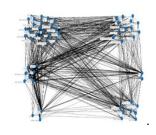


Fig.1 Real time measuring of vibration acceleration

OS8-4 Did a mismatch between the ASBJ's standard-setting and its organizational structure occur?

Keisuke Ogata (Osaka City University)

This paper examines the relationship between standard development and organizational structure of the ASBJ, Japanese accounting standard setter. According to the previous literature, the standard setter (re)structured its organization in order to execute strategies and goals that it sets by itself or is expected to achieve. In fact, the ASBJ slowed down the development of revolutionary and improved accounting standards during the period of 2009-2012. However, the ASBJ formed the organization to move ahead on developing such standards, that is, the accounting-profession-centric organization, based on organization analysis in this paper. This paper indicates that an exogeneous shock changed interests in some domestic actors, and consequently caused this mismatch.



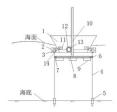
OS9 Recognition and Control (19)

OS9-1 A Design of Ocean Current Velocity Measuring Device

Jichao Zhao¹, Fengzhi Dai^{1,3}, Xin Ma², Fengkun Wang¹,
Haokang Wen¹, Hongbo Hao¹, Qianqian Zhang¹
(¹Tianjin University of Science and Technology, China, ²National Oceanic Administration Beihai Marine
Environmental Monitoring Center Station, China,

³Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

Ocean current refers to the relatively stable flow of the surface water of the ocean in a certain direction in a certain direction, and it is the main regulator of the thermal environment on the surface of the earth. At present, the ocean current velocity detection at sea is basically a field measurement by a staff member in a boat, and the adjustment of the detector position during the measurement process is very inconvenient. This paper designs a new submarine current velocity measuring device, including measuring ship, cable, fixed anchor and ocean current velocity detector. The cable on the reel is retracted through the cable retracting room, and the end of the cable is fixedly provided with a fixed anchor. The fixed anchor is fixedly provided with a plurality of ocean current flow rate detectors, and the ocean current flow rate detector has a built-in control chip, a wireless communication module, and Pressure Sensor. This device can flexibly adjust the depth of the detector according to actual needs, so as to measure the flow velocity of different depths.



OS9-2 Device Design Based on TDS Water Quality Detection

Jichao Zhao¹, Fengzhi Dai^{1,2}, Di Yin¹, Yuhui Cheng¹, Fengkun Wang¹, Leixin Han¹, Qianqian Zhang¹

(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

The traditional water quality detection method is sampling and detection by artificial nodes, which is easily interfered by weather and environment. The design is a new water quality detection device for marine waters and other waters. The device is spherical in shape and uses a built-in sensor and control system to detect the water quality in the form of drifting. This device has built-in micro control system, TDS detection module, power voltage regulator module, GPS module and wireless signal transmission module. The TDS module detects the concentration of total dissolved matter in the water, and the GPS module measures the current location of the device, which sends the data to the micro-control system. The micro control system sends the water quality information and the geographical location information to the network through the wireless transmitting module, and the user can view the water quality status by the device in real time through the Internet. The power supply voltage regulator module provides the different voltages required by the entire device to achieve the function of detecting the current water quality.



OS9-3 Design of Film Forming Rate Measuring Instrument based on Polyurethane Material

Jichao Zhao¹, Fengzhi Dai ^{1,2}, Fengkun Wang¹, Haokang Wen¹, Hongbo Hao¹, Qianqian Zhang¹ (¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

With the development and research of polyurethane materials, it has become widely used in the field of antibacterial, waterproof and moisture permeable, and medical. Therefore, this paper mainly studies on the determination of the film formation rate of polyurethane, and designs a film formation rate measuring instrument based on Atmega328P single chip microcomputer and BH1750 light intensity measurement chip. This design compares the advantages and disadvantages of the currently widely used film formation rate measuring instrument and improves it on the basis of it. By improving its multiple sensors into a high-precision main sensor, measurement requirements are reduced, and the size of the instrument is also reduced, making it easier and more portable. Moreover, it can be used not only to measure the film formation rate of polyurethane, but also to determine the film formation rate of other materials.



OS9-4 Research on the Intelligent Aircraft Design based on STM32

Hongbo Hao ¹, Fengzhi Dai ^{1,2}, Haokang Wen¹, Jichao Zhao¹, Qianqian Zhang¹ (¹Tianjin University of Science and Technology, China, ² Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

With STM32f767 igt6 (M7 series) as the core, the designed aircraft will finally realize the intelligence of the aircraft by using the optimized attitude algorithm (cascade PID and single-stage PID share the optimized control), the omni-directional ultrasonic radar detection barrier collision prevention technology, the long-distance wireless transmission technology (to realize the timely transmission of images), navigation technology (Beidou and GPS double positioning to realize more accurate positioning), voice recognition technology, man-machine interaction technology, and wireless local area network technology.



OS9-5 Research and Design of Gain Controllable System in RF Receiver

Haokang Wen ¹, Fengzhi Dai ^{1,2}, Jichao Zhao ¹, Hongbo Hao ¹, Hong Niu ¹, Qianqian Zhang ¹ (¹Tianjin University of Science and Technology, China, ² Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

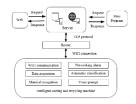
This paper studies and designs a gain controlled radio frequency amplifier system. As the hardware core of the whole system, the variable gain amplifier realizes the data function of the amplifier combined with the single chip microcomputer. After adjusting the gain of RF amplifier, the input signal can be amplified or attenuated, and the ideal output signal can be obtained. Using ADS simulation, the gain controlled RF amplifier system designed in this paper has better control effect, meets higher index, and has stable performance. The experiment shows that the gain controlled RF amplifier system has certain practicability.



OS9-6 Design of Packaging Bottle Recycling System based on Internet of Things

Yujie Yan¹, Fengzhi Dai^{1,2}, Shiwei Wu¹, Yuanyuan Xi¹, Huanhuan Li¹ (¹Tianjin University of Science and Technology, China, ² Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

The problems of environmental pollution and resource waste need to be solved. The existing packaging bottle recycling system in the market of China has the problems of high cost and maintenance cost, imperfect function and inflexible rebate mode. Based on the technology of intelligent detection, wireless communication and software development, this paper presents a comprehensive system of packaging bottle classification and recycling, which includes intelligent classification and recycling machine, Mini Program and Web management platform. The system can automatically identify and classify the metal bottles and plastic bottles, and it can also give integrals to the user, which has certain environmental protection significance.

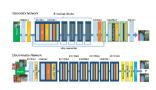


OS9-7 Research on Image Super-Resolution Reconstruction Based on Deep Learning

Lingran An¹, Fengzhi Dai^{1,2}, Yasheng Yuan¹

(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

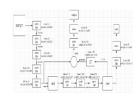
This paper mainly applies the relevant theories of deep learning to image super-resolution reconstruction technology. By comparing four classical network models used for image super-resolution (SR), finally a generative adversarial network (GAN) is selected to implement image super-resolution, which is called SRGAN. SRGAN consists of a generator and a discriminator that uses both perceived loss and counter loss to enhance the realism of the output image in detail. The data sets used by the training network are partly from the network and partly from the artificial. Compared with other network models, the final trained SRGAN network is above average in PSNR and SSIM values. Although it is not optimal, the output high-resolution images are the best in the subjective feelings of human eyes, and the reconstruction effect in the image details is far higher than that of other networks.



OS9-8 Research on Fatigue Detection Method Based on Deep Learning

Yasheng Yuan¹, Fengzhi Dai^{1,2}, Lingran An¹, Di Yin¹, Yuxuan Zhu¹, Yujie Yan¹ (¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

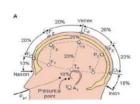
Aiming at the shortage of the existing state of deep learning to test people fatigue, this paper presents a new idea to detect fatigue. First, a video image format is saved to frames, and then the YOLOV3 - Tiny algorithm is used to detect faces in images. Compared with traditional OpenCV image process and other deep learning face recognition methods, YOLOV3-Tiny's advantages are mainly that the network is simple, the computation is small, and it can run on the mobile side or the device side. After face recognition, the recognized face is separate out, and then use OpenCV to process the face, roughly divide the face into three areas: the left eye area, right eye area and mouth area. Finally, YOLOV3 is used to identify the state of each region, and the improved PERCLOS algorithm is used to judge fatigue.



OS9-9 Fatigue Driving Monitoring System based on the EEG

Yuxuan Zhu¹, Fengzhi Dai^{1,2}, Di Yin¹, Yasheng Yuan¹
(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

This paper analyzes how to acquire the EEG signal, how to extract and analyze the EEG signal characteristic rhythm and how to estimate the fatigue degree and provide the voice reminder. Firstly, four characteristic rhythms of EEG signals are extracted by wavelet packet decomposition, and the characteristics are analyzed by relative energy frequency spectrum of rhythms. Then, according to the classification of fatigue degree, the energy value of δ wave in F3, F4 and C3 channels is selected as the basis of judging driver fatigue to classify and estimate the fatigue degree of EEG signals. Finally, when the threshold reaches 0.4, the sound card of the computer is called to prompt the tired driver.

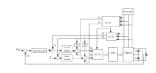


OS9-10 Research of the Control Strategy of Vienna Rectifier Circuit based on the Vector Control

Yuxuan Zhu¹, Fengzhi Dai^{1,2}, Di Yin¹, Yasheng Yuan¹

(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

This paper analyzes the working principle of VIENNA rectifier and establishes the transformation model of rectifier in three different mathematical coordinate systems. First is to obtain the control structure of the converter, which is a double closed loop control structure (the voltage is the outer loop control and the current is the inner loop control). By using a feed forward control strategy to solve the problem of phase-to-phase coupling. By adding the voltage equalization loop and using the midpoint balance algorithm to solve the problem of the voltage imbalance caused by the rectifier under load. Finally, uses MATLAB to build the model, simulates and verifies the established model system.

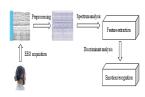


OS9-11 Research on Emotion Classification based on EEG

Di Yin¹, Fengzhi Dai^{1,3}, Mengqi Yin², Jichao Zhao¹

(¹Tianjin University of Science and Technology, China, ²Hebei University of Chinese Medicine, China, ³Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

Research shows that human emotion production is closely related to the activity correlation of cerebral cortex, so the research of emotion classification by EEG provides a reliable basis. The feature extraction and classification application of EEG have made rapid development, so we combine EEG with emotion to study emotion classification. However, there are differences between EEG signals of different subjects, which have a certain impact on emotion classification. How to ensure the high accuracy and robustness of recognition is a problem. In view of this problem, the spectrum analysis method is used to extract features to study different subjects in different states. The extracted features are classified into emotion by discriminant analysis algorithm, and the classification effect is satisfactory. There are many methods involved in feature extraction and the space is long, different feature extraction methods will be compared later, so as to improve the robustness and efficiency of emotional classification of EEG signals.



OS9-12 Identification of Synthetic Pigment based on Fluorescence Spectroscopy Combined with RBF **Neural Network**

Di Yin¹, Fengzhi Dai^{1,2}, Yuxuan Zhu¹, Yasheng Yuan¹ (¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

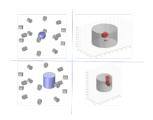
Compared with natural pigments, the synthetic pigment is cheap as an important component of food additives, which has good stability, strong coloring ability, etc. But the consumption of excessive synthetic pigment will cause harm to the human body, so an effective method of detecting the pigment is needed. In this paper, 12 samples were selected from lug/ml to 100ug/ml different concentrations of carmine and amaranth, the fluorescence spectra of all the samples were measured by the LS-55 fluorescence spectrophotometer. The results showed that the fluorescence peaks were respectively around 450nm and 420nm, redshifts and the fluorescence intensity decreased with the concentration. Two kinds of pigment samples were predicted by RBF neural network model, and the results showed the accuracy of the samples classification was 100% and the error of the sample concentrations was very small, the RBF neural network provides a method for detecting the pigment of foods.



OS9-13 Simulation Study of 3D Reconstruction in Electromagnetic Tomography with Multi-layer **Sensors Array**

Yuanli Yue, Ze Liu, Yu Miao (Beijing Jiaotong University, China)

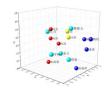
Electromagnetic tomography is an emerging technology of non-destructive testing, which is used in industrial process monitoring and biomedical detection due to its invasive and non-contacting nature. The paper provides the simulation study of 3D reconstruction in electromagnetic tomography with multi-layer sensors array. Various models of the sensor array with different layers and different numbers of coils are established in FEM software—COMSOL Multi-Physics and the changes of sensitivity map correspond to different layers of the sensor array are analyzed, the effects of layer and number of sensor coils to image reconstruction are discussed. The results confirm the feasibility of 3D reconstruction in electromagnetic tomography with Multi-layer Sensors Array and offer a reference to realize it.



OS9-14 Visualized the Knowledge Map in Children's Minds: A Study on Cognitive Structure Measurement

Qiang Wei, Hua Dong, Yi-tong Zhang, Ao-nan Zhang (Jianghan University, China)

How was knowledge or concepts organized in children's minds? The aim of this study was to explore a measurement based on multidimensional scaling analysis to visualize children's cognitive structure. 120 junior high school students (60 from first grade; 60 from third grade) and 2 teachers participated in this study. These 60 third grade students were divided into three groups based on ranking of physics achievements (20 in A group; 20 in B group; 20 in C group). Fifteen physics concepts selected from high school physics textbook were used in the study. Participants were required to rate relations between two concepts (1 showed close relation; 5 showed far relation), Euclidean distances were computed to operationalize relation-distance between items in target pairs. Compared to first-grade students, third-grade students categorized concepts as organization. Besides, they made the organization tight on the basis of relation-connection among concepts. Compared to A group and B group, C group with lower ranking had more difficulties in categorizing concepts, they spent less time on exercises which would have influences on finding relations among concepts further on making cognitive structure. The results indicate that the more effects students got in learning, the higher level cognitive structure they had.



OS9-15 Escape Route of Subway under Fire Conditions: An Experimental Study in Virtual Reality Environment

Hua Dong, Qiang Wei, Qing-qing Zhang, Lan-lan Fang (Jianghan University, China)

How to finding way for escaping from subway when people were in fire emergency? A virtual Reality (VR) was taken in our study in order to investigate people's stress-level and information searching behavior. In this VR experimental study, participants were required to finding way for escaping from a virtual subway station which was in fire emergency as soon as possible. Compared to male group, the female group had significantly higher stress level report, took longer time on searching information from the environment in order to finding way for escaping. Compared to female group, male group had much more focus on Signage. Our results indicated that female were always ready for searching information for environment and for reception, they even were influenced in finding way for escaping. Fire evacuation system for subway (or other seal off environment) should be design considering the response characteristics on this study's conclusion.



OS9-16 Research on the Smart Home Design based on Single-chip Microcomputer

Hongbo Hao¹, Fengzhi Dai^{1, 2}, Haokang Wen¹, Jichao Zhao¹
(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

The research of the smart home is mainly reflected in the indoor environment temperature, humidity, smoke concentration and the human body to monitor. This indoor environment monitoring system takes the STC89C52 monolithic computer as the control core, using MQ-2 smoke sensor, temperature and humidity sensor, infrared sensor, buzzer and other modules, the main function is to detect the indoor environment temperature and humidity, smoke concentration exceeded the predetermined value, immediately for sound and light alarm; and when the body is detected, immediately to the sound and light alarm. This system can be used in shopping malls anti-theft, Warehouse anti-theft, bank anti-theft and other occasions. The device for the current people's daily life has a strong guiding significance.



OS9-17 Design of a Portable Instrument for Measuring Heart Rate and Blood Oxygen

Haokang Wen¹, Fengzhi Dai^{1,2}, Jichao Zhao¹, Hongbo Hao¹, Qianqian Zhang¹ (¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

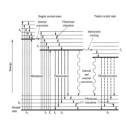
Aiming at the disadvantage of the inconvenience of the current heart rate blood oxygen detection device, a portable heart rate blood oxygen detector is proposed in this paper. The device can detect the heart rate and blood oxygen value of the human body at any time and place according to the needs of the measured person, and can display the heart rate, blood oxygen and temperature on the liquid crystal display. The instrument gets rid of the cumbersomeness of traditional medical appliances, greatly reducing the volume of the instrument and making it easier to carry.



OS9-18 Principal Component Analysis of Wine Based on Three-dim Fluorescence Spectra

Di Yin, Fengzhi Dai, Yuxuan Zhu, Yasheng Yuan (Tianjin University of Science and Technology, China)

The traditional sensory analysis method can not discriminate the wine objectively and accurately. Compared with the three-dimensional fluorescence technology, it has the advantages of strong selectivity, high resolution and direct access to the fluorescence characteristics of the sample. In this paper, three-dimensional fluorescence spectroscopy Five brands of red wine samples. The five characteristic parameters (mean value, standard deviation, center of gravity coordinates, first order center moment and correlation coefficient) of the three-dimensional fluorescence spectra of five dry red wine samples were extracted respectively. The results showed that the three different dimensions of Cabernet Sauvignon the characteristic parameters of the fluorescence spectrum are similar, based on the analysis of five dry red wine samples by principal component analysis (PCA), it was found that even the same raw material brewing wine due to different origin of raw materials, soil environment, climate and environment will cause the composition of the wine content, which shows a large difference.

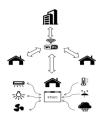


OS9-19 Control Design of Intelligent Device for Living Environment of Senile Apartment

Yasheng Yuan¹, Fengzhi Dai^{1,2}, Shengbiao Chang³, Lingran An¹, DiYin¹, Yuxuan Zhu¹, Yujie Yan¹

(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China, ³Dawning Information Industry Co., LTD, China)

At present, with the advancement of science and technology, some smart devices in the society are gradually integrated into the daily lives of the elderly. Now wireless network WIFI technology, real-time network communication function, some new Internet of things technology in the society are more and more accepted by the elderly. This paper researches the existing elderly apartments in the society, and uses the WIFI wireless communication method for information transmission in response to the special physiological needs of the elderly. The bottom layer uses various sensor nodes to transmit indoor environmental data to the upper layer in real time, and can reversely control each indoor electrical equipment through the current environmental index.



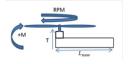
OS10 AI Applications (8)

OS10-1 Effects of Variable Arm Length on UAV Control Systems

M. Rizon, CK. Ang, MI. Solihin (UCSI University, Malaysia), Zuradzman M. R, H. Desa, Shahriman A. B., Wan Khairunizam(UniMAP, Malaysia) I. Zunaidi (University of Sunderland, UK)

Quadrotor is a type of unmanned aerial vehicle that has been widely used in many applications, such as, policing, surveillance, aerial photography and agriculture. Conventionally, the control of quadrotor flight direction is accomplished by varying speeds of motors or manipulating torques. In this paper, a novel mechanism is proposed. The mechanism uses stepper motors to control the arm length for changing flight directions, while maintaining motors' speed at constant. A mathematical model has been created. The analysis results have shown that varying arm length can effectively control the moment of bending of quadrotors. Increasing the length of arms can result in the increase of the moment of bending without changing speed of motors, thus saving energies. Experimental results have shown that the new mechanism is able to carry more payloads which the motor speed can be utilized fully at 100% while the flight direction is been controlled by changing of the arm length compared to conventional flight control mechanisms.

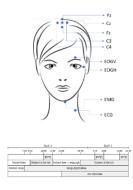




OS10-2 EEG based drowsiness detection using relative band power and short time fourier transform

Pranesh Krishnan, Sazali Yaacob, Annapoorni Pranesh Krishnan (UniKL, Malaysia) Mohamed Rizon, Ang Chun Kit (UCSI University, Malaysia)

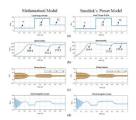
Sleeping on the wheels due to drowsiness is one of the major causes of death tolls all over the world. The objective of this research article is to classify drowsiness with alertness based on the EEG signals using spectral and band power features. A publicly available ULg DROZY database used in this research. The five EEG channels from the raw multimodal signal are extracted and by using a higher order Butterworth low pass filter the high frequency components above 50 Hz are removed. Another bandpass filter bank is designed to separate the raw signals into eight sub bands namely delta, theta, low alpha, high alpha, low beta, mid beta, high beta and gamma. The preprocessed signals are segmented into equal number of frames with a frame duration of 2 seconds using a rectangular time windowing approach with an overlap of 50%. The relative band power based on the short time fourier transform (STFT) was computed for each frame and the features are extracted. The extracted feature sets are further normalized and labelled as drowsy and alert and then combined to form the final dataset. K-fold cross validation method is used. The dataset is trained using KNN and SVM classifiers and the results are compared. The KNN classifier produces 96.1% (dataset1) and 95.5%(dataset2) classification accuracy.



OS10-3 Mathematical Model Implementation of SPWM fed Three-phase Induction Motor Drive Using MATLAB Simulink

Amir Rasyadan, Sazali bin Yaacob, Pranesh Krishnan (UniKL, Malaysia) Mohamed Rizon, Ang Chun Kit (UCSI University, Malaysia)

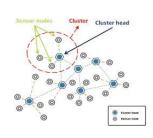
Three-phase induction motors are used in a vast area of applications mainly due to their simplicity, ruggedness and high reliability. With recent advancement in semiconductor technologies, the use of fixed speed induction motor drive is becoming obsolete, majority of the applications now requires inverter-based drives for variable speed operation. In the study of induction motor drive operation, mathematical models are often used to simulate the steady state and transient behavior of induction motor. However, to develop such model is not a straightforward task. Knowing only the equations by themselves are not always enough without some knowledge on solving mathematical equations with the use of computer simulation software. This work presents an approach to implement the mathematical model of a Sinusoidal Pulse Width Modulation (SPWM) fed threephase induction motor drive in MATLAB Simulink. The sub models include induction motor DQ-model and a voltage source inverter (VSI) fed by SPWM signal generator. The presented model implementation is able to simulate the dynamic behavior of an induction motor operation, this would be useful for further studies on the development of induction motor drive system.



OS10-4 Implementation of X-mean Clustering Algorithm for Wireless Sensor Networks

Abdelrahman Radwan, Nazhatul Hafizah Kamarudin, Mahmud Iwan Solihin, Hungyang Leong, Chun Kit Ang (UCSI University, Malaysia)

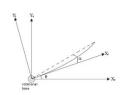
Wireless sensor network (WSN) is a promising technology that has the capabilities to support futuristic applications such as IOT and M2M communication. However, it must overcome crucial constrains such as the limited energy supply and packet routes selection. Clustering algorithm is a potential solution that prolongs the network lifetime when cluster size is balanced, and an optimal number of cluster heads are selected. K-mean algorithm as the one of the popular clustering algorithms preferred over traditional clustering techniques. However, there are some limitation hampering k-means clustering for WSN application such as number of optimal k which is assigned to deal with Cluster Head (CH) selection. In this paper, we propose to apply X-mean algorithm as a new clustering technique for WSN to prolong the network lifetime, i.e. energy consumption optimization. At first, clusters are constructed using tentative CHs and tentative area of centroids in an initial phase. Furthermore, if a cluster meets splitting criteria, new centroids are selected, and new clusters are constructed.



OS10-5 Robust H_{∞} controller design for flexible link manipulator based on constrained metaheuristics optimization algorithms

Mahmud Iwan Solihin, Lim Wei Hong, Chun Kit Ang, Mohamed Rizon, Abdelrahman Radwan (UCSI university, Malaysia)

The control of flexible manipulators to achieve and maintain accurate positioning is challenging due to the flexible nature of the system. The dynamics is even more complex with parameter variation of the system. Problems arise due to precise positioning requirements and system flexibility which leads to vibration. In this problem, the tracking controller of flexible link manipulators should be able to follow the command of desired angular position and eliminate tip's vibrations while maintaining a fast-tracking response. Robust controller should be designed to deal with the parameter variation of the system. However, parameters tuning of robust controller is a mathematically rigorous by conventional approach. In this paper, H-infinity robust controller tuning using meta-heuristics optimization is proposed. The performance of the design controller will be evaluated and comparison for different meta-heuristics optimization algorithms such as Cuckoo Search (CS), Teaching Learning-based Optimization (TLBO) and Black Hole Optimization Algorithm (BHBO) will be discussed.



Typical schematic diagram for Flexible Link Manipulator

OS10-6 Classification of Facial Nerve Paralysis Based on Regional Evaluation

Wan Syahirah W Samsudin, Rosdiyana Samad (Universiti Malaysia Pahang, Malaysia) Kenneth Sundaraj (Universiti Teknikal Malaysia Melaka) Mohamed Rizon (UCSI University, Malaysia) Mohd Zaki Ahmad (Hospital Tuanku Ampuan Afzan, Malaysia)

This paper presents an approach of regional evaluation using Kanade - Lucas - Tomasi (KLT) method and extract feature points to classify the normal and patients subjects and also to determine the severity level of paralysis for each region of face. There are Individual Score Table, Total Score Table and Paralysis Score Table were presented. A 100% of accuracy has been obtained in identifying the paralysis with k=3 using k-NN classifier for the Individual Score.



The development of regional evaluation method

OS10-7 Introduction of Forehead Lesion Assessment with House-Brackmann Score for Facial Nerve Paralysis Evaluation

Wan Syahirah W Samsudin, Rosdiyana Samad (Universiti Malaysia Pahang, Malaysia)
Kenneth Sundaraj (Universiti Teknikal Malaysia Melaka)
Mohamed Rizon (UCSI University, Malaysia)
Mohd Zaki Ahmad (Hospital Tuanku Ampuan Afzan, Malaysia)

This paper presents a novel approach of forehead lesion assessment using Gabor filter method to identify the type of facial nerve paralysis and proposed a forehead-HB score table to assist the clinicians in assessing the facial nerve function quantitatively, quicker and in a convenient way. A 100% of accuracy has been obtained in identifying the two type of facial lesion, Upper Motor Neuron (UMN) and Lower Motor Neuron (LMN) lesion. Increasing more data may enhance the performance of the accuracy.

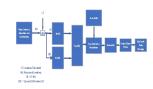


The development of forehead lesion assessment

OS10-8 Intelligent Wearable Biofeedback Fuzzy Logic Based Device for Monitoring and Treatment of Voice Loudness

Ali S. AlMejrad (King Saud University, Kingdom of Saudi Arabia)

Development of medical devices are expanding rapidly. This is occurring as results of development of high tech electronics, information technology and wireless communication technology. Integrating these technologies helps to provide good, less cost and more effective healthcare services. In this paper a novel intelligent medical biofeedback device is developed for accurate monitoring of the voice loudness using fuzzy logic compared to proportional control. This accurate monitoring device then enhanced treatment of people unable to control excessive or low loudness due intellectual disability or aggressive behavior causing loudness levels rejected by others. These people with this behavior may often be unaware of their problems and hence an intelligent wearable biofeedback device is necessary to be used by the patients outside the clinic for self-controlling excessive and low loudness without the need to the continuous therapeutic follow-up in speech pathology clinic. The use of the intelligent biofeedback device proved to be an effective due to its enhanced features. The technical design considerations, enhanced features of the device and evaluation will be presented.



Typical illustration for Developed IVLMT Device

OS11 System and Control (16)

OS11-1 Design of Humanoid Soccer Robot Based on STM32

Yuheng Zhang¹, Yulong Peng², Yizhun Peng¹, Lianchen Zhao¹, Zhou Zhang¹, Wanlong Peng¹

(¹Tianjin University of Science and Technology, China)

(²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

Humanoid robot is an important branch in the field of robotics, because its shape and movements are similar to human beings, it provides a good carrier for the related research in the field of artificial intelligence. Humanoid soccer robot of this paper is designed based on STM32 processor. Through theoretical analysis and experimental verification, the stability, working parameters and the division and cooperation of STM32 and 51 series single-chip computers of humanoid soccer robot system are analyzed, and determine the final control scheme.STM32 drives the camera to collect information, process images and make decisions. STC12C5A60S2 controls the robot steering gear to complete the corresponding action. Serial communication is used between the two controllers. The peripheral circuit mainly includes OV7725 camera module and TFT-LCD LCD display module.



OS11-2 A Design and Implementation of Intelligent Cradle

Ting Zhao¹, Qing He¹, Yulong Peng², Zhou Yang¹, Zhenjiang Chen¹, Shuo Jiang¹
(¹Tianjin University of Science and Technology, China)
(²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

The equipment is designed for families to raise children, the device is a cradle of artificial intelligence technology. The data of baby shaking are collected and analyzed by the sensor, so that the cradle bed can bionic cradle shaking. The SVM database training of infant crying can realize the recognition of infant crying and determine the specific meaning of crying, such as hunger, excretion, pain and other factors, and timely inform parents; Based on ROS robot operating system and iflytek platform, it can carry out natural language interaction and autonomous navigation. Parents can call the baby cradle and let it reach the designated position automatically to achieve autonomous obstacle avoidance and path planning without manual interference. At the same time, the camera can view the baby's status and transmit the real-time picture to the mobile phone APP.



OS11-3 A Design and Implementation of Intelligent Networking Bookcase

Zhou Zhang, Yajun Li, Yizhun Peng, Hucheng Wang, Yuqi Zhao (Tianjin University of Science and Technology, China)

The device is designed for the effective use of book resources. Users can share books in their hands through the device. Multiple devices connected together through wireless network can form a book storage network to realize the flow of paper books. The camera is used for the ISBN code identification of books, the WiFi module is used for the wireless network communication between the device and the background server, the bluetooth module is used for the near distance communication between the device and the mobile terminal, and the infrared module is used for detecting the storage state of the device. Equipment ISBN read, storage of equipment state inspection, such as simple data processing done by the device with a built-in MCU, user registration, user reading habits, such as book search more complex data calculated by the background server processing. By borrowing the concept of distributed computing, implements the equipment, and efficient use of server resources, reduce the workload of the entire system at the same time.



OS11-4 A Design and Implementation of Quad-rotor UAV

Junjie Lin, Chunxia Zhang, Yizhun Peng, Ting Zhao, Zhengke Xu (Tianjin University of Science and Technology, China)

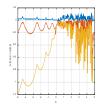
In the past 5 years, considerable attention has been paid to unmanned intelligent devices. The Quad-rotor UAV is an unmanned aircraft controlled by radio remote control equipment and self-contained program control device. Our UAV is based on TI MSP432, which can be connected to PC via USB port. This printed circuit board is used to transmit the program for the flight control of UAV. The OpenMV module serves as the data source of the line patrol controller, which is the top-level controller, the same level as the remote controller. The IMU unit calculates information to attitude controller, in order to keep the flight of UAV stable. After the IMU solution information is fused with the optical flow sensor, the information is sent to the horizontal controller to control the flight of the UAV in the horizontal direction. Similarly, After the IMU information is fused with the laser height information, the height controller is applied to control the flight height of UAV.



OS11-5 Characteristic Analysis and Synchronization Control of a Non-equilibrium System

Lianchen Zhao, Xinyu Zhang, Hongyan Jia, Yizhun Peng, Yuheng Zhang (Tianjin University of Science and Technology, China)

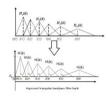
In this paper, the dynamic characteristics of a chaotic system without equilibrium point are studied. Through numerical simulation and theoretical analysis, the chaos characteristics of the system without equilibrium point are studied. In this paper, the nonlinear feedback synchronization control method is used to synchronize the system, and through software simulation, the results are analyzed to determine whether the drive system and the response system are synchronized. At the end of this paper, we give the advantages and disadvantages of this synchronization method.



OS11-6 Classification and Recognition of Baby Cry Signal Feature Extraction Based on Improved MFCC

Zhenjiang Chen, Yizhun Peng, Di Li, Zhou Yang, Nana Wang (Tianjin University of Science and Technology, China)

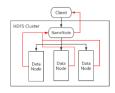
Since MFCC was proposed, it has been widely used in feature extraction of speech signals. However, for some specific sound signals, such as baby crying signal, the direct MFCC feature extraction has a low classification and recognition rate. Through the study of MFCC feature extraction process, it is found that if each filter in the triangle filter bank is shifted up by an $\partial_i(\partial_i \geq 0)$, the recognition rate of the improved MFCC feature extraction is greatly improved.



OS11-7 Design of Space Remote Sensing Data Storage Platform Based on Distributed File System

Di Li, Yizhun Peng, Ruixiang Bai, Zhenjiang Chen, Lianchen Zhao (Tianjin University of Science and Technology, China)

Due to the large space remote sensing data, a space remote sensing data has seven or eight hundred megabytes or more, and a large amount of space remote sensing data is generated every day for hundreds of GB, TB or even more, so a large amount of space is needed for storage. Space remote sensing data. In order to solve such problems, this paper prepares for the analysis of the subsequent space remote sensing data, and combines the distributed file system to store the space remote sensing data. The installation of the CentOS 6.5 virtual machine through VMware to build an HDFS cluster, through a Namenode node, three Datanode nodes to achieve access to space remote sensing data. Through the upload of the server, the space remote sensing data can be downloaded through the client, and the space remote sensing data can be downloaded through the client.



OS11-8 Research on Semantic Map Establishment of Parking Lot Based on Deep Learning and Multisensor

Shiqian Zhang, Yizhun Peng, Ruixiang Bai, Yuheng Zhang, Tianye Jian, Wanlong Peng (Tianjin University of Science and Technology, China)

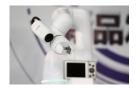
With the continuous development of robot technology, SLAM, which is one of the key technologies to realize fully autonomous mobile robots, has become a hot topic in the scientific community. Traditional SLAM technology relies on a single type of sensor to obtain information, and the semantic information of the map is rarely obtained. This paper mainly improves the SLAM mapping technology of the parking lot from the information fusion of sensors and the deep semantics of obtaining map semantic information. Through the lidar and RGB-D camera to obtain multi-modal information, combined with deep learning, extract the semantic information such as the parking lot number and parking position in the image information, help the robot to map and locate faster and better. Finally, simulations were performed using ROS and gazebo to verify the feasibility of the system.



OS11-9 Survey on Kinematics Calibration Technology of Manipulator

Zhou Yang, Yizhun Peng, Nana Wang, Yuheng Zhang, Tianye Jian (Tianjin University of Science and Technology, China)

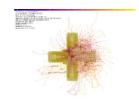
With more and more strict requirements on the quality and accuracy of industrial products, the requirements on the accuracy of robots are increased. Robot calibration is a common method to improve the accuracy. This paper mainly introduces the calibration based on model parameters. Firstly, the calibration of kinematic model parameters is reviewed in four aspects, including kinematic modeling, pose measurement and measurement instruments, parameter identification and error compensation respectively. Secondly, the various modeling methods of kinematics models, the applicable scope of measurement instruments and the algorithms of parameter identification and compensation are compared. Finally, the development trend of calibration is summarized and analyzed.



OS11-10 Visualization Analysis of Web Crawler Evolution Retrieval Research Based on KG

Zhenjiang Chen, Jiamian Wang, Yizhun Peng, Di Li, Lianchen Zhao (Tianjin University of Science and Technology, China)

In order to understand the basic situation and future development trend of domestic research on web crawler technology. By using Citespace information visualization analysis software, 2892 web crawler technical literatures in CNKI information technology database from 2000 to 2018 were data mining. From the aspects of literature time distribution, inter-agency cooperation network analysis, co-citation of authors, co-occurrence of keywords and analysis of research frontiers, this paper draws a map of scientific knowledge and sorts out the research background. This paper intuitively reveals the research status, development path, core research groups and research fields of web crawler technology.



OS11-11 Circuit Simulation of Synchronized Novel 4D Chaotic Systems

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

In this paper, synchronization of novel four-dimensional (4D) autonomous chaotic systems, based on the center translation method, is presented. The analog circuit model of the synchronization system is constructed. The numerical and circuitry simulation results are given to illustrate the validity of the synchronization circuitry.



OS11-12 Crowd Counting Network with Self-attention Distillation

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

Context information is essential for crowd counting network to estimate crowd numbers, especially in the congested scene accurately. However, shallow layers of common crowd counting networks (i.e., Congested Scene Recognition Network (CSRNet)) don't own large receptive filed so that they can't efficiently utilize context information from the crowd scene. To solve this problem, in this paper, we propose a crowd counting network with self-attention distillation (SADNet). Each input image is firstly sent to the VGG-16 network for feature extracting. Then, the extracted features are processed by the dilated convolutional part for the final crowd density estimation. Specially, we apply self-attention distillation strategy at different locations of the dilated convolutional part to use the global context information from the deeper layers to guide the shallower layers to learn. We compare our method with the other state-of-the-art works on the Shanghai Tech dataset, and the experiment results demonstrate the superiority of our method.



OS11-13 Path Planning Based on Improved Artificial Potential Field Method

Feifan Xu, Huailin Zhao, Zhen Nie, Xin Zhou, Zheheng Tao (Shanghai Institute of Technology, China)

In this paper, the traditional artificial potential field method is improved. Aiming at the problem that the traditional algorithm cannot pass through the obstacles close to each other and is prone to oscillation near the obstacles, the angle function is added to match the original force field function base on the traditional algorithm, and the stability is enhanced by combining the idea of fuzzy control. Finally, a reasonable and smooth optimal path is obtained by MATLAB simulation. It is proved that the multifunction parallel and multi-algorithm hybrid algorithm is feasible in the field of mobile robot path planning.



OS11-14 Self-balancing Car based on Adaptive Fuzzy PID Control

Zhen Nie, Huailin Zhao, Lu Sun, Xiongfeng Zhong (Shanghai Institute of Technology, China)

The self-balancing car is widely studied for its advantages of convenient operation, flexible movement, energy saving and reliability. In this paper, the STM32F105 is used as the main control chip to design a self-balancing car which realizes remote control and video transmission through WIFI. Because the self-balancing car is an unstable nonlinear system, the Kalman filter optimization algorithm is used to fuse the data of gyroscope and accelerometer, and the adaptive fuzzy PID control algorithm is used to control the balance of whole system. The experimental result shows that the system is easy to control, has strong stability, low power consumption and high transmission efficiency.



OS11-15 Crowd Counting Method Based on Improved CSRnet

Huailin Zhao, Shengyang Lu, Li Wang, Yaoyao Li (Shanghai Institute of Technology, China)

Aiming at the problem of population counting, the research is getting deeper and deeper. CSRnet proposed a method of dilated convolutions instead of convolutional layers and pooling layers. This paper mainly proposes an improved CSRnet crowd counting method, which uses a method similar to the inception-ResNet module to calculate the population density of sparse and dense crowds, and applies this method to ShanghaiTech dataset. The experimental results show that the accuracy of this method has been improved, and the speed of feature extraction has also been improved, compared to CSRnet.



OS11-16 Graph-based Global Reasoning Network for Crowd Counting

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

Convolutional neural network (CNN) has prompted the crowd counting task to massive progress in recent years. However, filters in the shallow convolutional layer of the CNN only model the local region rather than the global region, which can't capture context information from the crowd scene efficiently. To solve this problem, in this paper, we propose a Graph-based Global Reasoning Network (GGRNet). Each input image is processed by the VGG-16 network for feature extracting, and then the Graph-based Global Reasoning Unit (GGRU) reasons the context information from the extracted feature. Especially, the extracted feature firstly is transformed from the feature space to the interaction space for global context reasoning with the graph convolutional network (GCN). Then, the output of the GCN projects the context information from the interaction space to the feature space. The context information combines with the originally extracted features for final crowd density estimation. We conduct experiments on the UCF-QNRF dataset, and the results demonstrate the effectiveness of our method.



OS12 Advances in Theory and Education on Control (4)

OS12-1 Proposal teaching materials the concepts and principles of machine learning for use in education

Shinichi Imai, Yusuke Shiba (Tokyo Gakugei University)

In this paper, Technologies such as AI, IoT, and big data are very important contents. However, IoT related content is still in the developing stage and is now evolving at a tremendous speed. It is very important to learn about AI, IoT, big data, etc. Therefore, we propose a teaching tool based on soccer penalty shoots using machine learning. This teaching tool can visually confirm that the goalkeeper robot does not shoot the ball by machine learning.



OS12-2 Objective Evaluation of the Educational Effects on the Feedforward, Feedback and PID Control

Yugo Tokura, Takao Sato, Ryota Yasui, Natsuki Kawaguchi, Nozomu Araki and Yasuo Konishi (University of Hyogo, Japan)

We have newly developed an equipment for the control education. Using the equipment, grade-3 students in Mechanical Engineering course, University of Hyogo, received education on the feedforward, feedback and PID control from the spring to summer in 2019. To objectively evaluate the education effects, the students took tests before and after the control experiment class, and the examination results are compared. The comparison shows that most students precisely understand that the reference tracking performance can be improved by the feedback control and be degraded by the feedforward control.



OS12-3 Programming Learning of Temperature Control for Science Class of Elementary School

Yoshihiro Ohnishi¹, Takeshi Nakano², Teruyuki Tamai¹, Shinnosuke Mori¹, Kazuo Kawada³ (¹Ehime University, ²Ehime University Elementary School, ³Hiroshima University, Japan)

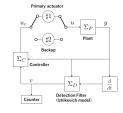
The programming learning will be made compulsory at elementary schools in 2020. This paper introduces the programming learning at elementary school. In this research, an experimental device on the theme of temperature control was developed in the field of learning electricity in elementary school science. Furthermore, learning activities in which elementary school students perform this programming are also considered. The goal is to learn programming as a technique for efficiently using electrical energy.



OS12-4 Actuator Fault-Tolerant Control using a Spiking Neuron Model

Masanori Takahashi (Tokai University, Japan)

This paper presents a new design method for an actuator fault-tolerant control system (FTCS) using a spiking neuron model. In the proposed FTCS, the Izhikevich neuron model is utilized as a fault detector. When the actuator fails, the neuron model is excited and spikes occurs. Thus, counting up spikes makes it possible to find failures. Compared with the existing AFTCSs, the proposed method has the following advantages: (1) it is possible to set a maximum detection time in advance, and (2) the structure of the control system does not depend on the mathematical model of the plants. It is quite simple even if plants have high orders. In this paper, several numerical simulation results are shown to confirm the effectiveness of the proposed AFTCS.

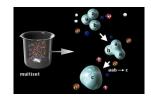


OS13 Natural Computing (5)

OS13-1 Emergence of Adaptive Behavior in Simulations by Using Abstract Rewriting System on Multisets

Yasuhiro Suzuki (Nagoya University, Japan)

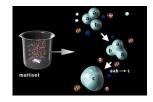
We have developed an Artificial Intelligence system by using a model of chemical reaction, Abstract Rewriting System on Multisets, ARMS, where "intelligence" means that the reaction system can "select" specific molecules to sustain their reactions. We have implemented the reaction system by using an ARMS and have obtained several molecules modified mutated DNA sequences that can sustain the reactions. We confirmed that reaction behaviors in the time series of concentration of non-mutated input molecule and mutated input molecule show oscillations; it would show that the system selects higher concentration one in between non-mutated and mutated one according to its concentration. Since the system exhibits adaptive autonomous behaviors, this DNA reaction networks system realize ARMS.



OS13-2 Implementing the Euler and Runge-Kutta Method by Using Abstract Rewriting System on Multisets

Yasuhiro Suzuki (Nagoya University, Japan)

In this paper, we show that by using a model of chemical reaction, Abstract Rewriting System on Multisets, ARMS, the Euler method, and Runge Kutta method are implemented smoothly. ARMS is a flexible computational model, and it enables us to implement Multi-Agent Systems or P Systems quickly. Hence, by using the proposed method, we can apply the Eular or Runge Kutta method for them. In this paper, we take the Lotka-Volterra model, for example, of the Multi-Agent system and show how to implement it by using the Euler and Runge-Kutta method; then we compare these results.



OS13-3 Extracting Tactile Sensation from Body Movement and Converting it into Vibrotactile Using the Tactile Score Bit

Yasuhiro Suzuki (Nagoya University, Japan)

Body motion, speed and acceleration are extracted using motion capture and converted to tactile score bits and TS bits by discretizing the magnitude. The TS bit is Kansei information, which is information that can be obtained by discretizing the extent and the duration of its size for a specific feature value over time. By using the TS bit, the sensitivity can be extracted from the temporal change in function. In this paper, we will introduce how to convert a dancer's body movement to the TS bit and TS bit to vibrotactile.



OS13-4 A Tactile Sense Centered Virtual Reality Game by Using Biometric Feedback

Yoshihito Ushida, Yasuhiro Suzuki (Nagoya University, Japan)

In this research, we try to construct a Virtual Reality (VR) system centered on the tactile sensation that has used as a secondary. Tactile sensation has a more significant effect on sensibility than audiovisual. Therefore, if tactile sensation and audiovisual sense are combined, presence can be given to a virtual object in the VR space. This system makes a user's biological information accessible in VR space. Then, a virtual object linked to the audiovisual data is presented. A player has to use the virtual object to play this game with physical body movements. And the system feeds back biometric information and deliver the change of biometric data through the sensory presentation to the user.



OS13-5 A Method of Extracting Sensibility from Time Series Data and Converting it to Vibrotactile

Yasuhiro Suzuki (Nagoya University, Japan)

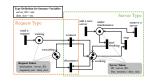
This paper proposes a method to convert sensory information into a vibrotactile sensation. In this method, sensibility is extracted from temporal changes of quantitative data by discretizing the magnitude based on the amount of time change of data and the time change of the data size. Sensibility information obtained by this discretization is called tactile score bits and TS bits. By changing the amplitude and length of the vibrotactile according to the TS bit, we can obtain the vibrotactile transformed from time-series data.



OS14 Software Development Support Method (5) OS14-1 Behavioral Modeling Technique for Multiple Objects of Software Using Extended Place/Transition Nets with Attributed Tokens

Tomohiko Takagi, Ryo Kurozumi (Kagawa University, Japan)

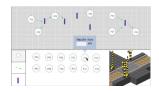
EPN (Extended Place/transition Net) is a formal modeling language to represent the behavior of software that consists of multiple objects. In software modeling using EPN, objects need to be defined individually even if they have the same variables and actions, which causes an increase in model size. This paper shows a novel language called EPNAT (EPN with Attributed Tokens) and modeling technique using it in order to address this problem. In EPNAT, objects are expressed as attributed tokens that are classified into types, and also states and events of objects of the same type are expressed as places and transitions, respectively. Attributed tokens can pass through places and transitions that have the same types as theirs. An EPNAT model can be converted to a VDM++ specification, and allows engineers to check its behavior.



OS14-2 Learning Support Technique of Software Visual Modeling Using Place/Transition Nets

Yuki Ue, Tomohiko Takagi (Kagawa University, Japan)

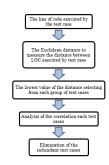
Software modeling is important especially for the development of large and complex software. However, the quality of software models depends on the skill of engineers, and learning it costs time and effort. We propose a learning support technique of software visual modeling to address this problem. The idea of block, which is well-known in the field of visual programming, is introduced into this technique in order that trainees can understand the notation of modeling languages intuitively and can be given guidance about the way to construct proper models. Also, animated graphics are introduced in order that trainees can understand the behavior of their models intuitively. PN (Place/transition Net) is selected as a modeling language in this paper, but other formal modeling languages also can be introduced into this technique.



OS14-3 Redundant Test Cases Elimination on Code Coverage with Distance and Correlation Measurement Method

Mochamad Chandra Saputra¹, Tetsuro Katayama¹, Yoshihiro Kita²,
Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹
(¹University of Miyazaki, Japan. ²Tokyo University of Technology, Japan)

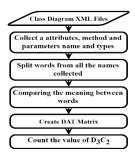
The test cases based on the white box testing will test different control flow paths in a program by executing the input on the test case to the source code and the result is Line of Code (LOC) executed then mainly interested in achieving the possible coverage of the source code. There are several test cases that have similar LOC executed. The distance and correlation measured by comparing the LOC executed by each test case using Euclidean distance. The test case that has the lowest value of distance means high redundancy and possible to execute similar LOC or path. The research tries to eliminate redundant test cases based on that similarity. Several redundant test cases eliminated to get the best test cases. By Euclidean distance, the research finds the redundant test cases on the test suite.



OS14-4 The Measurement of Class Cohesion using Semantic Approach

Bayu Priyambadha¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹ (¹University of Miyazaki, Japan, ²Tokyo University of Technology, Japan)

The cohesion is one of the design quality indicators in software engineering. The measurement of the value of cohesion is done by looking at the correlation between attributes and methods that are in a class. In Direct Distance Design Class Cohesion (D_3C_2) metrics, attributes and methods are assumed has a good correlation if they have a similar type. But, the similarity of type parameters and attributes do not always indicate that these attributes are managed (correlated) in the method. This study attempts to gain information that can enhance the degree of certainty of a correlation between the methods and attributes. Relatedness between them has seen from closeness the meaning of the attributes, methods, and parameters name. The experimental results have declared an increase in the value of cohesion produced in line with the similarity of meaning.



OS14-5 Proposal of an Algorithm to Generate VDM++ by Using Words Extracted from the Natural Language Specification

Yasuhiro Shigyo¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹ (¹University of Miyazaki, Japan), (²Tokyo University of Technology, Japan)

The natural language includes ambiguous expressions. VDM is one of methodology on the formal methods to write the specification without ambiguity. Because VDM++ is written by strict grammar which contains data types and invariants, it is difficult to write a VDM++ specification. This research attempts to generate automatically a VDM++ specification from natural language specification by machine learning. To generate a VDM++ specification, it is necessary to extract words such as function and variable from natural language specification. This paper proposes an algorithm to generate VDM++ specification from the extracted words. An identifier is generated from the extracted words, and then the VDM++ specification is generated by converting the identifiers into VDM++ grammar.



OS15 Recognition and System (11)

OS15-1 Efficient Detection Device for Wafer Physical Defects

Jianyong Chen, Xiaoyan Chen, Chundong Zhao (Tianjin University of Science and Technology, China)

Wafer defect detection is an important part of semiconductor manufacturing. In order to improve the efficiency of semiconductor wafer defect detection, this paper designs an efficient visual inspection device. The device uses programmable logic controller (PLC) as controller for the transmission mechanism and uses servo motor as drive device. A CMOS camera is used to capture wafer images, a computer is used for wafer image processing, and results are displayed on a graphical user interface. Camera calibration is implemented by integrating the mapping relationship between the pixel coordinate system and the world coordinate system, the internal and external parameters of the camera and the distortion coefficient. The device proposed in this paper is low in cost and the detection process is stable and reliable. It provides a new solution for wafer defect detection.



OS15-2 Wafer Defect Detection Method based on Machine Vision

Chundong Zhao, Xiaoyan Chen, Jianyong Chen (Tianjin University of Science and Technology, China)

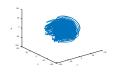
With the development of integrated electronic circuit manufacturing technology, enterprises have put forward higher requirements for the quality of silicon chips. Aiming at the low efficiency of silicon wafer defect detection, this paper proposes an automatic defect detection method based on machine vision. The voiding algorithm based on flood fill can effectively extract the inner contour information of the wafer profile. A rotation correction algorithm is proposed to correct the wafer yaw angle. The actual wafer was used to verify the performance of the proposed method. The results show that the proposed method is effective in detection accuracy.



OS15-3 Analysis and Hardware Implementation of a Novel 4D Chaotic System

Yan Sun, Yongchao Zhang, Jiaqi Chen (Tianjin University of Science and Technology, China)

In this paper, a novel 4D chaotic system is proposed. First, the basic dynamic characteristics of this system are analyzed theoretically. Second, dynamical properties of it are investigated by phase trajectory, Poincaré section map, Lyapunov exponent spectrum and bifurcation diagram. Finally, a analog circuit of the system is designed and simulated by Multisim. The experimental results show that the circuit simulation results are consistent with the numerical simulation results.



OS15-4 Research on Synchronous Control of a Novel 4D Dissipative Chaotic System

Jiaqi Chen, Yongchao Zhang, Yan Sun (University of Science and Technology, China)

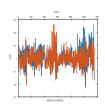
A novel four-dimensional dissipative chaotic system is presented in this paper, which with six nonlinear terms, three variable system parameters and one external excitation input. Through theoretical analysis and numerical simulation analysis of the chaotic characteristics of the system, a self-synchronization of the chaotic system is realized by the method of nonlinear synchronous control strategy, numerical results show that nonlinear synchronous controller is correct and effective.



OS15-5 EEG classification based on common spatial pattern and LDA

Lei Wang¹, Zixuan Li² (¹Tianjin University of Science and Technology, China), (²Dongbei University of Finance & Economics, China)

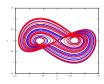
In the BCI system of motor imaging (MI), the effective method of MI feature extraction and classification is the key to the follow-up work. According to the physiological phenomena of event related desynchronization (ERD) and event related synchronization (ERS) of MI EEG signal, the optimal eigenvector representing the state of MI EEG signal corresponding to the maximum eigenvalue was selected, and then the feature extraction method of common spatial pattern (CSP) was proposed, and the classification of MI EEG signals was realized by combining with linear discriminant analysis (LDA). The experiment verified the method of data III provided by Graz University, and the recognition accuracy of left and right hand motion EEG signals is 80%. The results of experiment and data analysis show that LDA classifier can be applied to classify the feature vectors extracted from CSP, which has a good recognition accuracy and can lay a theoretical and experimental foundation for the practical application of BCI system based on MI.



OS15-6 Dynamic Characteristics Analysis of the Shimizu–Morioka Chaotic System

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

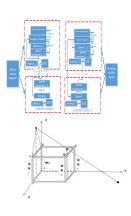
In the paper, we investigate the Shimizu–Morioka chaotic system based on Numerical simulations and FPGA implementation. Firstly, the stability of three equilibrium points of the system is analyzed by using the Routh-Hurwitz criterion. Then the coexistence characteristics of the system are studied by using digital analysis methods such as the phase portrait diagram, Lyapunov exponents diagram and bifurcation diagram. Finally, the digital circuit of the system is realized by FPGA, and the feasibility of the system is illustrated.



OS15-7 Research on the Motion Track of High-speed Objects

Qianqian Zhang^{1,2}, Fengzhi Dai^{1,3}, Jichao Zhao¹, Haokang Wen¹, Hongbo Hao¹ (¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China, ³Advanced Structural Integrity International Joint Research Centre, Tianjin University of Science and Technology, China)

Measuring the location coordinates of high-speed moving objects is of great significance in the strike accuracy test. Currently, there are a variety of measurement methods, such as light screen target measurement and acoustic target measurement. The integrated control and verification workstation includes the calculation system and wireless transmission module, which is mainly responsible for the final modeling and analysis of the data collected by the system to obtain the calculation results and display them. "Acquisition station 1" and "acquisition station 2" are composed of acquisition computer, battery, DCDC module (secondary power supply), camera, trigger module and other parts. The main function of acquisition station is to analyze and process the data collected by the camera and upload them to the integrated control algorithm workstation. The purpose of this design is to develop a set of high speed object trajectory landing point prediction system, and realize the recording, processing, wireless uploading, human-computer interaction and other functions of high speed linear motion target video collected by 4 sets of high speed cameras set up at two points.



OS15-8 Research on Surface Defect Detection of Aluminum based on Image Processing

Xuemin Liu¹, Ce Bian³, Di Yin², Yuxuan Zhu², Yasheng Yuan² (¹China Petroleum Engineering and Construction Corporation, China, ² Tianjin University of Science and Technology, China, ³ Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

Aluminum material is relatively smooth. Aluminum surface engender scratches and bruises easily when collide with other metal. Surface defect detection of aluminum products is particularly important. It is very convenient to use machine vision method for defect detection. Defect contour extraction is an important part of machine vision for defect detection. The surface of aluminum metal is very reflective and shallow scratches are easily mistaken for defects. There are many kinds of filtering, such as the mean filtering, gauss filtering, median filtering and directed filtering. With the help of filtering, dynamic threshold can achieve a good effect. The severe scratch defect and the slight scratch can be clearly separated from the surface of the aluminum product.



OS15-9 Research on the Control of Multi Position Production Line based on PLC

Yong Hou¹, Hao Wang¹, Runhua Mao², Xuemin Liu³
(¹Tianjin University of Science and Technology, China, ²Tianjin Tianke Intelligent and Manufacture Technology CO, LTD, China, ³China Petroleum Engineering and Construction Corporation, China)

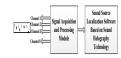
In view of the disadvantages and limitations of the traditional manual production line with the cylinder processing system as the main body, this paper proposes an intelligent production line control system based on PLC. The rearrangement of production line and automatic planning of production process are realized. The application of the system in practical production shows that the designed system can achieve 8 hours of unmanned automatic operation. It greatly improves production efficiency and product quality, reduces labor intensity and production cost, and makes the traditional production line intelligent and automatic.



OS15-10 Research on acoustic source localization system based on acoustic holography

Xiuqing Wang, Xiaoyun Jia (Tianjin University of Science and Technology, China)

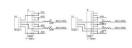
In order to solve the leakage problem caused by the rupture of oil and gas pipelines, a sound source localization algorithm based on acoustic holography is proposed. According to statistically optimal cylindrical near-field acoustic holography (SOCNAH), establishing the simulation analysis of simple sound source and multiple sound source. In this paper, the influence of noise on multi-frequency and multi-source sound signal is also studied, the window function is used to reduce the noise to acquire the best sound source signal. In addition, the near-field acoustic holography experiment of pipe cylinder model was established. The all-weather acoustic emission acquisition system was used to acquire and analyze acoustic emission signals, and the acquired acoustic emission signals were imported into the near-field acoustic holography positioning software to obtain the acoustic source positioning results. Simulation and experimental results show that the sound source localization method based on SOCNAH can realize the sound source localization of pipeline, determine the damaged state of pipeline, and carry out targeted remedy to ensure the safety of pipeline facilities.



OS15-11 Anti-interference Method of Electrical Fast Transient for Fire Alarm of Substation

Guo Wangyong, Ju Zhenfu, Chen Guang, Zhu Bo (Beijing NARI Yihe Environmental Protection Technology Co., Ltd, China)

Aiming at the problem of electrical fast transient (EFT) in substation, the mechanism of EFT generation and electromagnetic compatibility is analyzed. In this paper, the anti-interference method of fire alarm is designed for complex EFT in substation. The test results show that the design method can suppress the influence of EFT on fire alarm in substation effectively, improve the immunity level of EFT of fire alarm in substation, and meet the requirements of level 4 in GB / t17626.4-2006 standard.



OS16 Media Information Processing and Artificial Intelligence (4) OS16-1 Effectiveness of Data Augmentation in Pointer-Generator Model

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

We propose a new data augmentation method in automatic summarization system, especially Pointer-Generator model. 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 Pointer-Generator model. 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.



OS16-2 Mouse Cursor Control System Using Facial Movements

Masayoshi Tabuse¹, Manase Mizobe², Yasunari Yoshitomi¹, Taro Asada¹ (¹Kyoto Prefectural University, Japan, ²TORAY ENGINEERING Co.,Ltd, Japan)

It is necessary to support of computer operation for a physically disabled person. One of the possible physical movements of the physically disabled person is facial movement. Recognition of facial movement of a person makes it possible to operate a computer. Furthermore without the adjustment for a user and adjustment for the distance from a user, it is possible to reduce the burden on a user. We developed a system to resolve these problems. In our system, a web camera and dlib C++ library are used to obtain the face direction and extract feature points of the face. Changing the face direction, we can move a mouse cursor. Recognizing an open mouth or closed eye, we can carry out an operation of mouse click. In this paper, we evaluated the effect on operability due to the face direction and recognition rate due to distance.



OS16-3 Facial Expression Synthesis Using Vowel Recognition for Synthesized Speech

Taro Asada¹, Ruka Adachi², Syuhei Takada³, Yasunari Yoshitomi¹, Masayoshi Tabuse¹ (¹Kyoto Prefectural University, Japan, ²Software Service, Inc., Japan, ³Seika Town Hall, Japan)

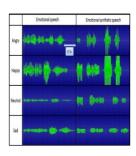
We have developed a system for facial expression synthesis of an agent in making a speech using vowel recognition for synthesized speech generated for the agent. The speech is recognized using a speech recognition system called as Julius, followed by facial expression synthesis of the agent using preset parameters depending on the vowel each. For making the agent, we used MikuMikuDanceAgent (MMDAgent), which is a freeware animation program that allows users to create and animate movies, to create an agent. To produce the agent's voice, we used the speech synthesis function setting built into MMDAgent. The impression evaluation obtained from questionnaire survey indicates that our proposed system is more natural than an agent that using preset parameters manually decided for each speech.



OS16-4 Speech Synthesis of Emotions in a Sentence Using Vowel Features

Rintaro Makino¹, Yasunari Yoshitomi², Taro Asada², Masayoshi Tabuse² (¹SoftBank Corp., Japan, ²Kyoto Prefectural University, Japan)

Recently, methods for adding emotion to synthetic speech have received considerable attention in the field of speech synthesis research. We previously proposed a method for speech synthesis of emotions using vowel features of a speaker. In the previous study, as an initial investigation, we adopted the utterance of a Japanese name that is semantically neutral. In the present study, by using the proposed method, emotional synthetic speech in a sentence made from the emotional speech of one male subject was discriminable with a mean accuracy of 78.9% when 13 subjects listened to the emotional synthetic utterances of "angry," "happy," "neutral," or "sad" when the utterance was the Japanese sentence ' $\subset \mathcal{O} \bowtie \mathcal{V} \subset \mathcal{F} \bowtie \mathcal{V} \subset \mathcal{F} \otimes \mathcal{V}$ ' (in Japanese), which means, 'This stuffed toy is pretty, isn't it?"



OS17 Machine Learning Technologies for Human Understanding (2) OS17-1 Customization of Contents for Acquisition of Skills of FPS without Trainer

Masao Kubo, Takeshi Ueno, Hiroshi Sato (National Defense Academy, Japan)

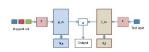
In this paper, we conducted a study to develop self-study materials with the ability to provide more suitable materials for students' skills. A first person shooter (FPS) type simulator-based teaching material is created to acquire knowledge to escape from a building surrounded by a group of zombies. Conventional games resume from a predetermined scene regardless of trainee's skill when defeated by an enemy, but are often forced to play with this, which contributes to no increases in knowledge and skill. In this paper, we propose a re-spawning point suitable for each trainee by a recommendation algorithm which tries to find good game scenes by trial and error. A simple experiment is performed to confirm the effectiveness of the proposed content generation algorithm.



OS17-2 Visual Classification of Malware by Few-shot Learning

Tran Kien, Masao Kubo, Hiroshi Sato (National Defense Academy, Japan)

The threat of malware to modern computer systems has been growing. Millions of new malware are said to be created every day all over the world. Therefore, the same malware is rarely found in different organizations. In this situation, signature-based malware detection can not work effectively. This study focuses on a few-shot learning, which can learn the pattern from very few samples. We apply Memory Augmented Matching Network (MANN) to malware classification. We show that the MANN can classify unknown malware from its binary image. We also show that the combination of MANN and prototypical network increases the accuracy of classification.



OS18 Service Robotics (7)

OS18-1 Modelling Autonomous Parallel Parking Procedure for Car-like Robot Avrora Unior in Gazebo Simulator

Dinir Imameev¹, Ksenia Shabalina¹, Artur Sagitov¹, Kuo-Lan Su², Evgeni Magid¹
(¹Kazan Federal University, Russia).
(²National Yunlin University of Science and Technology, Taiwan)

This paper focuses on implementation of path planning and control for Avrora Unior robot car that enable autonomous parallel parking. Path planning is based on existing geometrical approach, which was modified to fit specific kinematics of the robot shape and control geometry. Geometry and parking space size determine path key points: steering and counter-steering points. We implemented and tested the algorithm using Avrora Unior robot model in Gazebo simulator.



OS18-2 Traffic Sign Recognition Algorithm for Car-like Robot Avrora Unior

Nikita Nikiforov¹, Ksenia Shabalina¹, Artur Sagitov¹, Kuo-Hsien Hsia², Evgeni Magid¹
(¹Kazan Federal University, Russia)
(²National Yunlin University of Science and Technology, Taiwan)

Achieving high accuracy of traffic signs detection and recognition is difficult in realtime and is heavily influenced by non-ideal environment conditions. In this paper, we propose to combine a set of Haar cascades that had been trained on a large number of samples and could recognize different types of road signs in different positions and orientations. We use feature detection and feature matching in the process of traffic sign type identification. Our algorithm was validated on Avrora Unior robot model in a simulated environment within Gazebo.



OS18-3 Robotic palpation modeling for KUKA LBR IIWA using Gazebo Simulator

Artur Shafikov¹, Artur Sagitov¹, Hongbing Li², Natalia Schiefermeier-Mach³, Evgeni Magid¹ (¹Kazan Federal University, Russia), (²Shanghai Jiao Tong University, China) (³Health University of Applied Sciences, Austria)

Palpation is one of diagnostic methods being extensively used in medical practice. It is often used for tumor detection in cancer screening but its efficacy is highly dependent on examining physician's skill. Therefore, using a robotic tool could make this procedure more objective. In this paper, we present our control and perception modules of autonomous palpation robotic system. We have modelled KUKA LBR IIWA manipulator control using MoveIt motion planning in Robot Operating System and validated it in Gazebo simulator.



OS18-4 Remote Control Application for "Servosila Engineer" Robot on Android Mobile Devices

Daniel Kiryanov, Roman Lavrenov (Kazan Federal University, Russia)

Even though modern mobile robots' autonomous navigation capabilities rapidly increase, teleoperation mode is still an important tool, especially in critical domains like rescue or military robotics. This paper presents Android OS based teleoperator control tool for Russian crawler robot Servosila Engineer. We changed the way of data exchange between a robot and its operator, which allows using Wi-Fi data standards in order to simply data transfer from OCU process to vehicle process. Our application provides robot remote control and video data transfer from robot onboard cameras.



OS18-5 Network Failure Detection and Autonomous Return for PMB-2 mobile robot

Dmitry Bereznikov, Aufar Zakiev (Kazan Federal University, Russia)

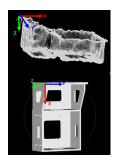
In real world teleoperated tasks a robot connection with its operator is not always stable, so it is important to increase the robot autonomy. This paper focuses on increasing robot autonomy through autonomous return and charging station docking in a case of connection loss. We integrated the algorithm into real robot control system or PAL Robotics PMB-2 robot and experimentally demonstrated its good efficiency. The algorithm analyzes network failure through incoming TCP/IP packets, uses Simultaneous Localization and Mapping (SLAM) and path planning algorithms for autonomous return, and dock station plugin for the robot docking and recharging, which continues until the connection to teleoperator station is restored.



OS18-6 Pick and Place of Large Object Based on 3D vision

Hsien-Huang P. Wu, Jia-Kun Xie (National Yunlin University of Science & Technology, Taiwan)

Automation is a necessary tool to achieve unmanned factory, and machine vision plays a vital role for providing intelligent recognition in automation. In this study, technique of 3D camera is used for 3D image capturing and matching to identify, pick and place large objects automatically. The system uses a commercially available 3D stereo vision camera to build the image acquisition system, and reconstruct the large objects in 3D. This 3D image is used for classifying the objects with the 3D object recognition algorithm. After the object was identified and its 3d information was obtained, a robot arm integrated with the camera system can be used for grasping. Compared with traditional 2d image matching for 3d big object recognition, stable 2d image features are much harder to obtain due to the shadow. The 3D stereo vision camera does not require strict requirements for lighting control, and only needs stable ambient light. The reduction of the difficulty in building image acquisition environment for large 3d object and the cost of camera system provide a new option for applications that requires large object identification.



OS18-7 Application of the MyRIO Based Mobile Robot Using Vision System

Bo-Jun Yang¹, Kuo-Hsien Hsia¹, Kuo-Lan Su¹, Evgeni Magid² (¹National Yunlin University of Science & Technology, Taiwan) (² Kazan Federal University, Russia)

The paper develops a MyRIO based mobile Robot with the vision system. The mobile robot contains a robot arm and a gripper based on the subject of the world skill competition project. The structure of the mobile platform uses the Matrix elements. The mobile platform integrates some sensors, four DC servomotors, three RC servomotors, a MyRIO based controller, and a vision system. The core of the MyRIO based controller is the NI-Single-Board RIO 9606 module. The vision system of the mobile Robot can search and recognize the assigned shape and color billiard ball to be fixed on the front side using Otsu algorithm. In the experimental results, the mobile robot moves to the assigned location from the start location, and uses the vision system to search the assigned billiard ball. Then the mobile robot uses the robot arm to catch the assigned billiard ball, and moves to the assigned position autonomously. The robot arm puts down the billiard ball. Finally, the mobile platform moves to the start location and stop.



OS19 Advanced Information Processing Applications (5) OS19-1 Extraction of Irrelevant Sentences from Online Hotel Reviews

Shogo Watanabe, Masaharu Hirota, Tetsuya Oda (Okayama University of Science, Japan)

Many reviews of hotels have been posted on review sites such as TripAdvisor and Yelp. Many tourists select a hotel to reserve based on their ratings and reviews. Although containing useful information, those reviews may also contain useless information, which reduces their readability. Removing irrelevant sentences from those reviews can improve their readability. This paper proposes a method to extract irrelevant sentences from a review. Our approach uses a supervised learning method to classify the sentences into relevant and irrelevant. We demonstrate the performance of our proposed method by evaluation experiment using TripAdvisor dataset.



OS19-2 Inferring Home Location of Foreign Tourists Based on Travel Routes Extracted from Social Media Sites

Lugasi Chen, Masaharu Hirota (Okayama University of Science, Japan)

Tourists of certain regions have a tendency to visit certain places when travelling abroad. The availability of large amount of data from social media sites allows researchers to profile those tendencies, which could be useful for many applications. We propose a method to infer the home location of a tourist based on such tendency, using metadata annotated to contents from social media sites. Our approach uses Long Short-Term Memory neural network to learn the quantized travel route of each user, which is based on clusters extracted from the obtained data. We demonstrate the performance of the proposed method by evaluation experiments using photographs obtained from Flickr.



OS19-3 The IoT Solution to Archive and Play the Digital Library of Kamishibai

Motohide Yoshimura, Ayumi Eikawa (The University of Nagasaki, Japan)

We innovate an IoT solution to archive and play the digital library of Kamishibai. Kamishibai is a form of Japanese picture story show. It consists of a sets of illustrated boards placed in a miniature stage-like device and the narrator tells the story by switching each boards. Our solution has two aspects. The one is an educational tool for children and the other is an electric toy playing with children. As to the former, the children collect local mythology and tradition and make kamishibai boards by drawing software. As to the latter, children construct a miniature stage-like device by applying NFC tags for switching each boards. In this paper, we report findings through the construction of a kamishibai device which displays the kamishibai boards on a content server by using NFC reader and tags.



OS19-4 A Research on Prediction of Inter-firm Relationships

Takao Ito¹, Tsutomu Ito², Matsuno Seigo³, Rajiv Mehta⁴, Makoto Sakamoto⁵ (¹Hiroshima University, Japan, ²Hino Motors Ltd, Japan, ³Ube National College of Technology, Japan, ⁴New Jersey Institute of Technology, USA, ⁵University of Miyazaki, Japan)

Inter-firm relationship is one of the basic issues for corporate strategy formation. A plethora of researches of inter-firm measurement have been published, but studies on prediction of inter-firm relationships have been sparse. In order to discover a new approach of corporate strategy, the authors collected transaction and cross shareholding data sets from Yokokai, parts suppliers of Mazda, and developed a new model to forecast inter-firm relationship using graph theory. The main contribution of this research is that prediction of inter-firm relationship depends not only future trends, but also interactive firms' relationship.



Fig. 1. Interactive transactional inter-firm relationship among Yokokai in2008.

OS19-5 Generation of Arbitrarily-Oriented Ripple Images Using Circular-Sector-Type Smoothing Filter and Inverse Filter

Toru Hiraoka (University of Nagasaki, Japan)

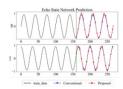
A non-photorealistic rendering method for generating ripple images from photographic Images has been proposed using intensity gradient. Ripple patterns imitate a wave on the water surface and are composed of continuous lines with fluctuations. Ripple images are expressed by superimposing ripple patterns on photographic images. However, the conventional method can only generate vertical and horizontal ripple patterns. Therefore, in this paper, we develop a method that can generate ripple patterns in any orientation. Ripple images generated by the proposed method are called arbitrarily-oriented ripple (AOR) images. The proposed method is executed by an iterative process using circular-sector-type smoothing filter and inverse filter. To verify the effectiveness of our method, we investigate the changes in AOR images by changing the values of the parameters, then we visually evaluate the appearance of these images.



OS20 Artificial Intelligence for Embedded Systems and Robotics (5) OS20-1 A Hardware-Oriented Echo State Network for FPGA Implementation

Kentaro Honda, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

Recurrent neural network (RNN) is commonly used for applications such as voice recognition and stock prediction. This paper designs echo state network (ESN), a kind of RNN for field programmable gate arrays implementation. The proposed network is able to compute faster compare to CPU, and the circuit's resources are reduced by using fixed-point operation, quantization of weights which including accumulate operations and making the dataflow modules more efficient. The circuit is verified by the prediction of sine and cosine wave experiments, and through the results, promising performance is shown.



OS20-2 Network with Sub-Networks

Ninnart Fuengfusin, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

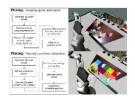
We introduce *network with sub-networks*, a neural network which it's weight layers can be detached into sub-neural networks during inference phase. To develop trainable parameters which can be inserted into both base- and sub-models, firstly, the parameters of sub-models are duplicated to base-model. Each model is forward-propagated separately. All models are grouped into pairs. Gradients from selected pairs of networks are averaged and updated both networks. With MNIST dataset, our base-model achieves the identical test-accuracy to the regularly trained models. In other hand, the sub-models are suffered an extend of loss in test-accuracy, nevertheless the sub-models provide alternative approaches to be deployed with less parameters compare to the regular model.



OS20-3 A Study on Fast Pick-and-Place Method for Home Service Robots using 3D point clouds

Tomohiro Ono, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

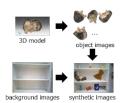
Home service robots have begun attracting attention due to decreasing birthrate and increasing aging population. The basic functions of home service robots are object recognition, picking and placing, recognition of people and environment, and interaction with peoples. In this paper, we focus on object picking and placing in the domestic environment. The pick-and-place task is a very important technique used for arrangement shelves and tidying up rooms. In order for the robot to operate smoothly, the movement to pick-and-place the object must be fast. Therefore, we develop a fast pick-and-place method using 3D point clouds. Regarding the picking, we describe a grasping-point estimation method. Regarding the placing, we describe a placeable position estimation method. These methods use at RoboCup@Home, an international competition aimed at the practical application of home service robots, and their effectiveness and validity are verified.



OS20-4 Acceleration of training dataset generation by 3D scanning of objects and Evaluation of recognition accuracy

Yushi Abe, Yutaro Ishida, Tomohiro Ono, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

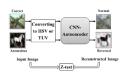
Object recognition is an important technology for Home Service Robot. When using object recognition in the home, a data set of the object matched to the environment is required. Generally, it takes a lot of time to create a data set, and there are concerns about human error in annotation work. As a previous method, there is an automatic annotation system, but it has been a problem that a lot of manual processing is required for dataset generation. In this paper, we use 3D scanning of an object to eliminate manual processing when creating a data set and further speed up. As a result, the proposed method can create datasets about 40 minutes faster than the previous method, and manual processing is not necessary. But, training YOLOv2 by using the dataset, and comparing the mean Average Precision, the accuracy was only dropped 4 points.



OS20-5 Anomaly Detection Using Autoencoder Trained with Reversed Color Models

Obada Al aama, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

Autoencoders (AEs) have been applied in several applications such as anomaly detectors and object recognition systems. However, although the recent neural networks have relatively high accuracy, but sometimes false detection may occur. This paper introduces AE as an anomaly detector. The proposed AE is trained using both normal and anomalous data based on convolutional neural network (CNN) with three different color models HSV, RGB and TUV (own model). As a result, the trained AE reconstruct the normal images without change, whereas the anomalous image would be reconstructed reversely. The training and testing of the autoencoder in case of RGB, HSV, and TUV color models were demonstrated and Cifar-10 dataset had been used for the evaluation process. It can be noticed that HSV color model has been more effective and achievable as an anomaly detector rather than other color models based on Z-test and F-test analyses.



OS21 Mathematical Informatics (4)

OS21-1 Hidden Surface Removal for Interactions between User's Bare Hands and Virtual Objects in Augmented Reality

Takahiro Ishizu, Makoto Sakamoto, Kenji Sakoma, Takahiro Shinoda, Amane Takei (University of Miyazaki, Japan). Takao Ito (Hiroshima University, Japan)

Augmented reality (AR) technology is a technique of superimposing information generated by a computer on perceptual information that we receive from real space. Recently, much attention has been focused on interaction techniques between users and virtual objects, such as the user directly manipulating virtual objects with his/her bare hands. On the other hand, in AR technology, since the 3-dimensional (3D) model is superimposed on the image of the real space afterwards, it is always displayed on the front side than the hand. Thus, it becomes an unnatural scene in some cases (occlusion problem). In this study, this system considers the object-context relations between the user's hand and the virtual object by acquiring depth information of the user's finger. In the evaluation experiment, it is confirmed that the hidden surface removal in this study not only makes it possible to consider the object-context relations but also can distinguish between finger boundaries and to clarify and process finger contours.



OS21-2 Proposal of Interactive Projection Mapping using Human Detection by Machine Learning

Takahiro Shinoda, Makoto Sakamoto, Takahiro Ishizu, Kenji Sakoma, Amane Takei (University of Miyazaki, Japan), Takao Ito (Hiroshima University, Japan)

In recent years, "Entertainment Computing" (EC) has attracted attention and has become one of the major industries in Japan. "Projection mapping" is well known in this EC. Projection mapping is a video technology that creates a new space by synthesizing space and video using a projector. Among them, many people are fascinated by works that create a fantastic world by combining dancer performance and projection mapping. However, these works require the performer to accurately align with the coordinates of the image objects in the projection mapping, which is not easy for everyone. In this study, we aim to entertain not only the people who see the projection mapping but also performers. Therefore, we have prototyped an interactive projection mapping that changes according to user movement. This time, we focused on sports and projected the ball to the user to experience baseball pitching and soccer lifting. Furthermore, we conducted a questionnaire survey to evaluate the sense of use of this system, and the results showed that many people can enjoy by this projection mapping.



OS21-3 Fundamental Study on Control of CG Characters by Electroencephalography (EEG) Analysis

Kenji Sakoma, Makoto Sakamoto, Takahiro Ishizu, Takahiro Shinoda, Amane Takei (University of Miyazaki, Japan), Takao Ito (Hiroshima University, Japan)

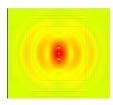
Virtual Reality (VR) technology is expected to develop in various fields such as medical, education, business and entertainment. In this study, we aim at more intuitive operation by focusing on troublesome mounting in VR. When using VR equipment, it is necessary to set up many cables and sensors. Also, when using it, there must always be a certain space around the user. This is because we always use the controller when operating in the world of VR, for reasons of care or for the safety of the user. For this reason, there arises a problem that the location must be selected when the VR device is used. As a method to solve this problem, we propose manipulation method of CG character by electroencephalography (EEG). In this paper, we ask five subjects to manipulate CG characters by EEG and evaluate this system by questionnaire.



OS21-4 Development of parallel microwave analysis code: ADVENTURE Fullwave

Amane Takei (University of Miyazaki, Japan)

In this presentation, a parallel microwave analysis code based on an iterative domain decomposition method is explained that is named ADVENTURE_Fullwave. A stationary vector wave equation for the high-frequency electromagnetic field analyses is solved taking an electric field as an unknown function. Then, to solve subdomain problems by the direct method, the direct method based on the LDL^T decomposition method is introduced in subdomains. The simplified Berenger's PML is in-troduced which these eight corners are given the average value of all PML's layers.



OS22 Robot Competitions for Social Contribution (5)

OS22-1 Real-Time Self Localization for Autonomous Robot of RoboCup MSL

Kaori Watanabe, Yuehang Ma, Tetsuya Yoshida, Hidekazu Suzuki (Tokyo Polytechnic University, Japan)

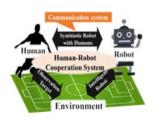
The main focus of the RoboCup competitions is the game of soccer, where the research goals concern cooperative multi-robot and multi-agent systems in dynamic environments. In the field of RoboCup, self-localization technique is important to estimate own position including goal and other robot positions and to decide strategy. This paper presents a self-localization technique using an omni-directional camera for an autonomous soccer robot. Then, we propose the self-localization method which generates the searching space based on a model-based matching with white line information of soccer field, and which recognizes the robot position by optimizing the fitness function using Genetic Algorithm. Moreover, we perform verification experiment of self-localization and verify the accuracy of the proposed method.



OS22-2 Behavior Selection System for Soccer Robot Using Neural Network

Moeko Tominaga¹, Yasunori Takemura², Kazuo Ishii¹ (¹Kyushu Institute of Technology, Japan, ²Nishinippon Institute of Technology, Japan)

With the progress of technology, the realization of a symbiotic society with human beings and robots sharing the same environment has become an important subject. An example of this kind of systems is soccer game. Soccer is a multi-agent game that requires strategies by taking into account each member's position and actions. The behavior of a player changes depending on the game situation, such as the score gap, the remaining time and the importance of the match. Players may play offensively when their team is losing, or be defensive when their team is winning with a minimum score difference. In this paper, we discuss the results of the development of a learning system that uses SOM to select behaviors depending on the situation.



OS22-3 Development of the Auto Measurement System for Cedars in a Forest Using a Drone

Keiji Kamei, Masahiro Kaneoka, Ken Yanai, Masaya Umemoto, Hiroki Yamaguchi, Kazuki Osawa (Nishinippon Institute of Technology, Japan)

Drones have been used in many purposes for a long time. Especially, development of the automatic observation systems such as measurement using drones for the primary sector of industry have been frequently researched in recent. The measurement of a tree growth in a forest is also one of the aim for a drone application. In this study, our aim is to develop the automatic measurement system for size of a tree in a forest. The difficulties are that a drone has to recognize trees, to create a map of a forest and to measure the size of trees from a front camera. To overcome those difficulties, we propose that a drone recognizes trees based on RCNN, creates a map from SLAM and measures a tree by SFM. Experimental results from the drone competition show that a drone has been able to recognize a tree and to fly safety.



OS22-4 Report on the 5th Tomato-harvesting Robot Competition

Yasunori Takemura¹, Takayuki Matsuo², Takashi Sonoda¹, Kazuo Ishii³ (¹Nishinippon Institute of Technology, Japan, ²National Institute of Technology, Kitakyushu College, Japan, ³Kyushu Institute of Technology, Japan)

Tomato is one of the 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. To develop the tomato harvesting robot, many research issues exist such as manipulator design, end-effector design, collaborative behavior, artificial intelligence, motor control, image processing, target recognition and so on. With an aim to promote the automation of tomato harvesting, we have organized the tomato harvesting robot competition since 2014. In this paper, we report on the results of 5th tomato harvesting robot competition in 2018.



OS22-5 Reports on the 7th Underwater Robot Festival in Kitakyushu

Yuya Nishida¹, Takashi Sonoda², Takayuki Matsuo³, Shinsuke Yasukawa¹, Masanori Sato⁴, Yasunori Takemura², Kazuo Ishii¹

(¹Kyushu Institute of Technology, Japan, ²Nishinippon Institute of Technology, Japan, ³National Institute of Technology, Kitakyushu College, Japan, ⁴Nagasaki Institute of Applied Science, Japan)

For enhancement of oceanic engineering technology and researchers, underwater robot competition has been held since 2016. Seventh competition in this year consists AUV league that university's vehicles automatically cruise at field and junior league that underwater craft is made. Six teams from nationwide university jointed in the AUV league in the competition and challenged the autonomous navigation in the field using developed vehicle. 14 teams from nearby high school jointed the junior league in the competition, learned to make underwater craft for two days, and try the competition using handmade craft. The paper reports competition regulation of AUV and junior league and results of the competition held in October 2019.

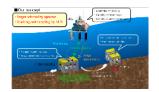


OS23 Advances in Field Robotics and Their Applications (6)

OS23-1 Sea Trials for Benthos Sampling Using Autonomous Underwater Vehicle

Yuya Nishida¹, Shinsuke Yasukawa¹, Takashi Sonoda², Keisuke Watanabe³, Kazuo Ishii¹ (¹Kyushu Institute of Technology, Japan, ²Nishinippon Institute of Technology, Japan, ³Tokai University, Japan)

Autonomous underwater vehicles (AUVs), free from umbilical cable, can cruise a wide area and show good performances for scientific bio-resource surveys. In the surveys, AUVs take seafloor images for estimations of benthos biomass and distribution using mounted camera systems. The next requirement of the bio-resource survey using AUVs is to take back the samples for scientists. Although previous AUVs would capture the specific benthos which are decided as the target beforehand, scientists on the site can't chose the sampling targets during a mission. To realize an efficient bio-resources survey by AUVs, we had developed an sampling method that human in the loop and command the sampling targets. This paper explains our sampling method by the AUV Tuna-Sand2 and shows results of sea trials.

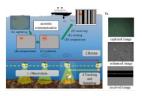


OS23-2 Field Experiments of Underwater Image Transmission for AUV

Shinsuke Yasuakwa¹, Yuya Nishida¹, Jonghyun Ahn², Takashi Sonoda³, Kentaro Yanagise¹, Keisuke Watanabe⁴, Kazuo Ishii¹

(¹Kyushu Institute of Technology, Japan, ²Hiroshima Institute of Technology, Japan, ³Nishinippon Institute of Technology, Japan, ⁴Tokai University, Japan)

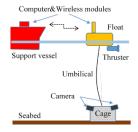
Autonomous Underwater Vehicle (AUV) has enough advantage in the task of observing a wide range area, however, it is difficult to achieve a task that requires high adaptability and recognition such as biological sampling. In order to improve the efficiency of the survey, it is necessary for AUV to report the state of the seafloor to the operators on board reasonably and in real time. In order to realize such new seafloor observation, the seafloor image transmission using the underwater acoustic communication device is the one of the solutions. We have been developing seafloor image selection and image compression technology for acoustic transmission. In this paper, we report the results of underwater image selection and transmission in biological sampling experiments conducted in November 2019 off the coast of Surugabay, Shizuoka, Japan. The image selection algorithm selected an image of a benthos, while an image of a marine snow was also selected. We also report the results of acoustic communications.



OS23-3 Development of Subsea Creature Monitoring Station for AUV Exploration Assistance

Keisuke Watanabe¹, Koshi Utsunomiya¹, Amir Sadiq¹, Daichi Hiramaki¹, Kyoko Takashima¹, Kazuo Ishii² (¹Tokai University, Japan, ²Kyushu Institute of Technology, Japan)

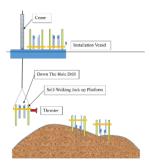
We are developing a set of sea creature investigation systems which consists of AUVs, a support vessel and subsea monitoring stations. In this paper, we introduce our recent result on developing a low cost monitoring station. This station is intended to monitor underwater images of subsea creatures wirelessly from a boat in advance before an exploration AUV is put into water. As AUV images cannot be checked until it returns, we need information where we should put an AUV. The station consists of a cage on the seabed, a float which relays underwater images to a support vessel and an umbilical cable from the cage to the float. We describe the concept, the design and system integration of the station in the paper. We also present an experimental result that was carried out to test the implemented functions at Suruga bay at 100m water depth.



OS23-4 Consideration on Installation Method of In-situ Drilling Platform through Simulations (withdraw)

Keisuke Watanabe (Tokai University, Japan)

Drastic cost reduction for subsea drilling is desired for scientific research and subsea mining field exploration. The traditional drilling method needs a special drilling platform which equips massive drilling facilities with many trained crews. Low cost in-situ drilling platform is one of the possible alternatives and we are studying about a self-walking jack up platform with a down the hole drill. In this paper, I focus on consideration on installation method to reduce its installation cost. The platform is suspended from a vessel and its motions in the horizontal plane are controlled by thrusters attached to the platform. The dynamics of a suspended platform with thrusters is formulated and a simulation program to estimate position accuracy is developed. Through simulations the effectiveness of the method is confirmed.



OS23-5 Environment Map Generation in Forest Using Field Robot

Noboru Takegami, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)

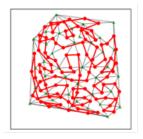
We are developing an autonomous field robot to save labor in forest operation. About half of Japan's artificial forest area is already available as wood. However, trees are not harvested and forest resources are not effectively used, because the labor and costs are not sufficient. The employment rate of young people in forestry tends to decline, and the unmanaged forest area is expected to increase in the future. Therefore, in our laboratory we propose an autonomous field robot with all terrain vehicles that focuses on the automation of work. The robot automates weeding and observation in the forest. In this research, we introduced Robot Operating System (ROS) to this robot. In addition, we observed trees by generating an environmental map in the forest using Simultaneous Localization and Mapping (SLAM).



OS23-6 Graph-Based Path Generation for Area Coverage

Ayumu Tominaga, Eiji Hayashi, Ryusuke Fujisawa (Kyushu Institute of Technology, Japan)

This research addresses the trajectory generation in 2D Euclidean space for navigation of an autonomous land vehicle (ALV). The main aim of the approach presented is to give the trajectory in order to cover the given work space to the ALV for maximize effect of the ALV. In this work, we propose graph-based offline trajectory generation method. Here, a Hamiltonian path would be find using 2D coordinates of environmental landmarks as nodes in the graph. The Hamiltonian path contains nodes that will express a midpoint between a pair of landmarks, it could be treated as global trajectory. We applied the method to an actual artificial forest with treating cultivated trees as nodes in the graph.



OS24 Robot Intelligence and Factory Automation (6) OS24-1 Deep Object 6-Dof Pose Estimation Using Semantic Pixel-wise Segmentation

Victor Pujolle, Eiji Hayashi (Kyushu Institute of Technology, Japan)

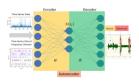
Pose estimation algorithms'goal is to find the position and the orientation of an object in space, given only an image. This task is complex, especially in an uncontrolled environment with several parameters that can vary, like the object texture, the background or the lightning conditions. Most algorithms performing pose estimation use deep learning methods. But it is hard to create dataset to train such kind of models. In this paper I developed a new algorithm robust to a high variability of conditions using semantic segmentation of the image and trainable on a virtual dataset. This system should perform keypoints based pose estimation without considering background, lighting or texture changes on the object.



OS24-2 Autoencoder with Spiking in Frequency Domain for Anomaly Detection of Uncertainty Event

Umaporn Yokkampon, Sakmongkon Chumkamon, Eiji Hayashi (Kyushu Institute of Technology, Japan)

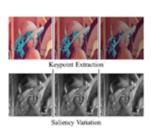
Since the research of big data and the internet of things are broadly and facilitate human life which could let the human know their information to predict or plan their activities. However, in uncertainty real-world data, there are the anomaly cases sometimes occur in all data because of the obtaining data process or obtaining devices. In this paper, we propose the autoencoder method with spiking raw data to the frequency domain to analyze and predict the anomaly case among the standard data set. Moreover, we evaluate and performance of the autoencoder method with various activation functions and loss functions. In this paper, we propose the new idea to utilize the Root Mean Square Standard Deviation for the loss function to improve the reconstruction process of the method. Finally, we evaluate and discuss the characteristic of Autoencoder performance.



OS24-3 Evaluation of the Relationships Between Saliency Maps and Keypoints

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

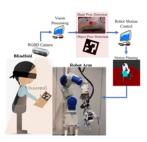
Attention is a selective action of focusing on particular objects, which is essential for environmental recognition and categorized into bottom-up attention driven by locally outstanding image region and top-down attention like searching. Itti et. al. proposed the saliency map based on intensity, color and edge orientation. However, the saliency depends on spatial frequency because fixed size Gaussian filters is applied for Itti's saliency map. Generally, scale-invariant keypoints in image feature extraction are generated by similar manner with saliency map and often applied for image matching and localization problems. One of desirable property of keypoints is invariant to photographed conditions such as lighting, orientation, distance, etc. In this paper, the relationships between saliency maps and keypoints are evaluated.



OS24-4 Robot Motion and Grasping for Blindfold Handover

Jiraphan Inthiam, Sackmongkon Chumkamon, Umaporn Yokkampon, Eiji Hayashi (Kyushu Institute of Technology, Japan)

Autonomous robots in human-robot interaction (HRI) recently are becoming part of human life as the number of service or personal robots increasingly used in our home. In order to fulfill the gap of HRI merit, we would like to propose a system of the autonomous robot motion and grasping creation for assisting the disabled person such as the blind people for handover tasks to help blind people in pick and place tasks. In this paper, we develop the robot motion to receive the object by handing over from the blindfold human to represent the blindness. To determine the target of the object and human hand, we implement the 6DOF pose detection using a marker and hand detection using the Single Shot Detection model in Deep learning for planning motion using 9DOF arm robot with hand. We finally experiment and evaluate the tasks from blindfold-robot handover tasks.



OS24-5 Gait Learning Method for Quadrupedal Robot Using Chaos Time-series Analysis

Yuehang Ma, Kaori Watanabe, Hidekazu Suzuki (Tokyo Polytechnic University, Japan)

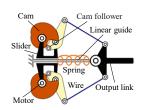
In the field of pet robots and robot-assisted therapy (RAT), characterization of animal motion is important for the development of robots resembling various animals. This paper presents a method for the generation of animal gait in quadrupedal robots. In this study, we employed AIBO as an experimental quadrupedal robot and generated the gait of the robot on the basis of an animal's gait. In the previous study, we optimized the mono-leg orbit, which can efficiently output a propulsive force, by imitating a dog's gait using a genetic algorithm. Moreover, we generated the quadrupedal gait of AIBO using both the optimum orbit of the mono-leg and an animal's gait, classified as the gait of a walking dog based on zoology. In this report, minor deviation of parameters for each joint was corrected to realize the stable gait on the ground.



OS24-6 Development of Antagonistic High Power Joint Mechanism with Cams

Katsuaki Suzuki¹, Yuya Nishida¹, Takashi Sonoda², Kazuo Ishii¹ (¹Kyushu Institute of Technology, Japan, ²Nishinippon Institute of Technology, Japan)

Acquiring flexible and agile behaviors as seen in biological systems, the robot can achieve acrobatic movements such as jumping and throwing. These acrobatic movements are expected to extend the range of robot activity. In this research, we propose a special mechanism using a pair of motors, springs and cams, which has three functions: normal operation, instantaneous operation and variable rigidity. Then, we derived a mathematical model of the mechanism and discussed the input-output characteristics of the mechanism by changing the design parameters, and analyzed the difference between the theoretical and measured results.



GS abstracts

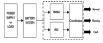
GS1 Neural Networks (6)

GS1-1 Neural Network and Internal Resistance based SOH classification for lithium battery

Jong-Hyun Lee¹, Hyun-Sil Kim², In-Soo Lee¹ (¹Kyungpook National University, Korea) (²Naval Combat Systems PMO Agency For Defense Development, Korea)

Today, lithium battery is used in various fields. Therefore, for stable use, it is important for the device and the system quickly to detect the defect occurring in the battery and diagnosis the fault accurately. Battery fault can be diagnosis by measuring the state of health (SOH) of the battery, and SOH is changed by various operating conditions. In this paper, the battery SOH monitoring system was implemented to diagnosis the fault of a battery cell through MNNSC (Multilayer Neural Network State Classifier) and IRSC (Internal Resistance State Classifier). In this method, MNNSC utilized the discharge voltage data that was obtained by operating the lithium battery cell at high temperature. On the other method, IRSC uses open circuit voltage, terminal voltage and current to calculate internal resistance. From the experiment results, we know that the proposed battery SOH monitoring method diagnosed the state of battery very well.





GS1-2 Estimation of Self-Posture of a Pedestrian Using MY VISION and Deep Learning

Tomoyuki Kurosaki, Joo Kooi Tan (Kyusyu Institute of Technology, Japan)

In this paper, we aim at developing a system that can be used easily even by elderly people; thus the use of a single wearable camera, resulting in an inexpensive system. Walking posture of a user equipped with a self-mounted camera is estimated using a pair of images obtained from the camera. Because the parallax of the image pair obtained from the chest-mounted camera is normally small when walking straight, it is difficult to estimate camera motion. So we employ a convolutional neural network in this research. It consists of three networks; a bootstrap net, an iterative net and a refinement net. In the bootstrap net and the iterative net, optical flows, camera motion and a depth image are alternately estimated to improve accuracy. In the refinement net, the resolution of the depth image is increased.



GS1-3 Simultaneous Space Object Recognition and Pose Estimation by Convolutional Neural Network

Roya Afshar, Zhongyi Chu (Beihang University, China) Shuai Lu (Beijing University of Chemical Technology, China)

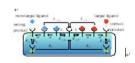
The increasing population of orbital debris is considered as a growing threat to space missions. For this purpose, Convolutional Neural Network was implemented based on transfer learning and data augmentation in order to conduct satellite classification and pose regression. In addition, the effects of un-centered and noisy images as well as different illumination conditions were analyzed by implementing different pre-trained networks. Based on the results, the present method could identify satellites and evaluate their poses against different space conditions effectively.



GS1-4 An error correction mechanism for reliable chemical communication systems

Masashi K. Kajita (The University of Tokyo, Japan)

Chemical communication systems, such as bio-inspired chemical sensory systems or biological cells, sense the environment by detecting target ligand molecules, which convey environmental information. However, non-target ligands, similar to the target ones, are ubiquitous in the environment and can hamper accurate information transmission. In this work, we investigate an error correction mechanism for reliable chemical communication and find an intuitive understanding of how the mechanism can amplify the small difference between the target and non-target ligands. We also demonstrate that the mechanism can balance accuracy and output intensity. Our approach may provide a method to design a reliable chemical communication system.



GS1-5 A Reinforcement Learning-Based Path Planning Considering Degree of Observability

Yong Hyeon Cho, Chan Gook Park (Seoul National University, Republic of Korea)

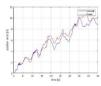
This paper presents a novel way to find a path using degree of observability as a reward for the reinforcement learning in the INS/GNSS loosely coupled system. In the proposed algorithm, an agent follows the Dubin's car model in a grid map, using a degree of observability to update Q-value. Various ratios between the penalty and reward at each step show different trajectories, and the specific state's degree of observability at the endpoint of a grid map is compared with one another. The progress is shown by a computer simulation.

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GS1-6 A Performance Analysis of Pose Estimation Based on Two-View Tracking and Multi-State Constraint Kalman Filter Fusion

Tae Ihn Kim, Jae Hyung Jung, Chan Gook Park (Seoul National University, Republic of Korea)

This paper presents a performance analysis of two-view tracking and Multi-State Constraint Kalman Filter (MSCKF) fusion for a pose estimation. The system and measurement model of both two-view tracking and MSCKF are derived based on the fusion condition. The simulation result of the fused algorithm using the Drone Racing dataset, collected from an aggressive flight of micro aerial vehicle (MAV), shows the performance improvement of both attitude and position estimation compared to the performance of MSCKF.



GS2 Control Techniques (5)

GS2-1 ORB-SLAM based Sensor Fusion Algorithm for Real-Time Precision Driving

Yong Jin Ock, Zhan Ming Gu, Jang Myung Lee (Pusan National University, Korea)

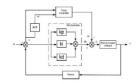
There was a problem that it was not possible to determine the exact posture and position with a single image alone. To compensate for this, additional IMU sensor and encoder sensor should be installed and calibrated. At this time, the encoder sensor acquires information about the distance traveled and the attitude of the mobile robot. The IMU sensor measures the attitude error caused by the sliding and friction of the mobile robot and acquires the slope information of the current terrain. As a result, by combining the location information acquired by using the SLAM and the complex location information of the IMU sensor and the encoder sensor, precise position control is possible even in a space without many feature points.



GS2-2 Gait Control of A Four-Legged Robot with Fuzzy-PID Controller

Arphakorn Kunha, Amornphun Phunopas, Wisanu Jitviriya (King Mongkut's University of Technology North Bangkok, Thailand)

The mobile robot has developed as the legged mobile robot. Which has a high locomotion performance on smooth and non-smooth surface Meanwhile, the legged mobile robot movement should be have algorithm for control on the legged. Because the legged robot has required self-balance and gait that imitated from the locomotion behavior of four-legged animal, such as dog cat horses, etc. Therefore, this paper aims to describes the control system design of the four-legged robot through the PID that it is a controlling of gait. The fuzzy model has used as a determined a range of error in system. But the experiment has emphasized on walking-trot in the gait of animal



GS2-3 Hybrid Force/Position Teaching and Control Method for 6 DoF Manipulator utilizing f-PAWTED

Quang-Trung Chu, Hiroki Tanaka, Hideki Inuzuka, Yoshifumi Morita (NITech, Japan) Masao Sakai (Aichi Pref., Japan)

We have proposed a direct teaching method coupling with a specialized device, Parallel Wire Teaching Device (PAWTED) with a force/torque sensor, named f-PAWTED so that operator can easily teach any desired trajectories to the 6 DoF robot manipulator by using a human hand instead of a teaching pendant. By applying the f-PAWTED and hybrid position/force control method, the robot can accurately reproduce the teaching trajectory in both position and direction, as well as force and torque in 3-dimensional space without consuming huge amount of time. In this paper we propose a teaching system based on hybrid position/force control measure to teach robot in both position, orientation and force. The experimental results proved that we can precisely playback desired trajectories by utilizing f-PAWTED.

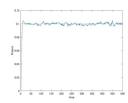


f-PAWTED

GS2-4 A Study on Generalized Predictive Control in Consideration of Noise

Akira Yanou (Kawasaki University of Medical Welfare, Japan)

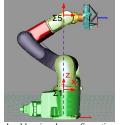
Generalized Predictive Control (GPC) is one of the model-based control methods. The control law is derived through the performance index based on the sum about the squares of control input and the squares of the error between reference signal and output prediction. Although coprime factorization approach has been used in order to extend the conventional control law in the previous researches, there has been a possibility that the order of the derived control law becomes high. Therefore, this paper extends GPC through newly defined output prediction and proposes the method to re-design the control law or the characteristic from noise to output with keeping the closed-loop transfer function. Numerical example is shown to check the characteristic of the proposed method.



GS2-5 Simulation Study on Emergency-Stopping Avoidance Control due to Singularity During Teaching Operation with Parallel Wire-Type Teaching Device

Hideki Inuzuka (NITech, Japan), Masao Sakai (Aichi Pref., Japan), Yoshifumi Morita (NITech, Japan)

It is possible to easily teach complex motions to industrial robots by the direct teaching system using our developed teaching device (PAWTED). However, practical experiments have shown that there are still some problems. One of them is the interruption of teaching operation caused by the emergency stop feature of the robot due to singular configuration during teaching operation. In order to solve this problem, we proposed a control method to avoid the emergency stop of the robot due to shoulder singular configuration by correcting robot motion using a unique and flexible characteristic of the PAWTED. Specifically, we considered correcting the robot motion by changing the target value that the robot follows the PAWTED. We confirmed the effectiveness of the proposed control method by conducting simulation study to verify that the emergency stop does not occur even in a singular configuration or its vicinity.



shoulder singular configuration

GS3 Vision & Image Processing (4)

GS3-1 Detecting Pedestrians and Moving Directions by a MY VISION System

Kenta Hori, Seiji Ishikawa, Joo Kooi Tan (Kyushu Institute of Technology, Fukuoka, Japan)

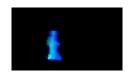
We propose a method for detecting visually impaired (user) pedestrians using images provided by a camera attached to the visually impaired (head). In the proposed method, a flow area different from the flow generated by the movement of the camera is extracted from the camera image. Pedestrians are detected by calculating the characteristics of a multi-scale cell HOG (MSC-HOG) that places cells along the outline of a person in the area. At the same time, a histogram is created in the flow area of the pedestrian, and the direction is recognized by comparing it with the flow histogram showing the walking movements learned in advance. This is to know the direction of the pedestrian toward the user wearing the camera. We experimented with the proposed method and showed its effectiveness.



GS3-2 Human Motion Recognition Using TMRIs

Cao Jing, Youtaro Yamashita, Joo Kooi Tan (Kyusyu Institute of Technology, Japan)

With the aggravation of the aging trend in Japan, the number of elderly people living alone has gradually increased, and the development of elderly people care system has begun to receive attention. Considering the importance of introducing an intelligent robot to the care of those elderly people in near future, this paper concentrates on automatic human motion recognition. This paper proposes a MHI(Motion History Image)-based method called TMRIs (Triplet Motion Representation Images) that solve in recognition, a self-occlusive motion problem particularly in the depth direction using a single camera. The performance and effectiveness of the method are verified by experiments.



GS3-3 Automatic Extraction of Abnormalities on Temporal CT Subtraction Images Using Sparse Coding and 3D-CNN

Yuichiro Koizumi, Noriaki Miyake, Huimin Lu, Hyoungseop Kim (Kyushu Institute of Technology, Japan) Takatoshi Aoki (University of Occupational and Environmental Health, Japan) Shoji Kido (Osaka University)

In recent years, the rate of death from cancer has tended to increase in Japan, and the number of deaths from lung cancer in particular has been increased. CT device is effective for early detection of lung cancer. However, there is a concern that increasing the performance of CT will increase the burden on doctors. Therefore, by presenting a "second opinion" in the CAD system, the burden on the doctor is reduced. In this paper, we develop a CAD system for automatic detection of lung cancer from 3D CT images. Our proposed method using temporal subtraction technique, sparse coding and 3D convolutional neural network. Also, to confirm effective sparse coding parameters in CNN, an image for each parameter was used as an input image. We applied our method to 31 cases and obtain the result that sparse level contributed most to the score.

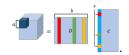
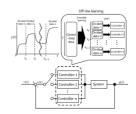


Fig. 1 Sample of image reconstruction by sparse coding. Combining base size a, base number b, and sparse level s.

GS3-4 Design of a Data-Driven Multi Controllers Using VRFT and Ensemble Learning

Takuya Kinoshita, Yuma Morota, Toru Yamamoto (Hiroshima University, Japan)

Data-driven control has been focused as a scheme of directly designing a controller from experimental data, and virtual reference feedback tuning (VRFT) was proposed for linear time-invariant systems. In the field of machine learning, the ensemble learning was proposed to improve the accuracy of prediction by using multiple learners. In this study, a design scheme of data-driven controllers using ensemble learning and VRFT is newly proposed for linear time-varying systems. The ensemble learning can divide the linear time-varying system into some sections that can be regarded locally as linear time-invariant systems.



GS4 Robotics 1 (4)

GS4-1 Design and Modeling of an Automatic Cartesian Farming Robot

Wisanu Jitviriya, Amornphun Phunopas (King Mongkut's University of Technology North Bangkok, Thailand) Eiji Hayashi (Kyushu Institute of Technology, Japan)

Currently, farming robots have become increasingly for households. The combination of modern technology and agriculture that is automatic system design, it is extremely accurate but also cost less than hiring human labor to work. All processes of the farming robot must be organic. The development of Cartesian Coordinate Robot (CCR) can operate in the multi-function such as tillage, applying fertilizer, sowing, and watering plants. In this research, which focuses on image processing to detect the plants and eliminate the weeds. The OpenCV library was used to detect the color green from the plant leaves, and from that, the program will do the rest. The elimination part of the system was constructed based on a brand-new idea that had never been done before until now. From all the experiments done, the conclusion looked promising, the blades were able to function at 80 percent efficiency



GS4-2 K-APF Algorithm to Avoid Obstacles in Path Planning

Dong-Kyo Jeong (Pusan National University, Korea) Jang-Myung Lee (Pusan National University, Korea)

In this paper, a K-APF algorithm has been proposed to resolve the local minima and unstable path problems that occur when the conventional APF (Artificial Potential Field) algorithm is used for path planning in a real environment, which is the most popular path planning algorithm for robot manipulators and mobile robots, To avoid the local minima with the conventional APF, repulsive coefficients have been added to the potential field and the unstable path has been smoothed by the Kalman filter. In order to demonstrate the performance of the proposed algorithm, it is compared to A* star and Dijkstra algorithms through the real experiments in terms of accuracy and speed.



GS4-3 Selection System of Robot type for cell assembly production (Production efficiency comparison of single arm robot and double arm robot)

Takahiro Watanabe, Hidehiko Yamamoto, Takayoshi Yamada (Gifu University, Japan)

The purpose of this research is to compare the production efficiency of single arm robot and double arm robot. This research determines which robot is suitable for an assembly cell production, a single arm robot or a double arm robot. First, we develop the system to use a double arm robot to determine the best parts location 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 up various parameters required for GA. The GA module decides the efficient arrangement place of parts, jigs and robot hands by GA and outputs the acquired arrangement visual images. Next, we use a single arm robot at the same parts location and compare the working time with a double arm robot. Finally, we conclude which robot is suitable for an assembly cell judging from the results of a total robot working time.

Cell type assembly machine

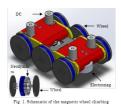




GS4-4 Curvature Surface Magnetic Wheel Climbing Robot with Adaptive Electromagnetic Adhesive Force

Richit Palangwatanakul, Apisit Thungsang, Kaned Thungod (Mahasarakham University, Thailand)
Arsit Boonyaprapasorn, Wanachart Borisut (Chulachomklao Royal Military Academy, Thailand)
Thavida Maneewarn, Suriya Natsupakpong (King Mongkut's University of Technology Thonburi, Thailand)
Thunyaseth Sethaput (Sirindhorn International Institute of Technology, Thammasat University, Thailand)

Various industrial structures or machines mostly consist of different shapes of ferromagnetic curvature surfaces. The magnetic wheel climbing robot is the suitable approach for achieving both adhesion and locomotion of the inspection robot. However, the adjustable magnetic force for robot adhesion is necessary, especially when the thickness of the surface is not uniform or the variation of the air gap between the magnetic adhesion units caused by the curvature of the surface. This can lead to the insufficient adhesive force. Furthermore, unnecessary driving torque of the motor to actuate the climbing robot from the over design of the magnetic adhesive force from the magnetic wheels can be avoided. Due to the level of the adaptive adhesive force is necessary to be considered, we designed the adaptive electromagnetic adhesive force mechanism for the curvature surface climbing robot with magnetic wheels. The PID controller was employed to control the electromagnetic force, and the adhesive force was measured by a load cell. This measurement signal was used as a feedback signal. In the paper, we investigated the capability of this adjustable magnetic force system. Five aspects of experimentation were implemented. It was clear that the light weight electromagnetic force adjustment mechanism could provide the flexibility to regulate the adhesive force for the magnetic robot while traveling on the ferromagnetic curvature surface.



GS5 Robotics 2 (4)

GS5-1 Intention Classification of a User of a Walking Assist Cart by Using Support Vector Machine Noritaka Sato, Tomoki Yokotani, Yoshifumi Morita (Nagoya Institute of Technology, Japan)

As the number of elderly people increases, the demand for walking assist cart is increasing. To develop better assist function for the cart, we focused on the prediction of the intention of a user of the cart (Intention classification of the user), when the state of the cart changes. As the first step of the study, the forces and torques to the cart from the user's hands, and the rotational velocities of the wheels are sensing. And the Support Vector Machine, which is one of the most popular and effective techniques in the artificial intelligence is used for intention classification. As a result of the experiment with five subjects, we confirmed that our method was able to predict the intention of the user with enough accuracy.



GS5-2 Development of an Environmentally Adaptable Autonomous Mobile Robot

Naokazu Iwata, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

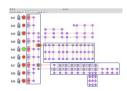
In recent years, much attention has been focused on service robots for supporting a human life. These kinds of robots are necessary to adapt flexibly to various kinds of usage, scenes, or even to environmental changes. This paper proposes an autonomous mobile robot system that adapts to various environments and travel routes based on the image features obtained from a RGB-D camera. To realize the robot system, techniques are proposed for estimating self-position of a robot using local features of images, segmenting an image for finding a movable area, and planning a route for finding the destination. In the route planning, junctions are labelled numbers for the robot to travel in the order. The developed mobile robot travels to the destination employing the information on the estimated road region, its self-position and the planned route. Experimental results, traveling two routes in a real environment, show effectiveness of the proposed system.



GS5-3 Automated Task and Path Management for Industrial AGVs in Foam Manufacturing Plant

Amornphun Phunopas¹, Wisanu Jitviriya², Noppadol Pudchuen³, Songklod Tunsiri⁴, Eiji Hayashi⁵ (^{1,2,3}King Mongkut's University of Technology North Bangkok, Thailand, ⁴Urban Community Development College, Thailand ⁵Kyushu Institute of Technology, Japan)

AGVs are increasingly used in the automated warehouse with a high demand for changing traditional workflow management to industrial 4.0. The heart of the computerized system is the central software that can distribute work functions from the queues and manage the AGVs' traffic. On the 2D floor plant layout, the girds are initially from marked points or the place that AGVs have to transit to do an assigned task. This research proposes autonomously generating paths via four nearest grids and path switching scenarios. The results show the generated paths with sequential tasks concurrently in random conditions. The task management method can prevent the AGVs' crash and bottleneck from the operation of nine machines in the foam manufacturing plant.



GS5-4 Object Tracking Method Considering Time Series Information Using Re3 with Stochastic Depth

Taichi Kitayama, Hyoungseop Kim (Kyushu Institute of Technology, Japan)

Container transportation plays an important role for international cargo transportation. The amount of container cargo movement in the world has increased over the years. In recent years, container terminals are required to automate cargo handling operations from the viewpoint of improving the working environment and ensuring the safety of employees. However, the automation of cargo handling work has not yet been realized in Japan. One of the reasons is that the technology for measuring the relative position between the container and the suspension has not been established. In this study, we propose a tracking method of container gripping area using deep learning for the purpose of relative position measurement. A hybrid tracker called Re3 using a convolutional neural network (CNN) was used. However, this model alone has a problem that global features cannot be extracted well. To solve this problem, this method incorporates a model called Stochastic Depth.

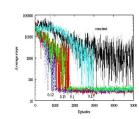


GS6 Application Techniques (9)

GS6-1 A Promoting Method of Role Differentiation Using the Learning Rate Getting Periodically Negative Value in Multi-agent Reinforcement Learning

Masato Nagayoshi, Simon Elderton (Niigata College of Nursing), Hisashi Tamaki (Kobe Univ.)

There have been many studies on the multi-agent reinforcement learning (MARL) in which each autonomous agent obtains its own control rule by RL. Here, it is considered that different agents having individuality is more effective than uniform agents in terms of role differentiation in MARL. In this paper, we propose a promoting method of role differentiation using a wave-form changing parameter in MARL. Then we confirm the effectiveness of role differentiation by the learning rate getting periodically negative value through computational experiments using "Pursuit Game" as one of multi-agent tasks.



GS6-2 Verification of a Combination of Gestures Accurately Recognized by Myo Using Learning Curves

Kengo Kitakura, Hideyuki Tanaka (Hiroshima University, Japan)

A technique for hand gestures recognition from sEMG (surface ElectroMyoGraphy) is useful for extending means of human communication. Recently, the Myo armband is one of the most popular sEMG acquisition systems, because it is relatively inexpensive and easy to remove. This paper studies verification of a combination of hand gestures recognized by using the Myo armband as an input device. To this end, relationship between data distribution and learning curves is investigated for binary classification problem and multi-class classification problems. A verification method is then proposed for finding a combination of gestures accurately classified. Since data distribution depends on removal of Myo, three cases of experiments are carried out: For the first case, Myo is not removed between training and test data acquisition. For the second and third case, Myo is removed; there is a little time or several days between data acquisition.



GS6-3 Augmentative and Alternative Communication Device Based on Head Movement to Aid Paralyzed Victims with Speech Disabilities

Vihanga Ashinsana Wijayasekara, Torin Wirasingha (Informatics Institute of Technology, Sri Lanka)

Augmentative and Alternative Communication (AAC) devices have been proven to be as an alternative to help people, who are having communication difficulties. In this paper, high tech AAC device focusing on paralyzed victims or other motor disabilities which allow them to control with their head gestures is proposed. The proposed system consists of a mobile app, a controller and a head tracker. Easy to familiar with and less material cost are some of the key advantages of this device.



GS6-4 The research about editing system of performance information for player piano. -Make inferences about whole musical composition by using DP matching system-

Mami Ezaki, Eiji Hayashi (Kyushu Institute of Technology, Japan)

Playing the piano expressive by player piano, it is necessary to adjust the volume, length, and timing of music. In the case of piano music, there are often 1000 or more notes in the score of even a short piece of music. So, to edit music data manually requires not only knowledge but also a huge amount of time and effort. Therefore, we aimed to develop a system that, like a skilled pianist, can perform even the first musical score based on information related to previous skills and experience. In this paper, we developed a system that automatically estimates the performance expression of unedited music using edited performance data and score data. We described a phrase search using DP matching and a method for selecting an optimal phrase for inference, and evaluated the entire song.



GS6-5 Evaluating Public Perception using Fuzzy Logic: A case study of Praeksa Mai dumpsite in Samut Prakan, Thailand (withdraw)

Sun Olapiriyakul, Khemika Kongpetch (Sirindhorn International Institute of Technology, Thammasat University, Thailand)

Particularly in developing countries, the issue of poor public perception towards solid waste management systems is commonly observed across rapidly urbanizing regions. The evaluation of the negative impact a waste site on public perception is the first step towards improving the well-being of local communities. This research intends to resolve the negative perception issues by developing a constructive impact assessment methodology for a dumpsite in Samut Prakan, Thailand. The evaluation of public perception impact is made, considering the factors affecting public concerns over environmental and health risks and population exposure. The fuzzy logic concept is used to account for public perception variability across different impact distances. The calculated impact scores of the dumpsite are useful for problem prioritization and benchmarking purposes.



GS6-6 A Development of a Model CubeSat with an Amateur Radio Transceiver for Education on Satellite Communication

Masahiro Tokumitsu, Kentarou Konishi (National Institute of Technology, Yonago College, Japan), Taku Takada, (National Institute of Technology, Kochi College, Japan), Fumio Asai (Member of the Radio Amateur Satellite Corporation), Makoto Wakabayashi (National Institute of Technology, Niihama College, Japan)

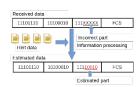
We report the development of a Model CubeSat for education on satellite communication. The communication between satellites and ground stations is an essential part of satellite operations. As a critical part of the satellite systems, we focused on satellite communication to train the student so that they can develop and operate the CubeSats. The Model CubeSat equips with fundamental components that are necessary as the satellites such as an onboard computer, sensors, communication, and power supply. The software programs of the Model CubeSat provide two functions: controlling and monitoring satellites, and data transmission of telemetry data and image data. The students can study the communication equipment and operations of satellite communication by our Model CubeSat.



GS6-7 Performance Evaluations on Data Estimation Technique with Statistical Properties of Telemetry Data for Corrupted Data in Amateur Satellite Communication

Yusuke Teranishi, Masahiro Tokumitsu (National Institute of Technology, Yonago College, Japan), Taku Takada, (National Institute of Technology, Kochi College, Japan), Fumio Asai (Member of the Radio Amateur Satellite Corporation), Makoto Wakabayashi (National Institute of Technology, Niihama College, Japan)

We propose a novel technique on a data estimation for satellite communication and report performance evaluations of the proposed technique. The proposed technique estimates the original data from the incorrect data, error detection codes, and supplemental information. Firstly, we investigated the possibility of data estimation for long length data by a brute-force technique. The first simulation results showed that the brute force technique succeeded in estimating the original data with the length 1024 bit from the incorrect data. Next, we considered the novel technique on the data estimation for the incorrect data. The second simulation results showed that the proposed technique succeeded in estimating the original data with the length 1024 bit from the incorrect data.



GS6-8 Heritage Building Design Properties: Development of As Built Drawing by UAV Application via 3D Laser Scanner

Hazry. D, Azizan. M. A, Noriman. N.Z, Romeli. N (Universiti Malaysia Perlis)

Inadequate information that represent the existing figure of the building after transmission of years and the eagerness of the Malaysian's architect to develop frantically modern development design that gradually neglecting the essence of cultural perseverance of the heritage building has been brawled excessively. Taking a human – factor constraint to conduct the physical survey, the technologies such as computers and digital media have given beneficial value that are time saving and less risky. Hence, the research aim for the development of the as-built drawing for Masjid Alwi, Kangar, Perlis has been completed via UAV Application and 3D Laser Scanner, and results were recorded on the structural and architectural properties of Masjid Alwi and analyzed accordingly. Therefore, the needs of having an adequate as-built drawing due to the depletion of the ancient documentation and as a baseline for the designer maintaining the cultural identity in a way to design new development.



GS6-9 A Virtual System for Measurements and Analysis of the Respiratory Sounds for Diagnosis of Respiratory System

Ali S. AlMejrad (King Saud University, Kingdom of Saudi Arabia)

Respiratory problem is one of the most common health problems occurring in Saudi Arabia due to the continuous changes of the weather in addition to surface winds that cause dust during all seasons in the year. This problem affects most people and especially children and elderly in addition to the adults who have respiratory problems such as asthma. This is one of the problem that need emergency care as soon as it occurred. The goal of our research is to develop a compact respiratory diagnostic system using advanced signal processing that can be used remotely via the virtual instrumentation technology to help accurately diagnosis at early stages of respiratory diseases. It can also overcome the lack of expert physicians in rural regions and some urban clinics or health centers. The proposed system will be implemented using virtual instrumentation (VI) that consists of computer, microphone with simple analog circuit, digitizer and LabVIEW software (National Instruments Inc.). VI has been designed for easy measurement and analysis. In addition to that, it has features and ability to control the whole system of acquisition, play, display, processing, advanced analysis, display and report printing of the different acquired respiratory signals and diagnosis.. The developed system has been tested with real respiratory signals of normal and abnormal cases that proved to be efficient system while dealing with many respiratory problems conditions.



GUI and Front Panel of Developed Virtual Respiratory Measurements and Analysis System

GS7 Poster (4)

POS7-1 The Development and Evaluation of Fig's Leaf Syrup

Shang-Hui Li, Pei Hi Zheng, I Chih Chiang, Yu Ting Su, Syue Sheng Lin (Far East University, Taiwan)

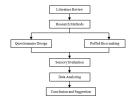
The figs sold in the market are only fruits and their processed products, the use of fig's leaves are relatively rare. But, the fig's leaves contain furanocoumarins, flavonoids, pectins, resins, sugar and vitamin C (Meng et al., 1996). Perhaps the special aroma of its leaves, or perhaps the astringency of the leaves, is less acceptable to consumers. This study used fig's leaves as the main ingredient with crystal sugar and different kinds of vanilla formula to developed if more consumers willing to accept fig's leaves syrup or not. Sensory evaluation was processed after the finished product was diluted. The obtained results was statistically analyzed by SPSS12.0, and analyzed by single factor variance and number allocation table analysis.110 students and teachers of Far East University, Tainan were selected for convenience sampling methods and 100 valid questionnaires were collected. The content of the evaluation was based on the appearance, aroma concentration, aroma preference, sweetness concentration, sweetness preference, astringency, aftertaste, overall acceptability, and willingness etc. And find out the most suitable formula of the fig's leaves syrup. In terms of appearance, the fig's leaf syrup with other vanilla is more acceptable than the original fig's leaf syrup. As for lemon fig's leaf syrup, although the aroma is the strongest, but the overall acceptance and purchase intention is the lowest due to its high astringency. Mint fig's leaf syrup, its aroma is accepted with the highest level. The results of the comprehensive data analysis found that the most suitable formula is fig's leaf 60gs, water 400gs, crystal sugar 200gs and mint 15gs.



POS7-2 The Research and Development of Fruit Puffed Rice

Shang-Hui Li, Yi-Ru Wang, Yi Ting Liu, En-Yi Lu, Cheng Han Li, Fang Quan Zhang (Far East University, Taiwan)

In recent years, Agriculture and Food Agency, FDA, Council of Agriculture, Taiwan, has vigorously promoted rice food products such as rice bread, rice noodles, rice seed strips, rice instant noodles, rice cakes, rice puffs and other products. Puffed rice is one of the most common traditional snacks in Taiwan. The ingredients are mostly rice, maltose, brown sugar, water and salad oil. But snacks on the market have gradually diversified due to the advancement of the times, moreover, the commercially available puffed rice flavor is too monotonous and generally not popular with young people. In this study, to make puffed rice based on natural freshly squeezed fruit juice with four different formulas of original flavor, pineapple, lemon and grape for sensory evaluation. 100 consumers were selected from Far East University, Tainan, by means of a convenient sampling method for formal favorite sensory evaluation. 95 valid questionnaires were collected. The evaluation included rice flavor, sweetness, acidity, degree of adhesion, brittleness and overall acceptance, and the results were statistically analyzed with SPSS12.0. The study results showed that pineapple-scented puffed rice had the highest level on crispness, the overall acceptance and the willingness to purchase. However, lemon- scented puffed rice had a low scent, low overall aroma, less fragile, high acidity, and low on overall acceptance and willingness to purchase. The most suitable formula for this study was rice scent 300g, pineapple juice 90g, salt 3g, maltose 90g, salad oil 24g, and brown sugar 160g.



POS7-3 The Research of Heath Western Cuisine – A Study of Aloe in Cooking

HsiYing Hsieh (Far East University, ROC Taiwan)

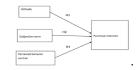
Aloe vera, is widely used in food, medicine and cosmetic products. With the improvement of the system of health care food, more and more consumers are willing to buy health care food and cosines. The study aims to understand the purchase intention of Aloe Vera in Cooking for heath western cuisine. The questionnaire will be surveyed in Tainan City. Data analysis of description, T-test, and Anova will be conducted by SPSS software. Based on the results of study, the future development and utilization of aloe vera cuisine are also discussed.

Study Da	ckground and Purpose-
	I
	Literature Review
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	tesearch Hypothesis
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	Discussion

POS7-4 The Influence of Attitude, Subjective Norm, Perceived Behavior Control on Purchase Intention – A Study of the Green Restaurants in Taiwan

HsiYing Hsieh (Far East University, ROC Taiwan)

Green food is widely promoted for personal health and environmental benefits. Thus, decision making on consumers' purchase intention towards green restaurants in is a critical issue. The purpose of study is to understand how attitude, subjective norm and perceived behavioral control drive consumer influence purchase intentions of green restaurant. The questionnaire surveys were conducted to customers have consumed at green restaurants in Taiwan. In total, 250 valid questionnaires were obtained. Data analyses use the SPSS software to test hypotheses. Based the finding attitude, subjective norm and perceived behavioral control were significantly affect purchase intention for green restaurants. Implication and suggestion are then discussed.



AUTHORS INDEX

Notation of session name

PS: Plenary Session IS: Invited Session, OS: Organized Session, GS: General Session,

Note: 33/90 = (page no. in Technical Paper Index) / (page no. in Abstracts)

[A]				Asada	Taro	OS16-2	31/75
A. B.	Shahriman	OS10-1	29/61			OS16-3	31/75
Abe	Yushi	OS20-4	25/80			OS16-4	31/75
Abdullah	Reem Ali	OS8-2	30/54	Asai	Fumio	GS6-6	22/93
Aburada	Kentaro	OS14-3	40/70			GS6-7	22/94
		OS14-4	40/71	Azizan	M A	GS6-8	22/94
		OS14-5	40/71				
Adachi	Ruka	OS16-3	31/75	[B]			
Afshar	Roya	GS1-3	33/86	Bai	Ruixiang	OS11-7	35/65
Ahmad	Mohd Zaki	OS10-6	29/62			OS11-8	35/65
		OS10-7	30/63	Bereznikov	Dmitry	OS18-5	32/77
Ahn	Jonghyun	OS23-2	25/83	Bian	Ce	OS15-8	41/73
Aihara	Kazuyuki	OS6-1	24/52	Во	Zhu	OS15-11	42/74
Al aama	Obada	OS20-5	25/80	Boonyaprapasorn	Arsit	GS4-4	33/91
AlMejrad	Ali S.	GS6-9	22/94	Borisut	Wanachart	GS4-4	33/91
		OS10-8	30/63				
Alpizar	Ixchel	OS7-3	28/53	[C]			
	Ramirez			Chai	Yi	OS2-3	38/46
Al-Talib	Ammar A.	OS8-1	30/54	Chang	Hsuan T.	OS5-6	21/51
An	Lingran	OS9-7	37/57	Chang	Shengbiao	OS9-19	38/60
		OS9-8	37/57	Chen	Chen-Pang	OS5-5	21/51
		OS9-19	38/60	Chen	Chi-Jie	OS5-6	21/51
Ang	Chun Kit	OS10-1	29/61	Chen	Jianyong	OS15-1	41/71
		OS10-2	29/61			OS15-2	41/72
		OS10-3	29/61	Chen	Jiaqi	OS15-3	41/72
		OS10-4	29/62			OS15-4	41/72
		OS10-5	29/62	Chen	Lugasi	OS19-2	31/78
Aoki	Takatoshi	GS3-3	41/89	Chen	Xiaoyan	OS15-1	41/71
Araki	Nozomu	OS12-2	26/68			OS15-2	41/72

Chen	Yu-Kai	OS5-2	21/50			OS9-18	38/60
		OS5-4	21/51			OS9-19	38/60
		OS5-5	21/51			OS15-7	41/73
Chen	Zhenjiang	OS11-2	35/64	Desa	Hazry	OS10-1	29/61
		OS11-6	35/65			GS6-8	22/94
		OS11-7	35/65	Domae	Yukiyasu	OS7-3	28/53
		OS11-10	35/66	Dong	Hua	OS9-14	37/59
Cheng	Yuhui	OS9-2	36/55			OS9-15	38/59
Chiang	I Chih	POS7-1	30/95				
Chiu	Jui-Yang	OS5-4	21/51	[E]			
Cho	Yong Hyeon	GS1-5	34/87	Eikawa	Ayumi	OS19-3	31/78
Chu	Quang-Trung	GS2-3	34/88	Eiler	Anne-Claire	OS6-4	24/53
Chu	Zhongyi	GS1-3	33/86	Elderton	Simon	GS6-1	21/92
Chuang	Chih-Wei	OS5-3	21/50	Escande	Adrien	OS7-2	28/53
Chuang	Ching-Chun	OS5-3	21/50	Ezaki	Mami	GS6-4	22/93
Chumkamon	Sakmongkon	OS24-2	27/85				
		OS24-4	27/85	[F]			
				Fang	Lan-lan	OS9-15	38/59
[D]				Fei	Shumin	OS3-1	28/47
Dai	Во	OS1-2	39/45	Fuengfusin	Ninnart	OS20-2	25/79
Dai	Fengzhi	OS3-1	28/47	Fujisawa	Ryusuke	OS23-5	25/84
		OS9-1	36/55			OS23-6	25/84
		OS9-2	36/55	Fujiu	Katsuhito	OS6-4	24/53
		OS9-3	36/56				
		OS9-4	36/56	[G]			
		OS9-5	37/56	Gautam	Ashish	OS6-2	24/52
		OS9-6	37/56	Geng	Guanwang	OS1-3	39/45
		OS9-7	37/57	Gu	Zhan·Ming	GS2-1	34/87
		OS9-8	37/57	Guan	Yu-Ming	OS5-2	21/50
		OS9-9	37/57	Guang	Chen	OS15-11	42/74
		OS9-10	37/57	Guo	Jr-Hung	OS4-1	23/48
		OS9-11	37/58				
		OS9-12	37/58	[H]			
		OS9-12 OS9-16	37/58 38/59	[H] Han	Leixin	OS9-2	36/55

Нао	Hongbo	OS9-1	36/55	Hsiao	Jia-Ming	OS5-7	21/52
Нао	Hongbo	OS9-3	36/56	Hsieh	HsiYing	POS7-3	30/95
		OS9-4	36/56			POS7-4	30/96
		OS9-5	37/56	Hua	Chih-Chiang	OS5-3	21/50
		OS9-16	38/59	Huang	Shu-Hua	OS4-7	24/50
		OS9-17	38/60	Hung	Chung-Wen	OS5-1	21/50
		OS15-7	41/73			OS5-2	21/50
Harada	Kensuke	OS7-1	28/53				
		OS7-2	28/53	[I]			
		OS7-3	28/53	I.	Zunaidi	OS10-1	29/61
		OS7-4	28/54	Ihida	Satoshi	OS6-4	24/53
Hayashi	Eiji	PS-2	20/43	Imai	Shinichi	OS12-1	26/68
		OS23-5	25/84	Imameev	Dinir	OS18-1	32/76
		OS23-6	25/84	Inthiam	Jiraphan	OS24-4	27/85
		OS24-1	27/84	Inuzuka	Hideki	GS2-3	34/88
		OS24-2	27/85			GS2-5	34/88
		OS24-4	27/85	Ishida	Yutaro	OS20-4	25/80
		GS5-3	33/92	Ishii	Kazuo	OS22-2	23/82
		GS6-4	22/93			OS22-4	23/82
Не	Qing	OS11-2	35/64			OS22-5	23/82
Hiramaki	Daichi	OS23-3	25/83			OS23-1	25/83
Hiraoka	Toru	OS19-5	31/79			OS23-2	25/83
Hirota	Masaharu	OS19-1	31/78			OS23-3	25/83
		OS19-2	31/78			OS24-3	27/85
Но	Chian C.	OS4-2	23/48			OS24-6	27/86
Но	Yu-Wei	OS5-5	21/51	Ishikawa	Seiji	GS3-1	40/89
Honda	Kentaro	OS20-1	25/79	Ishizu	Takahiro	OS21-1	39/80
Hong	Lim Wei	OS8-2	30/54			OS21-2	39/81
		OS10-5	29/62			OS21-3	39/81
Hori	Kenta	GS3-1	40/89	Ito	Takao	OS8-3	30/54
Hou	Yong	OS15-9	42/74			OS19-4	31/78
Hsia	Kuo-Hsien	OS4-1	23/48			OS21-1	39/80
		OS4-3	23/49			OS21-2	39/81
		OS18-2	32/76			OS21-3	39/81
		OS18-7	24/77	Ito	Tsutomu	OS8-3	30/54

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Ito	Tsutomu	OS19-4	31/78	Kim	Hyoungseop	GS3-3	41/89
Iwata	Naokazu	GS5-2	33/91			GS5-4	33/92
				Kim	Hyun-Sil	GS1-1	33/86
[1]				Kim	Tae Ihn	GS1-6	34/87
Jeong	Dong-Kyo	GS4-2	32/90	Kinoshita	Takuya	GS3-4	41/89
Jia	Hongyan	OS11-5	35/64	Kiryanov	Daniel	OS18-4	32/77
		OS15-6	41/73	Kita	Yoshihiro	OS14-3	40/70
Jia	Xiaoyun	OS15-10	42/74			OS14-4	40/71
Jia	Yingmin	OS2-4	38/47			OS14-5	40/71
		OS3-4	29/48	Kitakura	Kengo	GS6-2	21/92
Jia	Yongnan	OS2-1	38/46	Kitayama	Taichi	GS5-4	33/92
		OS3-3	29/47	Kohno	Takashi	PS-1	20/43
Jian	Tianye	OS11-8	35/65			OS6-1	24/52
		OS11-9	35/66			OS6-2	24/52
Jiang	Shou	OS11-2	35/64			OS6-3	24/52
Jing	Cao	GS3-2	40/89	Koizumi	Yuichiro	GS3-3	41/89
Jitviriya	Wisanu	GS2-2	34/88	Kongpetch	Khemika	GS6-5	22/93
		GS4-1	32/90	Konishi	Kentarou	GS6-6	22/93
		GS5-3	33/92	Konishi	Yasuo	OS12-2	26/68
Johnson	Jeffrey	PS-3	28/43	Krishnan	Pranesh	OS10-2	29/61
Jung	Jae Hyung	GS1-6	34/87			OS10-3	29/61
				Kubo	Masao	OS17-1	40/75
[K]						OS17-2	40/76
Kajita	Masashi	GS1-4	33/87	Kunha	Arphakorn	GS2-2	34/88
Kamarudin	Nazhatul	OS10-4	29/62	Krishnan	Annapoorni	OS10-2	29/61
	Hafizah				Pranesh		
Kamei	Keiji	OS22-3	23/82	Kurosaki	Tomoyuki	GS1-2	33/86
Kaneoka	Masahiro	OS22-3	23/82	Kurozumi	Ryo	OS14-1	40/70
Katayama	Tetsuro	OS14-3	40/70		•		
		OS14-4	40/71	[L]			
		OS14-5	40/71	Lai	Chun-Chi	OS4-3	23/49
Kawada	Kazuo	OS12-3	26/68	Lavrenov	Roman	OS18-4	32/77
Kawaguchi	Natsuki	OS12-2	26/68	Lee	Hung-Chi	OS5-3	21/50
Kido	Shoji	GS3-3	41/89		In-Soo		
Kien	Tran	OS17-2	40/76	Lee	111-500	GS1-1	33/86
		- · -					

Lee	Jang-Myung	IS-1	34/44	Liu	Wei	OS1-3	39/45
		GS2-1	34/87	Liu	Xuemin	OS15-8	41/73
		GS4-2	32/90			OS15-9	42/74
Lee	Jong-Hyun	GS1-1	33/86	Liu	Yafan	OS1-4	39/46
Lee	Min-Feng	OS5-4	21/51	Liu	Yi Ting	POS7-2	30/95
Leong	Hungyang	OS10-4	29/62	Liu	Yue	OS3-3	29/47
Levi	Timothée	OS6-1	24/52	Liu	Ze	OS9-13	37/58
		OS6-4	24/53	Lo	Cheng-	OS4-4	23/49
Li	Cheng Han	POS7-2	30/95		Hsiang		
Li	Chenyang	OS1-1	39/45	Lu	En-Yi	POS7-2	30/95
Li	Chu-Fen	OS4-4	23/49	Lu	Huimin	GS3-3	41/89
Li	Di	OS11-6	35/65	Lu	Shengyang	OS11-15	36/67
		OS11-7	35/65	Lu	Shuai	GS1-3	33/86
		OS11-10	35/66	Lund	Henrik	IS-2	19/44
Li	Hongbing	OS18-3	32/76		Hautop		
Li	Huanhuan	OS9-6	37/56			IS-3	19/44
Li	Jung-Shian	OS4-4	23/49	Luo	Lian	OS1-3	39/45
Li	Qing	OS2-1	38/46				
		OS3-3	29/47	[M]			
Li	Shang-Hui	POS7-1	30/95	Ma	Xin	OS9-1	36/55
		POS7-2	30/95	Ma	Yuehang	OS22-1	22/81
Li	Yajun	OS11-3	35/64			OS24-5	27/85
Li	Yaoyao	OS11-12	36/66	Maneewarn	Thavida	GS4-4	33/91
		OS11-15	36/67	Magid	Evgeni	OS4-1	23/48
		OS11-16	36/67			OS18-1	32/76
Li	Zixuan	OS15-5	41/72			OS18-2	32/76
Liao	Chenglin	OS2-3	38/46			OS18-3	32/76
Lin	Chia-Jen	OS4-3	23/49			OS18-7	24/77
Lin	Junjie	OS11-4	35/64	Makino	Rintaro	OS16-4	31/75
Lin	Syue Sheng	POS7-1	30/95	Mao	Runhua	OS15-9	42/74
Liu	Chuan-Gang	OS4-4	23/49	Matsuno	Seigo	OS8-3	30/54
Liu	I-Hsien	OS4-4	23/49			OS19-4	31/78
		OS4-7	24/50	Matsuo	Takayuki	OS22-4	23/82
Liu	Qunpo	OS2-2	38/46			OS22-5	23/82
Liu	Ta-Che	OS4-4	23/49	Mehta	Rajiv	OS19-4	31/78

Miao	Yu	OS9-13	37/58	Niu	Hong	OS9-5	37/56
Miyake	Noriaki	GS3-3	41/89			OS11-11	36/66
Mizobe	Manase	OS16-2	31/75	Noriman	N.Z	GS6-8	22/94
Mochizuki	Ryuugo	OS24-3	27/85				
Mohamed	Rizon	OS10-1	29/61	[O]			
		OS10-2	29/61	Ock	Yong·Jin	GS2-1	34/87
		OS10-3	29/61	Oda	Tetsuya	OS19-1	31/78
		OS10-5	29/62	Ogata	Keisuke	OS8-4	31/55
		OS10-6	29/62	Ohnishi	Yoshihiro	OS12-3	26/68
		OS10-7	30/63	Okazaki	Naonobu	OS14-3	40/70
Mokayef	Mastaneh	OS8-2	30/54			OS14-4	40/71
Mokayef	Miad	OS8-2	30/54			OS14-5	40/71
Mori	Shinnosuke	OS12-3	26/68	Olapiriyakul	Sun	GS6-5	22/93
Morita	Yoshifumi	GS2-3	34/88	Ono	Tomohiro	OS20-3	25/79
		GS2-5	34/88			OS20-4	25/80
		GS5-1	33/91	Osawa	Kazuki	OS22-3	23/82
Morota	Yuma	GS3-4	41/89	Ouchi	Tomohito	OS16-1	31/74
Motoda	Tomohiro	OS7-2	28/53				
M. R	Zuradzman	OS10-1	29/61	[P]			
				Pagliarini	Luigi	IS-3	19/44
[N]				Palangwatanakul	Richit	GS4-4	33/91
Nagayoshi	Masato	GS6-1	21/92	Park	Chan Gook	GS1-5	34/87
Nakamura	Akira	OS7-3	28/53			GS1-6	34/87
Nakano	Takeshi	OS12-3	26/68	Peng	Wanlong	OS11-1	35/63
Natsupakpong	Suriya	GS4-4	33/91			OS11-8	35/65
Nie	Zhen	OS11-12	36/66	Peng	Yizhun	OS11-1	35/63
		OS11-13	36/67			OS11-3	35/64
		OS11-14	36/67			OS11-4	35/64
		OS11-16	36/67			OS11-5	35/64
Nikiforov	Nikita	OS18-2	32/76			OS11-6	35/65
Nishida	Yuya	OS22-5	23/82			OS11-7	35/65
		OS23-1	25/83			OS11-8	35/65
		OS23-2	25/83			OS11-9	35/66
		OS24-6	27/86			OS11-10	35/66
Niu	Chuan-Ming	OS5-3	21/50	Peng	Yulong	OS11-1	35/63

Peng	Yulong	OS11-2	35/64		Chandra		
Phunopas	Amornphun	GS2-2	34/88	Sato	Hiroshi	OS17-1	40/75
		GS4-1	32/90			OS17-2	40/76
		GS5-3	33/92	Sato	Masanori	OS22-5	23/82
Priyambadha	Bayu	OS14-4	40/71	Sato	Noritaka	GS5-1	33/91
Pudchuen	Noppadol	GS5-3	33/92	Sato	Takao	OS12-2	26/68
Pujolle	Victor	OS24-1	27/84	Schiefermeier-	Natalia	OS18-3	32/76
				Mach			
[R]				See	K S	OS8-1	30/54
Radwan	Abdelrahman	OS10-4	29/62	Sethaput	Thunyaseth	GS4-4	33/91
		OS10-5	29/62	Shabalina	Ksenia	OS18-1	32/76
Rasyadan	Amir	OS10-3	29/61			OS18-2	32/76
Romeli	N.	GS6-8	22/94	Shafikov	Artur	OS18-3	32/76
Rossi	Ruggero	PS-3	28/43	Shi	Wenxin	OS15-6	41/73
				Shiba	Yusuke	OS12-1	26/68
[S]				Shigyo	Yasuhiro	OS14-5	40/71
Sadiq	Amir	OS23-3	25/83	Shih	Po-Yun	OS5-1	21/50
Sagitov	Artur	OS18-1	32/76	Shinoda	Takahiro	OS21-1	39/80
		OS18-2	32/76			OS21-2	39/81
		OS18-3	32/76			OS21-3	39/81
Sakai	Hiroshi	OS8-3	30/54	Shou	Ho-Nien	OS4-5	23/49
Sakai	Masao	GS2-3	34/88			OS4-6	24/49
		GS2-5	34/88	Solihin	Mahmud	OS10-1	29/61
Sakamoto	Makoto	OS8-3	30/54		Iwan		
		OS19-4	31/78			OS10-4	29/62
		OS21-1	39/80			OS10-5	29/62
		OS21-2	39/81	Song	Chau-Chung	OS5-1	21/50
		OS21-3	39/81			OS5-5	21/51
Sakamoto	Takumi	OS7-4	28/54	Song	Yunzhong	OS3-1	28/47
Sakoma	Kenji	OS21-1	39/80	Song	Zhikun	OS1-1	39/45
		OS21-2	39/81	Sonoda	Takashi	OS22-4	23/82
		OS21-3	39/81			OS22-5	23/82
Samad	Rosdiyana	OS10-6	29/62			OS23-1	25/83
		OS10-7	30/63			OS23-2	25/83
Saputra	Mochamad	OS14-3	40/70			OS24-6	27/86

Su	Kuo-Lan	OS4-1	23/48	Takegami	Noboru	OS23-5	25/84
		OS4-3	23/49	Takei	Amane	OS21-1	39/80
		OS18-1	32/76			OS21-2	39/81
		OS18-7	24/77			OS21-3	39/81
Su	Yu Ting	POS7-1	30/95			OS21-4	39/81
Suganuma	Naoki	PS-4	27/43	Takemura	Yasunori	OS22-2	23/82
Sugita	Junichi	OS6-4	24/53			OS22-4	23/82
Sun	Junyang	OS1-3	39/45			OS22-5	23/82
Sun	Lu	OS11-14	36/67	Tamai	Teruyuki	OS12-3	26/68
Sun	Yan	OS15-3	41/72	Tamaki	Hisashi	GS6-1	21/92
		OS15-4	41/72	Tamukoh	Hakaru	OS20-1	25/79
Sundaraj	Kenneth	OS10-6	29/62			OS20-2	25/79
		OS10-7	30/63			OS20-3	25/79
Suzuki	Hidekazu	OS22-1	22/81			OS20-4	25/80
		OS24-5	27/85			OS20-5	25/80
Suzuki	Katsuaki	OS24-6	27/86	Tan	Joo Kooi	GS1-2	33/86
Suzuki	Yasuhiro	OS13-1	26/69			GS3-1	40/89
		OS13-2	26/69			GS3-2	40/89
		OS13-3	26/69			GS5-2	33/91
		OS13-4	26/69	Tanaka	Hideyuki	GS6-2	21/92
		OS13-5	26/69	Tanaka	Hiroki	GS2-3	34/88
				Tao	Zheheng	OS11-13	36/67
[T]				Teranishi	Yusuke	GS6-7	22/94
Tabuse	Masayoshi	OS16-1	31/74	Thungod	Kaned	GS4-4	33/91
		OS16-2	31/75	Thungsang	Apisit	GS4-4	33/91
		OS16-3	31/75	Tiang	Sew Sun	OS8-2	30/54
		OS16-4	31/75	Tixier-Mita	Agnes	OS6-4	24/53
Takada	Syuhei	OS16-3	31/75	Tokumitsu	Masahiro	GS6-6	22/93
Takada	Taku	GS6-6	22/93			GS6-7	22/94
		GS6-7	22/94	Tokura	Yugo	OS12-2	26/68
Takagi	Tomohiko	OS14-1	40/70	Tominaga	Ayumu	OS23-6	25/84
		OS14-2	40/70	Tominaga	Moeko	OS22-2	23/82
Takahashi	Masanori	OS12-4	26/68	Toshiyoshi	Hiroshi	OS6-4	24/53
Takano	Naruaki	OS6-3	24/52	Tsuji	Tokuo	OS7-1	28/53
Takashima	Kyoko	OS23-3	25/83	Tsuru	Masato	OS7-2	28/53

Tunsiri	Songklod	GS5-3	33/92			OS11-9	35/66
				Wang	Runjiao	OS1-3	39/45
[U]				Wang	Xiuqing	OS15-10	42/74
Ue	Yuki	OS14-2	40/70	Wang	Yi-Ru	POS7-2	30/95
Ueno	Takeshi	OS17-1	40/75	Wang	Zhechen	OS2-4	38/47
Umemoto	Masaya	OS22-3	23/82	Wang	Zhuo	OS3-2	28/47
Ushida	Yoshihito	OS13-4	26/69	Wangyong	Guo	OS15-11	42/74
Utsunomiya	Koshi	OS23-3	25/83	Watanabe	Kaori	OS22-1	22/81
						OS24-5	27/85
[W]				Watanabe	Keisuke	OS23-1	25/83
W Samsudin	Wan	OS10-6	29/62			OS23-2	25/83
	Syahirah					OS23-3	25/83
		OS10-7	30/63			OS23-4	25/84
Wakabayashi	Makoto	GS6-6	22/93	Watanabe	Shogo	OS19-1	31/78
		GS6-7	22/94	Watanabe	Takahiro	GS4-3	32/90
Wan	Khairunizam	OS10-1	29/61	Wei	Qiang	OS9-14	37/59
Wan	Weiwei	OS7-4	28/54			OS9-15	38/59
Wang	Fengkun	OS9-1	36/55	Wen	Haokang	OS9-1	36/55
		OS9-2	36/55			OS9-3	36/56
		OS9-3	36/56			OS9-4	36/56
Wang	Fuzhong	OS2-2	38/46			OS9-5	37/56
Wang	Gaowei	OS2-2	38/46			OS9-16	38/59
Wang	Guan-Jie	OS4-2	23/48			OS9-17	38/60
Wang	Нао	OS15-9	42/74			OS15-7	41/73
Wang	Hucheng	OS11-3	35/64	Wijayasekara	Vihanga	GS6-3	22/93
Wang	Jiamian	OS11-10	35/66		Ashinsana		
Wang	Jiangyue	OS1-2	39/45	Wirasingha	Torin	GS6-3	22/93
Wang	Jiwu	OS1-1	39/45	Wu	Hsien-Huang	OS18-6	24/77
		OS1-2	39/45		P.		
		OS1-4	39/46	Wu	Shiwei	OS9-6	37/56
Wang	Lei	OS15-5	41/72	Wu	Yung-Chun	OS5-4	21/51
Wang	Li	OS11-15	36/67				
		OS11-16	36/67	[X]			
Wang	Manli	OS2-2	38/46	Xi	Yuanyuan	OS9-6	37/56
Wang	Nana	OS11-6	35/65	Xiao	Huimin	OS3-1	28/47

Xie	Jia-Kun	OS18-6	24/77			OS9-10	37/57
Xu	Feifan	OS11-13	36/67			OS9-11	37/58
Xu	Zhengke	OS11-4	35/64			OS9-12	37/58
						OS9-18	38/60
[Y]						OS9-19	38/60
Yaacob	Sazali	OS10-2	29/61			OS15-8	41/73
		OS10-3	29/61	Yin	Mengqi	OS9-11	37/58
Yamaba	Hisaaki	OS14-3	40/70	Yin	Hongpeng	OS2-3	38/46
		OS14-4	40/71	Yin	Mengqi	OS9-11	37/58
		OS14-5	40/71	Yokkampon	Umaporn	OS24-2	27/85
Yamada	Takayoshi	GS4-3	32/90			OS24-4	27/85
Yamaguchi	Hiroki	OS22-3	23/82	Yokotani	Tomoki	GS5-1	33/91
Yamamoto	Hidehiko	GS4-3	32/90	Yoshida	Tetsuya	OS22-1	22/81
Yamamoto	Toru	GS3-4	41/89	Yoshimura	Motohide	OS19-3	31/78
Yamanobe	Natsuki	OS7-1	28/53	Yoshitomi	Yasunari	OS16-2	31/75
		OS7-3	28/53			OS16-3	31/75
Yamashita	Youtaro	GS3-2	40/89			OS16-4	31/75
Yan	Yujie	OS9-6	37/56	Yu	Shih-Ting	OS5-2	21/50
		OS9-8	37/57	Yuan	Xuechun	OS1-1	39/45
		OS9-19	38/60	Yuan	Yasheng	OS9-7	37/57
Yanagise	Kentaro	OS23-2	25/83			OS9-8	37/57
Yanai	Ken	OS22-3	23/82			OS9-9	37/57
Yang	Bo-Jun	OS18-7	24/77			OS9-10	37/57
Yang	Xia	OS6-1	24/52			OS9-12	37/58
Yang	Zhou	OS11-2	35/64			OS9-18	38/60
		OS11-6	35/65			OS9-19	38/60
		OS11-9	35/66			OS15-8	41/73
Yanou	Akira	GS2-4	34/88	Yue	Yuanli	OS9-13	37/58
Yasui	Ryota	OS12-2	26/68				
Yasukawa	Shinsuke	OS22-5	23/82	[Z]			
		OS23-1	25/83	Zakiev	Aufar	OS18-5	32/77
		OS23-2	25/83	Zhang	Ao-nan	OS9-14	37/59
Yin	Di	OS9-2	36/55	Zhang	Chunxia	OS11-4	35/64
		OS9-8	37/57	Zhang	Fang Quan	POS7-2	30/95
		OS9-9	37/57	Zhang	Qianqian	OS9-1	36/55

Zhang	Qianqian	OS9-2	36/55			OS9-16	38/59
Zhang	Qianqian	OS9-3	36/56			OS9-17	38/60
		OS9-4	36/56			OS15-7	41/73
		OS9-5	37/56	Zhao	Lianchen	OS11-1	35/63
		OS9-17	38/60			OS11-5	35/64
		OS15-7	41/73			OS11-7	35/65
Zhang	Qing-qing	OS9-15	38/59			OS11-10	35/66
Zhng	Shiqian	OS11-8	35/65	Zhao	Ting	OS11-2	35/64
Zhang	Tengfei	OS3-4	29/48			OS11-4	35/64
Zhang	Weicun	OS2-1	38/46	Zhao	Yuqi	OS11-3	35/64
		OS3-3	29/47	Zhenfu	Ju	OS15-11	42/74
Zhang	Xinyu	OS11-5	35/64	Zheng	Pei Hi	POS7-1	30/95
Zhang	Yi-tong	OS9-14	37/59	Zhong	Xiongfeng	OS11-14	36/67
Zhang	Yongchao	OS15-3	41/72	Zhou	Xin	OS11-13	36/67
		OS15-4	41/72	Zhu	Yuxuan	OS9-8	37/57
Zhang	Yuhan	OS11-11	36/66			OS9-9	37/57
Zhang	Yuheng	OS11-1	35/63			OS9-10	37/57
		OS11-5	35/64			OS9-12	37/58
		OS11-8	35/65			OS9-18	38/60
		OS11-9	35/66			OS9-19	38/60
Zhang	Zhou	OS11-1	35/63			OS15-8	41/73
		OS11-3	35/64				
Zhao	Chundong	OS15-1	41/71				
		OS15-2	41/72				
Zhao	Huailin	OS11-12	36/66				
		OS11-13	36/67				
		OS11-14	36/67				
		OS11-15	36/67				
		OS11-16	36/67				
Zhao	Jichao	OS9-1	36/55				
		OS9-2	36/55				
		OS9-3	36/56				
		OS9-4	36/56				
		OS9-5	37/56				
		OS9-11	37/58				

