



ICAROB 2024

PROCEEDINGS OF THE 2024 INTERNATIONAL CONFERENCE ON ARTIFICIAL LIFE AND ROBOTICS

February 22 to 25, 2024
J:COM HorutoHall, Oita, Japan
29th AROB International Meeting Series

Editor-in-Chief
Masanori Sugisaka
Editors: Yingmin Jia, Takao Ito, Ju-Jang Lee
ISBN 978-4-9913337-0-5

The 2024 International Conference on Artificial Life and Robotics (ICAROB2024), J:COM HorutoHall, Oita, Japan, 2024

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Contents

1	Organization, etc.	1
2	Messages	11
3	Time Table	15
4	Opening Ceremony	19
5	Technical paper index	20
6	Abstracts	
6-1	PS abstracts	50
6-2	OS abstracts	51
6-3	GS abstracts	103
7	Authors index	114

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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 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 these journals, [Journal of Robotics, Networking and Artificial Life \(JRNAL\)](#)(vol1-8) indexed by [SCOPUS & ESCI](#) and [Journal of Robotics, Networking and Artificial Life \(JRNAL\)](#)(vol9-) indexed by [SCOPUS](#) & [ESCI](#) and [Journal of Advances in Artificial Life Robotics \(JAALR\)](#). From now on, ALife Robotics Corporation Ltd. is in charge of management of both the conference and the journals. 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 programming
Robotics
Software development support method
System cybernetics
Unmanned underwater vehicles
Unmanned Aerial Systems Technologies
Unmanned Aerial Systems designing, controls and navigation
Unmanned Aero vehicles
Virtual reality
Visualization
Hardware-oriented submissions are particularly welcome. This conference will discuss new results in the field of artificial life and robotics

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MESSAGES



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

Masanori Sugisaka

Masanori Sugisaka

General Chair of ICAROB

It is my great honor to invite you all to The 2024 International Conference on Artificial Life and Robotics (ICAROB 2024) to be held at J:COM HorutoHall, Oita, Japan, 2024. This Conference is changed as the old symposium from the first (1996) to the Eighteenth (2013) annually which were organized by Oita University 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 indexed by [SCOPUS](#) and [CPCI-Web of Science](#) now. From now on, ALife Robotics Corporation Ltd. is in charge of management. This year we have The 2024 International Conference on Artificial Life and Robotics (ICAROB2024) (29th 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 have founded [Robot Artificial Life Society](#) in 2017/12/07 together with Professor at Hiroshima University Takao Ito and Professor at University of Miyazaki Makoto Sakamoto. I hope that fruitful discussions and exchange of ideas between researchers during Conference (ICAROB2024) 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 of ICAROB



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

A handwritten signature in black ink, appearing to read 'Jia Yingmin', written over a light-colored background.

It is my great pleasure to invite you to The 2024 International Conference on Artificial Life and Robotics (ICAROB 2024), will be held at J:COM Horuto Hall, Oita, JAPAN, from February 22 to 25, your understanding and support will be the strongest driving force for us to organize the meeting well.

ICAROB develops from the AROB that was created in 1996 by Prof. Masanori Sugisaka and will celebrate her 29th birthday in 2024. 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 the 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 seeing you at the ICAROB2024.



Takao Ito
Co-General Chair
(Professor Hiroshima
University, Japan)

A handwritten signature in black ink that reads "Takao Ito". The signature is stylized and cursive.

Takao Ito

Co-General Chair of ICAROB

It is my great honor and pleasure to invite you all to the 2024 International Conference on Artificial Life and Robotics (ICAROB 2024).

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 our AROB conference. Our conference has brought together many research scholars, faculty members, and graduate students from all over the world, and published numerous 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. The ICAROB has provided a foundation for unifying the exchange of scientific information on the studies 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 Horuto Hall, one of the most famous international convention centers in Oita city, Japan. You can find many fantastic scenic spots and splendid historical places in Oita city. Enjoy your stay!

I eagerly look forward to personally meeting you during the ICAROB 2024 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)

A handwritten signature in black ink, appearing to read 'J. Lee'.

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 11th ICAROB 2024 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 11th ICAROB.

I'm looking forward to meeting you at the 11th ICAROB in on line and wishing you all the best.

GENERAL SESSION TOPICS

GS1 Machine Learning & Neural Network & Artificial Life (8)	GS2 Image Processing I (5)
GS3 Image Processing II (3)	GS4 Robotics (6)
GS5 Applications I (4)	GS6 Applications II (4)
GS7 Applications III (6)	

ORGANIZED SESSION TOPICS

OS1 Intelligent Life and Cybersecurity (6)	OS2 Pattern Recognition and Robotics I (5)
OS3 Pattern Recognition and Robotics II (9)	OS4 Pattern Recognition and Robotics III (10)
OS5 Intelligent Life and Robotics (6)	OS6 Intelligence and Optimization (5)
OS7 Deep Learning and its Applications (4)	OS8 Intelligent Control (5)
OS9 Software Development Support Method (4)	OS10 Intelligent Life and Robotics I (6)
OS11 Intelligent Life and Robotics II (6)	OS12 Machine Learning and its Applications (4)
OS13 Robot Control (10)	OS14 Robotic Manipulation (3)
OS15 Artificial Intelligence for Embedded Systems and Robotics (6)	OS16 Industrial Artificial Intelligence Robotics (4)
OS17 Electronics and Kansei Engineering Based on ETT theory (5)	OS18 Computer and Information Engineering (12)
OS19 Natural Computing (3)	OS20 Advances in Field Robotics and Their Applications (15)
OS21 Human-Machine Interface (3)	OS22 Mathematical Informatics (8)
OS23 Industrial Revolution (5)	OS24 Robotics and Intelligent Casting (5)
OS25 Research Towards the Sustainable Development Goals (SDG's) (10)	OS26 Navigating the Digital Frontier: Innovations in the Age of Industry Revolution 4.0 (11)
OS27 Post-narratological Approaches to Cognition in Humans and Robots (5)	

TIME TABLE (2/22)

in Japan time

2/22(Thu.) 17:30-19:30	Welcome Party (Oita Century Hotel)
2/25(Sun.) 15:30-16:00	Farewell party (Room 406 ZOOM ID: 823 7614 7664)

TIME TABLE (2/23)

2/23(Fri.)	Room 403 on-site	Room 404 on-site	Room 405 on-site, online (ZOOM ID: 851 9389 0058)	Room 406 on-site, online (ZOOM ID: 823 7614 7664)	Room 407 online (ZOOM ID: 883 1147 2552)
9:40-	Registration (407)				
10:00-11:15	OS24 Robotics and Intelligent Casting (5) Chair: Jiwu Wang	OS9 Software Development Support Method (4) Chair: Tetsuro Katayama	GS2 Image Processing I (5) Chair: Yui Tanjo	OS23 Industrial Revolution (5) Chair: Hazry Desa on-site, online	OS13-1 Robot Control (5) Chair: Yizhun Peng online
11:15-11:30					
11:30-12:00	Chair: Marion Oswald (Room 302, 303) Opening ceremony			OS2 Pattern Recognition and Robotics I (5) Chair: Fengzhi Dai Will be end at 12:45 online	OS13-2 Robot Control (5) Chair: Yizhun Peng Will be end at 12:45
12:00-13:00	Lunch				
13:00-14:00	Chair: Takao Ito (Room 302, 303) Plenary Speech PS1 Tomoaki Ozaki				OS3-1 Pattern Recognition and Robotics II (5) Chair: Fangyan Li Will be end at 14:15
14:00-14:20					
14:20-15:20	Chair: Marion Oswald (Room 302, 303) Plenary Speech PS2 Hazry Desa				OS3-2 Pattern Recognition and Robotics II (4) Chair: Fangyan Li
15:20-15:40	Coffee break				
15:40-17:10	OS1 Intelligent Life and Cybersecurity (6) Chair: I-Hsien Liu	OS15 Artificial Intelligence for Embedded Systems and Robotics (6) Chair Hakaru Tamukoh	GS4 Robotics (6) Chair: Jiwu Wang onsite, online	GS3 Image Processing II (3) Chair: Seiji Ishikawa online, on-site	OS10 Intelligent Life and Robotics I (6) Chair: Evgeni Magid

TIME TEBLE (2/24)

2/24(Sat.)	Room 303 on-site	Room 403 on-site	Room 404 on-site	Room 405 on-site, online (ZOOM ID: 851 9389 0058)	Room 406 on-site, online (ZOOM ID: 823 7614 7664)
9:40-	Registration (407)				
10:00-11:15	OS20-1 Advances in Field Robotics and Their Applications (5) Chair: Kazuo Ishii	OS17 Electronics and Kansei Engineering Based on ETT theory (5) Chair: Tetsuo Hattori	GS1-1 Machine Learning & Neural Network & Artificial Life (5) Chair: Hiroki Tamura	OS19 Natural Computing (3) Chair Marion Oswald Will be end at 10:45	OS18-1 Computer and Information Engineering (5) Chair: Norrima Mokhtar online, onsite
11:15-11:30	Coffee break				
11:30-12:00	OS20-2 Advances in Field Robotics and Their Applications (2) Chair: Kazuo Ishii		GS1-2 Machine Learning & Neural Network & Artificial Life (3) Chair: Hiroki Tamura Will be end at 12:15	OS22 Mathematical Informatics (8) from 11:00 to 13:00 Chair: Takao Ito	OS18-2 Computer and Information Engineering (2) Chair: Norrima Mokhtar online, on-site
12:00-13:00	Lunch				
13:00-14:00	Chair: Yingmin Jia (Room 302, 303) Plenary Speech PS3 Haruhisa Okuda				
14:00-14:15	Coffee break				
14:15-15:30	OS20-3 Advances in Field Robotics and Their Applications (5) Chair: Kazuo Ishii	OS27 Post-narratological Approaches to Cognition in Humans and Robots (5) Chair: Jumpei Ono (ZOOM ID: 826 8397 1634)	OS8 Intelligent Control (5) Chair: Yingmin Jia	OS5-1 Intelligent Life and Robotics (4) Chair: Kuo-Hsien Hsia on-site, online	OS18-3 Computer and Information Engineering (5) Chair: Norrima Mokhtar online, on-site
15:30-15:40	Coffee break				
15:40-16:25	OS20-4 Advances in Field Robotics and Their Applications (3) Chair: Kazuo Ishii		OS14 Robotic Manipulation (3) Chair: Kensuke Harada onsite, online (ZOOM ID: 849 1028 4955)	OS5-2 Intelligent Life and Robotics (2) Chair: Kuo-Hsien Hsia on-site, online	OS21 Human-Machine Interface (3) Chair Norrima Mokhtar online, on-site
16:25-16:40	Coffee break				
16:40-17:40	OS7 Deep Learning and its Applications (4) online Chair Mastaneh Mokayef (ZOOM ID: 824 3203 3781)	OS12 Machine Learning and its Applications (4) Chair: Masato Nagayoshi	GS5 Applications I (4) Chair: onsite, online (ZOOM ID: 849 1028 4955)	OS16 Industrial Artificial Intelligence Robotics (4) Chair Eiji Hayashi on-site	GS6 Applications II (4) Chair Masayuki Fujiwara on-site
18:30-20:30	Banquet (Tokiwa Kaikan)				

TIME TEBLE (2/25)

2/25(Sun.)	Room 405 online (ZOOM ID: 851 9389 0058)	Room 406 online (ZOOM ID: 823 7614 7664)	Room 407 online (ZOOM ID: 883 1147 2552)
9:40-	Registration (407)		
10:00-11:30	OS6 Intelligence and Optimization (5) Chair Mastaneh Mokayef	OS26-1 Navigating the Digital Frontier: Innovations in the Age of Industry Revolution 4.0 (6) Chair Wei Hong Lim	OS25-1 Research Towards the Sustainable Development Goals (SDG's) (5) Chair Ammar A.M. Al Talib
11:30-12:30	Lunch		
12:30-13:45	OS4-1 Pattern Recognition and Robotics III (5) Chair Huahao Li	OS26-2 Navigating the Digital Frontier: Innovations in the Age of Industry Revolution 4.0 (5) Chair Wei Hong Lim	OS25-2 Research Towards the Sustainable Development Goals (SDG's) (5) Chair Ammar A.M. Al Talib
13:45-14:00	Coffee break		
14:00-15:30	OS4-2 Pattern Recognition and Robotics III (5) Chair Huahao Li	OS11 Intelligent Life and Robotics (6) Chair: Evgeni Magid	GS7 Applications III (6) Chair: Kasthuri Subaramaniam
15:30-16:00	Farewell Party (Room 406 ZOOM ID: 823 7614 7664)		

The 2024 International Conference on ARTIFICIAL LIFE AND ROBOTICS (ICAROB2024)

February 22 (Thursday)

17:30-19:30 Welcome Party (Oita Century Hotel)

February 23 (Friday)

Room 302, 303

11:30-12:00 Opening Ceremony

Chair: Marion Oswald (Vienna University of Technology, 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. Vice General Chair of ICAROB | Katia Passerini (Seton Hall University, USA) |
| 5. Vice General Chair of ICAROB | Norrima Mokhtar (University of Malaya, Malaysia) |

February 24 (Sunday)

Banquet: Tokiwa Kaikan

18:30-20:30

Chair: Takao Ito (Hiroshima University, Japan)

Welcome Addresses

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

Dr. Norrima Mokhtar (University of Malaya, Malaysia)

TECHNICAL PAPER INDEX

February 23 (Friday)

9:40-Registration

Room 302, 303

11:30-12:00 Opening Ceremony

Chair: Marion Oswald (Vienna University of Technology, Austria)

13:00-14:00

Plenary Speech PS1

Chair: Takao Ito (Hiroshima University, Japan)

PS1 Developing High-Speed Working Motion of the Multi Robot in DENSO

Tomoaki Ozaki (DENSO CORPORATION, Japan)

14:20-15:20

Plenary Speech PS2

Chair: Marion Oswald (Vienna University of Technology, Austria)

PS2 Experimenting with Variable Arm Quadrotors: Realizing Dynamic Configurations for Enhanced Flight Performance

Hazry Desa (Universiti Malaysia Perlis, Malaysia)

Room 403

10:00-11:15 OS24-Robotics and Intelligent Casting (5)

Chair: Jiwu Wang (Beijing Jiaotong University, China)

OS24-1 *A high-performance motion planning method based on asymptotically optimal RRT*
Tianbin Meng, Jiwu Wang (Beijing Jiaotong University, China)

OS24-2 *CSM-RRT*: an improved RRT* algorithm based on constrained sampling mechanism*
Hang Yang, Jiwu Wang (Beijing Jiaotong University, China)
Xueqiang Shang (Aero Engine Corporation of China, China)

OS24-3 *Small Sample Object Detection Based on Improved YOLOv5*
Yuxuan Gao (Beijing Jiaotong University, China),
Jiwu Wang (Beijing Jiaotong University, China),
Zixin Li (Aero Engine Corporation of China)

- OS24-4 *Research on Gas Pore Prediction Method Based on Sand Core Characteristic Time*
Xiaolong Wang (Beijing Jiaotong University, China), Qihua Wu (Weichai Power Co., Ltd. China), Jiwu Wang (Beijing Jiaotong University, China), Jinwu Kang (Tsinghua University,China),
Na Li (Weichai Power Co., Ltd. China), Yucheng Sun(Weichai Power Co., Ltd. China)
- OS24-5 *Optimization Analysis of a Deep Learning-Based Model for Predicting Temperature Fields in the Solidification Process of Castings*
Yahui Yang (Beijing Jiaotong University, China), Jiwu Wang (Beijing Jiaotong University, China),
Jinwu Kang (Tsinghua University,China)

15:40-17:10 OS1 Intelligent Life and Cybersecurity (6)

Chair: I-Hsien Liu (National Cheng Kung University, Taiwan)

Co-Chair: Chu-Fen Li (National Formosa University, Taiwan)

Co-Chair: Pang-Wei Tsai (National Cheng Kung University, Taiwan)

- OS1-1 *Detecting abnormal operations in ICS using finite-state machines*
Pei-Wen Chou, Nai-Yu Chen, Jung-Shian Li, I-Hsien Liu
(National Cheng Kung University, Taiwan)
- OS1-2 *Industrial Control System State Monitor Using Blockchain Technology*
Yun-Hao Chang, Tzu-En Peng, Jung-Shian Li, I-Hsien Liu
(National Cheng Kung University, Taiwan)
- OS1-3 *Enhancing Dam Security and Water Level Alerting with Blockchain Technology*
YingCheng Wu, Jung-Shian Li, Chu-Fen Li, I-Hsien Liu
(National Cheng Kung University, Taiwan)
- OS1-4 *MiniDAM: A Dam Cybersecurity Toolkit*
Tzu-En Peng, Meng-Wei Chang, Yun-Hao Chang, Jung-Shian Li, I-Hsien Liu
(National Cheng Kung University, Taiwan)
- OS1-5 *Case Study of Network-Based Intrusion Detection System Deployment in Industrial Control Systems with Network Isolation*
Nai-Yu Chen, Pei-Wen Chou, Jung-Shian Li, I-Hsien Liu
(National Cheng Kung University, Taiwan)
- OS1-6 *The AI integration service innovation model of real estate industry in Taiwan*
Li-Min Chuang, Chih-Hung Chen (Chang Jung Christian University, Taiwan)

Room 404

10:00-11:00 OS9 Software Development Support Method (4)

Chair: Tetsuro Katayama (University of Miyazaki, Japan)

Co-Chair: Tomohiko Takagi (Kagawa University, Japan)

- OS9-1 *An Improved Conversion Technique from EPNAT Models to VDM++ Specifications for Simulation of Abstract Software Behavior*
Sho Matsumoto¹, Ryoichi Ishigami¹, Tetsuro Katayama², Tomohiko Takagi¹
¹ Kagawa University, Japan, ² University of Miyazaki, Japan
- OS9-2 *Prototype of RAGESS Which Is a Tool for Automatically Generating SwiftDiagrams to Support iOS App Development*
Haruki Onaga*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, and Naonobu Okazaki*
*University of Miyazaki, Japan, †University of Nagasaki, Japan
- OS9-3 *Extension to Support Types and Operation/Function Definitions in BWDM to Generate Test Case Tool from the VDM++ Specification*
Shota Takakura*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, and Naonobu Okazaki*
*University of Miyazaki, Japan, †University of Nagasaki, Japan
- OS9-4 *Proposal of ASLA Which Is a Segmentation and Labeling Tool for Document Images Based on Deep Learning*
Kanta Kakinoki*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, and Naonobu Okazaki*
*University of Miyazaki, Japan, †University of Nagasaki, Japan

15:40-17:10 OS15 Artificial Intelligence for Embedded Systems and Robotics (6)

Chair: Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

Co-Chair Yuma Yoshimoto (National Institute of Technology, Kitakyushu College, Japan)

- OS15-1 *YOLO real-time object detection on EV3-Robot using FPGA hardware Accelerator*
Dinda Pramanta¹, Ninnart Fuengfusin², Arie Rachmad Syulistyo², Hakaru Tamukoh²
(¹Kyushu Institute of Information Sciences, Japan) (²Kyushu Institute of Technology, Japan)
- OS15-2 *A Low Computational Cost Hand Waving Action Recognition System with Echo State Network for Home Service Robots*
Hiromasa Yamaguchi¹, Akinobu Mizutani¹, Arie Rachmad Syulistyo¹, Yuichiro Tanaka¹, Hakaru Tamukoh¹ (¹Kyushu Institute of Technology, Japan)
- OS15-3 *A Rapidly Adjustable Object Recognition System through Language Based Prompt Engineering*
Naoki Yamaguchi¹, Tomoya Shiba¹, Kosei Isomoto¹, Hakaru Tamukoh¹
(¹Kyushu Institute of Technology, Japan)

- OS15-4 *Development of a SayCan-based task planning system capable of handling abstract nouns*
Kosei Yamao¹, Daiju Kanaoka¹, Kosei Isomoto¹, Akinobu Mizutani¹, Yuichiro Tanaka¹,
Hakaru Tamukoh¹, (¹Kyushu Institute of Technology, Japan)
- OS15-5 *RoboCup@Home 2023: Stickler for the Rules Task Solutions*
Tomoya Shiba¹, Hakaru Tamukoh¹, (¹Kyushu Institute of Technology, Japan)
- OS15-6 *Offloading Intellectual Processing from Home Service Robots to Edge Devices*
Yuma Yoshimoto¹, Mizuki Kawashima¹, Shun Yonehara¹
(¹National Institute of Technology, Kitakyushu College, Japan)

Room 405

10:00-11:15 GS2 Image Processing I (5)

Chair: Yui Tanjo (Kyushu Institute of Technology, Japan)

- GS2-1 *A Method for Embedding Multiple Photographic Images in a Photographic Image*
Naoki Kouno, Kanya Goto, Toru Hiraoka (University of Nagasaki, Japan)
- GS2-2 *Generation of Flowing-Line Images Using Vertical and Horizontal Smoothing Filters*
Karin Kuroki, Toru Hiraoka (University of Nagasaki, Japan)
- GS2-3 *Human Motion Recognition from Multiple Directions and Its Gait Cycles Analysis*
Miki Ooba, Yui Tanjo (Kyushu Institute of Technology, Japan)
- GS2-4 *A Method of Improving the QOL of the People with Visual Impairment by MY VISION*
Shun Kitazumi, Yui Tanjo (Kyushu Institute of Technology, Japan)
- GS2-5 *Human Behavior Segmentation and Recognition Using a Single-camera*
Jing Cao, Yui Tanjo (Kyushu Institute of Technology, Japan)

15:40-17:10 GS4 Robotics (6)

Chair: Jiwu Wang (Beijing Jiaotong University, China)

- GS4-1 *Development and evaluation of a learning support robot for vector learning*
Kosei Machida, Shinichi Imai (Tokyo Gakugei University, Japan)
- GS4-2 *Feasibility Study on Methods to Measure the Strain on Young Children's Bodies*
Sachiko Kido, Praveen Nuwantha Gunaratne, Hiroki Tamura
(University of Miyazaki, Japan)

- GS4-3 *An Integration of Contact Force Models with Multibody Dynamics Analyses for Human Joint Mechanisms and Effects of Viscoelastic Ground Contact*
Shintaro Kasai¹, Dondogjamts Batbaatar², Hiroaki Wagatsuma¹
(¹Kyushu Institute of Technology, Japan; ²Mongolian University of Science and Technology, Mongolia)
- GS4-4 *Haptic Sensation Enhancement via the Stochastic Resonance Effect and Its Application to Haptic Feedback for Myoelectric Prosthetic Hands*
Yoshitaka Mizumoto, Taro Shibanoki (Okayama University, Japan)
- GS4-5 *PID Parameter Tuning of a Low-Cost DC Motor Speed Control for Mobile Robot Application*
Munkh-Erdene Ayurzana¹, Erkhembayar Gankhuyag¹, Naranbaatar Erdenesuren¹, Dondogjamts Batbaatar¹
(¹Mongolian University of Science and Technology, Mongolia)
- GS4-6 *Reinforcement Learning DDPG Algorithm Based Wheeled Mobility Aid Robot Control Methods*
Junkai Li, Mohd Rizon Mohamad Juhari, Tiang Sew Sun (UCSI University, Malaysia)

Room 406

10:00-11:15 OS23 Industrial Revolution (5)

Chair: Hazry Desa (Universiti Malaysia Perlis (UniMAP), Malaysia)

- OS23-1 *Investigating the Engineering Interventions in the Conservation of Malaysia Heritage Structures: A Review on Preserving Historical Edifices Through Advance Civil Engineering Techniques*
Muhammad Azizi Azizan, Nurfadzillah Ishak, Hazry Desa (UniMAP, Malaysia)
- OS23-2 *Drones and Data: A Comprehensive Exploration of UAVs in Data Mining*
Muhammad Azizi Azizan, Nurfadzillah Ishak, Hazry Desa (UniMAP, Malaysia)
- OS23-3 *Development of Variable Arm to Control the Manoeuvrability of Quadrotor*
L. Y. Hong, H. Desa and M. A. Azizan (UniMAP, Malaysia)
M. H. Tanveer (Kennesaw State University, USA)
- OS23-4 *Development of IOT-Enabled Smart Water Metering System*
S. D. Wen, H. Desa and M. A. Azizan (UniMAP, Malaysia)
A. -S. T. Hussain (Al-Kitab University, Iraq)
M. H. Tanveer and R. Patan (Kennesaw State University, USA)
- OS23-5 *Object Detection and Instance Segmentation with YOLOV8: Progress and Limitations*
L. J. Lee, H. Desa and M. A. Azizan (UniMAP, Malaysia)
A. -S. T. Hussain (Al-Kitab University, Iraq)
M. H. Tanveer (Kennesaw State University, USA)

11:30-12:45 OS2 Pattern Recognition and Robotics I (5)

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

Co-Chair: Yunzhong Song (Henan Polytechnic University, China)

- OS2-1 *A Study on Sales Patterns for Vegetable Products in Retail Stores*
Yuhao Zhang¹, Shuangshuang Ma¹, Jiashuai Wang¹, Fengzhi Dai¹, Lijiang Zhang²
(¹ Tianjin University of Science and Technology, China, ² Xinjiang Shenhua Biotechnology Co., Ltd, China)
- OS2-2 *Research and Implementation of Cooperative Control for ROS Mobile Robot*
Saijie Zhang, Huailin Zhao
(Shanghai Institute of Technology, China)
- OS2-3 *An OpenCV-based Method for Workpiece Residue Image Processing*
Jiaxin Wang, Hao He, Fangyv Liu, Fengzhi Dai
(Tianjin University of Science and Technology, China)
- OS2-4 *On Nonblockingness Verification and Enforcement of Controlled Nondeterministic Discrete-Event Systems*
Xiang Ren, Zipei Wang (Tianjin University of Science and Technology, China)
- OS2-5 *Modeling and Reachability Verification of Controlled Nondeterministic Finite-State Automata*
Zipei Wang, Xiang Ren (Tianjin University of Science and Technology, China)

15:40-16:25 GS3 Image Processing II (3)

Chair: Seiji Ishikawa (Kyushu Institute of Technology, Japan)

- GS3-1 *Online Classroom Student Engagement Analysis using Enhanced YOLOv5*
Shuai Wang, Abdul Samad Shibghatullah (UCSI University, Malaysia)
- GS3-2 *A Method of Recognizing Body Movements Based on a Self-viewpoint Video*
Iichirou Moribe, Yui Tanjo (Kyushu Institute of Technology, Japan)
- GS3-3 *Supporting Safe Walk of a Visually Impaired Person at a Station Platform based on MY VISION*
Shintaro Yamada, Yui Tanjo, Seiji Ishikawa (Kyushu Institute of Technology, Japan)

Room 407

10:00-11:15 OS13-1 Robot Control (5)

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

- OS13-1 *Intelligent Logistics Handling Robot: Design, Control, and Recognition*
Yanchao Bi, Jiale Cheng, Limei Wang, Yizhun Peng
(Tianjin University of Science and Technology, China)
- OS13-2 *Greenhouse Design Using Visual Recognition and IoT Technology*
Yuntian Xia, Yizhun Peng
(Tianjin University of Science and Technology, China)
- OS13-3 *Design of Modular Photovoltaic Environmentally Friendly Portable Stroller*
Suqing Duan, Yizhun Peng
(Tianjin University of Science and Technology, China)
- OS13-4 *"Teenage Mutant Ninja Turtles" - Design of a Bionic Quadrupedal Rescue Robot*
Hongpi Zhao, Yingfan Zhu, Zhihan Zhao, Xin Liang, Lei Lv, Yizhun Peng (Tianjin University of Science and Technology, China)
- OS13-5 *Design of Grass Lattice Planter for Complex Environment Based on Adaptive Suspension Technology*
Shaokai Tian, Wenqi Fu, Yizhun Peng
(Tianjin University of Science and Technology, China)

11:30-12:45 OS13-2 Robot Control (5)

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

- OS13-6 *Design of Intelligent Ecological Multifunctional Plant and Animal Breeding System*
Suqing Duan, Yuntian Xia, Siyi Wang, Yizhun Peng (Tianjin University of Science and Technology, China)
- OS13-7 *Design of a Fully Automated Logistics Handling Platform*
Hongpi Zhao, Jianfeng Qin, Yizhun Peng (Tianjin University of Science and Technology, China)
- OS13-8 *Design and Application of AI-based Brush Calligraphy and Painting Robot*
Haibo Li, Yizhe Sun, Shuxin Wang, Yizhun Peng (Tianjin University of Science and Technology, China)
- OS13-9 *Intelligent Wheelchair System: Non-contact Heart Rate and Body Temperature Measurement*
Dongpo Ma, Junsheng Zhang, Yizhun Peng (Tianjin University of Science and Technology, China)

- OS13-10 *Recognition and Localization Method for Automotive Axle Holes in Assembly Robots*
Junsheng Zhang, Dongpo Ma, Yizhun Peng (Tianjin University of Science and Technology, China)

13:00-14:15 OS3-1 Pattern Recognition and Robotics II (5)

Chair: Fangyan Li (Tianjin University of Science and Technology, China)

Co-Chair: Haozhe Sun (Tianjin University of Science and Technology, China)

- OS3-1 *Detection and Identification of Daylily Maturity Based on YOLOv8*
Fangyan Li (Tianjin University of Science and Technology, China)
- OS3-2 *Chaos Synchronization and Circuit Design of Chen System and Lü System with Different Structures*
Haozhe Sun (Tianjin University of Science and Technology, China)
- OS3-3 *A Parking Space Recognition Method Based on Digital Image Technology*
Hao He, Fangyv Liu, Jiabin Wang (Tianjin University of Science and Technology, China)
- OS3-4 *A Design of Intelligent Handling Robot Based on AT89C52*
Fangyv Liu, Jiabin Wang, Hao He (Tianjin University of Science and Technology, China)
- OS3-5 *Application and Differences of Robotic Arms, Traditional Machines and Manual Work in Production*
Xue Yang, Ying Su, Yuping Mei, Haiquan Wang (Tianjin University of Science and Technology, China)

14:20-15:20 OS3-2 Pattern Recognition and Robotics II (4)

Chair: Fangyan Li (Tianjin University of Science and Technology, China)

Co-Chair: Haozhe Sun (Tianjin University of Science and Technology, China)

- OS3-6 *A Deep Exploration of the Mounting Issues Related to Six Rotor UVA*
Yuping Mei, Ying Su, Xue Yang (Tianjin University of Science and Technology, China)
- OS3-7 *The Application of Hexacopter UAV in The Field of Climbing Evasion*
Ying Su, Yuping Mei, Xue Yang (Tianjin University of Science and Technology, China)
- OS3-8 *Deep Learning and Embedded Based Operational Safety System for Special Vehicles*
Haoran Gong, Yumei Huang, Jiahao Xie (Tianjin University of Science and Technology, China)

- OS3-9 *"Green Fruit" - Intelligent Traceable Agricultural Product Production and Marketing Platform Based on Blockchain Technology*
Yumei Huang, Jiahao Xie, Haoran Gong, Ziyue Xiao (Tianjin University of Science and Technology, China)

15:40-17:10 OS10 Intelligent Life and Robotics (6)

Chair: Evgeni Magid (Kazan Federal University, Russia)

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

- OS10-1 *A Design of a Modular Mobile Robot for Rescue Operations*
Baris Celiker, Shifa Sulaiman, Tatyana Tsoy (Kazan Federal University, Russia)
- OS10-2 *Implementation of Bug1 and Bug2 Path Planning Algorithms for TurtleBot Using ROS Noetic*
Ilya Spektor¹, Aidar Zagirov², Ramil Safin², Evgeni Magid^{1,2}
(¹HSE University, Russia) (²Kazan Federal University, Russia)
- OS10-3 *Implementation of Alg1 and Alg2 Path Planning Algorithms for Mobile Robots Using ROS Noetic*
Anastasia Yankova¹, Timur Gamberov², Tatyana Tsoy²
(¹HSE University, Russia) (²Kazan Federal University, Russia)
- OS10-4 *Implementation of VisBug-21 and VisBug-22 Path Planning Algorithms Using ROS Noetic*
Viktoriiia Mirzoian¹, Maxim Mustafin², Evgeni Magid^{1,2}
(¹HSE University, Russia) (²Kazan Federal University, Russia)
- OS10-5 *DistBug path planning algorithm package for ROS Noetic*
Alexander Pak¹, Alexander Eremin², Tatyana Tsoy²
(¹HSE University, Russia) (²Kazan Federal University, Russia)
- OS10-6 *On sensor modeling in Gazebo simulator*
Niez Yuldashev, Alexandra Dobrokvashina, Roman Lavrenov
(Kazan Federal University, Russia)

February 24 (Saturday)

9:40-Registration

Room 302, 303

13:00-14:00

Plenary Speech PS3

Chair: Yingmin Jia

PS3 *Artificial Intelligence and Technologies of Arm-type and Mobile Robots in Industry*

Haruhisa Okuda

(Mitsubishi Electric Corporation, Japan)

Room 303

10:00-11:15 OS20-1 *Advances in Field Robotics and Their Applications (5)*

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

Co-Chair: Keisuke Watanabe (Tokai University, Japan)

- OS20-1 *Image Collection Experiments of a Handy AUV for Offshore Structure Inspection*
Keisuke Watanabe, Koki Amano, Shingen Urano, Yasutaka Taniguchi, Konosuke Watanabe (Tokai University, Japan)
- OS20-2 *Design of Disassembly-reassembly Type USV for Coral Reef Research*
Keisuke Watanabe, Koki Amano, Gaku Minato, Yasutaka Taniguchi, Konosuke Watanabe (Tokai University, Japan)
- OS20-3 *Optimization method to improve visual SLAM in dynamic environment*
Yufei Liu, Kazuo Ishii (Kyushu Institute of Technology, Japan)
- OS20-4 *Design of flexible mechanism for flexible manipulator*
Huang Jiawei, Kazuo Ishii (Kyushu Institute of Technology, Japan)
- OS20-5 *Driver Drowsiness Detection Method based on Deep Learning*
Shi Puwei, Kazuo Ishii (Kyushu Institute of Technology, Japan)

11:30-12:00 OS20-2 Advances in Field Robotics and Their Applications (2)

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

Co-Chair: Keisuke Watanabe (Tokai University, Japan)

OS20-6 *An Analysis of Translational Motion for a Mobile Robot with Line-Symmetric Rollers Arrangement*

¹Kenji Kimura, ²Kazuo Ishii

(¹National Institute of Technology, Matsue College, Japan, ²Kyushu Institute of Technology, Japan)

OS20-7 *Development of Teaching Materials for Robot Programming for Junior High School Students: Student-Based Educational Activities*

Kenji Kimura, Youta Takano (National Institute of Technology, Matsue College, Japan)

14:15-15:30 OS20-3 Advances in Field Robotics and Their Applications (5)

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

Co-Chair: Keisuke Watanabe (Tokai University, Japan)

OS20-8 *Design and Software Production of Robotics Educational Design for Elementary and Junior High School Student*

Youta Takano, Kenji Kimura (National Institute of Technology, Matsue College, Japan)

OS20-9 *Development of visual inspection system for low-reflective material utilizing of a string shadow*

Keiji Kamei¹, Tomorou Kawahara¹, Yoshiyuki Daimaru²

(¹Nishinippon Institute of Technology, Japan) (²Nissan Motor Kyushu, Japan)

OS20-10 *Development of IoT-Based Remote Monitoring Module for Greenhouse Environment to Facilitate Crop Growth Data Analysis*

Moeko Tominaga, Yasunori Takemura, Junya Era, Wataru Kaishita
(Nishinippon Institute of Technology, Japan)

Eiji Mizoe, Tomoyasu Furukawa

(Kumamoto Fruit and Vegetable Shippers Association Co. Ltd., Japan)

OS20-11 *Development greenhouse environment prediction system using IoT data*

Yasunori Takemura, Naoya Nishida, Moeko Tominga
(Nishinippon Institute of Technology, Japan)

Eiji Mizoe, Tomoyasu Furukawa

(Kumamoto Fruit and Vegetable Shippers Association Co. Ltd., Japan)

OS20-12 *The Development of SaaS for Quantifying the Amount of Drifted Debris on the Coast*

Ayumu Tominaga, Ryohei Komori
(National Institute of Technology Kitakyushu College, Japan)

Eiji Hayashi (Kyushu Institute of Technology, Japan)

15:40-16:25 OS20-4 Advances in Field Robotics and Their Applications (3)

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

Co-Chair: Keisuke Watanabe (Tokai University, Japan)

OS20-13 *Development of an antagonistic wire-driven joint mechanism capable of rapid motion and variable stiffness*
Katsuaki Suzuki¹, Yuya Nishida², Kazuo Ishii²
(¹Kumamoto Industrial Research Institute, Japan, ²Kyushu Institute of Technology, Japan)

OS20-14 *Gakken Hills Interdisciplinary Ekiden Competing with Humans, Animals, and Robots*
Takuya Fujinaga¹, Moeko Tominaga², Daigo Katayama³, Kazuo Ishii³
(¹Fukuoka University, ²Nishinippon Institute of Technology, ³Kyushu Institute of Technology, Japan)

OS20-15 *Development of a Low-Cost Underwater Robot for Research and Education*
Takuya Fujinaga (Fukuoka University Japan)

16:40-17:40 OS7 Deep Learning and its Applications (4)

Chair: Mastaneh Mokayef (UCSI University, Malaysia)

Co-Chair: Takao Ito (Hiroshima University, Japan)

OS7-1 *Parallel Cross Window Attention Transformer and CNN Model for Segmentation of Instrument during Surgery*
Abdul Qayyum¹, M. K. A. Ahamed Khan³, Moona Mazher⁴, Imran Razzak⁵, Steven Niederer^{1,2}, Mastaneh Mokayef³, C.S. Hassan³, Ridzuan, A.³
(¹Imperial College, London, United Kingdom) (²The Alan Turning Institute, London, UK) (³UCSI University, Malaysia) (⁴University College London, UK) (⁵University of New South Wales, Australia)

OS7-2 *Magnetic Resonance Spectroscopy (MRS) Reconstruction using Style Transfer Deep Depth wise Framework*
Abdul Qayyum¹, M. K. A. Ahamed Khan³, Moona Mazher⁴, Imran Razzak⁵, Steven Niederer^{1,2}, Mastaneh Mokayef⁶, C.S. Hassan⁶, Ridzuan, A.⁶
(¹Imperial College, London, UK) (²The Alan Turning Institute, UK) (^{3,6} UCSI University, Malaysia) (⁴University College London, UK) (⁵University of New South Wales, Australia)

OS7-3 *Federated Learning on Brain Disease Research: Segmentation of Cerebral Small Vessel Diseases (CSVD) using Multi-scale Hybrid Spatial Deep Learning Approach*
Moona Mazher¹, Abdul Qayyum², M. K. A. Ahamed Khan³, Steven Niederer^{2,4}, Mastaneh Mokayef³, Ridzuan, A.³, C. S. Hassan³ (¹University College London, UK) (²National Heart & Lung Institute, Imperial College, London, UK) (³UCSI University, Malaysia) (⁴Alan Turning Institute, London, UK)

OS7-4 *Hybrid Classical and Quantum Deep Learning Models for Medical Image Classification*

Moona Mazher¹, Abdul Qayyum², M. K. A. Ahamed Khan³, Steven Niederer^{2,4}, Mastaneh Mokayef³, Ridzuan, A³, C. S. Hassan³ (¹University College London, UK,) (²National Heart & Lung Institute, Imperial College, UK) (³UCSI University, Malaysia) (⁴Alan Turning Institute, UK)

Room 403

10:00-11:15 OS17 Electronics and Kansei Engineering Based on ETT theory (5)

Chair: Tetsuo Hattori (Kagawa University, Hiroshima Institute of Technology, Japan)

Co-Chair: Yusuke Kawakami (NIT (Kagawa College), Japan)

OS17-1 *A High-Speed Estimation Method of Parameters in Impulse Response*

Toshiki Tanaka, Ivan Tanev (Doshisha University, Japan), Tetsuo Hattori (Kagawa University, Japan)

OS17-2 *A Consideration on Amplification Function in BJT Evers-Moll Model and PTT (I)
---- V-I Characteristics ----*

Shimon Hattori, Osamu Matoba (Kobe University, Japan), Tetsuo Hattori (Kagawa University, Japan), Toshiki Tanaka (Kinkei System, Japan), Yusuke Kawakami (NIT (Kagawa College), Japan)

OS17-3 *A Consideration on Amplification Function in BJT Evers-Moll Model and PTT (II)
---- H Parameters in the Small Signal Amplifier Circuit----*

Shimon Hattori, Osamu Matoba (Kobe University, Japan), Tetsuo Hattori (Kagawa University, Japan), Toshiki Tanaka (Kinkei System, Japan), Yusuke Kawakami (NIT (Kagawa College), Japan)

OS17-4 *Color Image Arrangement Using Histogram Matching*

Yusuke Kawakami (NIT (Kagawa College), Japan), Tetsuo Hattori (Kagawa University, Japan), R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan (R.O.C.))

OS17-5 *Methodology for Creativity Oriented STEM Education Based on ETT Theory*

Tetsuo Hattori, Toshihiro Hayashi, Mai Hattori, Yoshiro Imai (Kagawa University, Japan), Asako Ohno (Osaka Sangyo University, Japan), Takeshi Tanaka (Hiroshima Institute of Technology, Japan)

14:15-15:30 OS27 Post-narratological Approaches to Cognition in Humans and Robots (5)

Chair: Jumpei Ono (Aomori University, Japan)

Co-Chair: Hiroki Fxyma (Kobe University, Japan)

- OS27-1 *A Game Framework Based on the Disinformation Warfare in Russo-Ukrainian War*
Jumpei Ono (Aomori University, Japan), Takashi Ogata (Iwate Prefectural University, Japan)
- OS27-2 *Comparative Analysis of Eye Tracking between Veteran and Novice during Radiological Interpretation*
Yuka Naito (Chuo University, Japan), Jun Nakamura (Chuo University, Japan), Yoshinobu Ishiwata (Yokohama City University, Japan)
- OS27-3 *Development of Notification System to Prevent Working Productivity from Declining Caused by Increased Carbon Dioxide Concentration*
KAMODA Yohei, NAKAMURA Jun (CHUO University, Japan)
- OS27-4 *Visualization of the Skilled Physician's Gaze Characteristic during Diagnosis*
Taiki Sugimoto (Chuo University, Japan), Jun Nakamura (Chuo University, Japan), and Yoshinobu Ishiwata (Yokohama City University, Japan)
- OS27-5 *Comparative Analysis of Methods for Visualizing the Sensory Experience of Food and Beverages*
Hiroki Fxyma (Kobe University, Japan)

16:40-17:40 OS12 Machine Learning and its Applications (4)

Chair: Masato Nagayoshi (Niigata College of Nursing, Japan)

Co-Chair Takashi Kuremoto (Nippon Institute of Technology, Japan)

- OS12-1 *Restoration of Guqin Music by Deep Learning Methods*
Takashi Kuremoto*, Kazuma Fujino*, Hirokazu Takahashi*, Shun Kuremoto**, ***,
Mamiko Koshiba**, Hiroo Hieda***, Shingo Mabu**
(*Nippon Institute of Technology, **Yamaguchi University, ***Institute for Future
Engineering, Japan)
- OS12-2 *Constructive Nurse Scheduling Using Reinforcement Learning Considering
Variations in Nurse Work Patterns*
Masato Nagayoshi (Niigata College of Nursing, Japan),
Hisashi Tamaki (Kobe University, Japan)
- OS12-3 *A Basic Study on Indicator of Transfer Learning for Reinforcement Learning*
Satoshi Sugikawa, Kenta Takeoka, Naoki Kotani
(Osaka Institute of Technology, Japan)
- OS12-4 *Machine Learning Approach to Predict Cooling Load for Existing Buildings*
Makoto Ohara*, Hideo Isozaki**
(*International Professional University of Technology in Osaka, Japan,
**Kobe University, Japan)

Room 404

10:00-11:15 GS1-1 Machine learning& Neural Network & Artificial Life (5)

Chair: Hiroki Tamura (University of Miyazaki, Japan)

- GS1-1 *Deep Learning Based Prediction of Heat Transfer Coefficient Using Spectrogram
Images from Boiling Sound*
Fuga Mitsuyama, Ren Umeno, Tomohide Yabuki, Tohru Kamiya (Kyushu Institute of
Technology, Japan)
- GS1-2 *A Study on Classification of Faulty Motor Sound Using Convolutional Neural
Networks*
Jamil Md Shafayet, Praveen Nuwantha Gunaratne, Hiroki Tamura
(University of Miyazaki, Japan)
- GS1-3 *Design and Development of a Flexible Active Ankle Joint Orthosis for Locomotion
Assistance*
Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

GS1-4 *A study on the Real-Time Biomechanical Analysis of Lamber Burden Utilizing Stereoscope Cameras*
Taufik Hidayat Soesilo, Praveen Nuwantha Gunaratne, Hiroki Tamura
(University of Miyazaki, Japan)

GS1-5 *Verification of Determination Possibility using Convolutional Autoencoder for Machine Tool Abnormality Detection*
Yuta Sumoto, Praveen Nuwantha, Hiroki Tamura (University of Miyazaki, Japan)

11:30-12:15 GS1-2 Machine learning& Neural Network & Artificial Life (3)

Chair: Hiroki Tamura (University of Miyazaki, Japan)

GS1-6 *Basic Research for High-speed Heart Sound Determination using AI*
Riku Nakashima, Praveen Nuwantha Gunaratne, Hiroki Tamura
(University of Miyazaki, Japan)

GS1-7 *Prediction of High-Energy Electron Flux at Geosynchronous Orbit using a neural network technique*
Ami Iwabu, Kentaro Kitamura (Kyusyu Institute of Technology, Japan)

GS1-8 *Image Gradient-based Monocular Visual-Inertial Odometry*
Tae Ihn Kim (Hyundai Motor Company, Republic of Korea), Jae Hyung Jung, and Chan Gook Park (Seoul National University, Republic of Korea)

14:15-15:30 OS8 Intelligent Control (5)

Chair: Yingmin Jia (Beihang University, China)

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

OS8-1 *Global Stabilization of A Class of Nonholonomic Integrators via Discontinuous Control*
Lixia Yan, Yingmin Jia (Beihang University (BUAA), China)

OS8-2 *Frequency Dependence Performance Limit of Vibration Absorbers*
Jiqiang Wang¹, Xiaoyu Yin², Weicun Zhang³
(¹Chinese Academy of Sciences, China)
(²Science & Technology Bureau of Zhenhai District, China)
(³University of Science and Technology Beijing, China)

OS8-3 *Adaptive Concurrent Learning Algorithm Based on Pontryagin's Maximum Principle for Nonlinear System Optimal Tracking Control with State Inequality Constraints*
Yuqi Zhang, Bin Zhang (Beijing University of Posts and Telecommunications, China)

- OS8-4 *Privacy preserving Mean-square consensus for discrete-time heterogeneous multi-agent systems with Communication Noises*
Tongqing Yang¹, Lipo Mo¹, Yingmin Jia²
(¹Beijing Technology and Business University, China)
(²Beihang University (BUAA), China)
- OS8-5 *Event-Triggered Consensus Control for Nonlinear Singular Multi-Agent Systems under Directed Topology*
Lin Li, Tong Yuan, Mei Huang
(University of Shanghai for Science and Technology, China)

15:40-16:25 OS14 Robotic Manipulation (3)

Chair: Kensuke Harada (Osaka University, Japan)

Co-Chair: Akira Nakamura (Saitama Institute of Technology, Japan)

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

- OS14-1 *Evaluation Standard of Error Recovery Planning Focused on Revival Process from Failures in Robotic Manufacturing Plants*
Akira Nakamura¹, Kensuke Harada²
(¹Saitama Institute of Technology, ²Osaka University, Japan)
- OS14-2 *Robotic Food Handling Utilizing Temperature Dependent Variable-Stiffness Material*
Rozilyn Marco¹, Prashant Kumar², Xinyi Zhang², Weiwei Wan², Kensuke Harada²
(¹University of Toronto, Canada, ²Osaka University, Japan)
- OS14-3 *Vegetable maturity evaluation for harvest robots*
Reno Muhammad Fadilla, Tokuo Tsuji, Tatsuhiro Hiramitsu, and Hiroaki Seki
(Kanazawa University, Japan)

16:40-17:40 GS5 Applications I (4)

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

- GS5-1 *Unsupervised image registration based on Residual-connected DRMINE for diagnostic metastatic bone tumors*
Shogo Baba¹, Tohru Kamiya¹, Takashi Terasawa², Takatoshi Aoki²
(¹Kyushu Institute of Technology, Japan), (²University of Occupational and Environmental Health, Japan)
- GS5-2 *Developing a smart Belt for Monitoring Elderly Activities Based on Multi-Modal Sensors Integration and Internet of Things*
Abdul Jalil, Pujianti Wahyuningsih, Najirah Umar, Muhammad Risal, Suwatri Jura, A. Edeth Fuari Anatasya (Universitas Handayani Makassar, Indonesia)

- GS5-3 *A penalized motion detection model for extracting ionospheric echoes from low signal-to-noise ratio Ionogram video images*
Yuu Hiroshige¹, Akiko Fujimoto¹, Akihiro Ikeda², Shuji Abe³, Akimasa Yoshikawa³
(¹Kyushu Institute of Technology, Japan) (²National Institute of Technology, Kagoshima College, Japan), (³Kyushu University, Japan)
- GS5-4 *Verification Experiments on the Lower Back Burden caused by Posture and Environment during Lifting Operations*
Tomoka Kimura, Yutaro Fujino, Sachiko Kido, Praveen Nuwantha Gunaratne, Hiroki Tamura
(University of Miyazaki, Japan)

Room 405

10:00-10:45 OS19 Natural Computing (3)

Chair: Marion Oswald (Vienna University of Technology, Austria)

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

- OS19-1 *A Model of Reaction-diffusion phenomena with Multiset Processing*
Yasuhiro Suzuki (Nagoya University Japan)
- OS19-2 *Extract tactile qualities from time series data*
Yasuhiro Suzuki (Nagoya University, Japan)
- OS19-3 *Healthcare applications of vibrotactile stimulation developed by Tactile Score*
Yasuhiro Suzuki, Rie Taniguchi (Nagoya University, Japan)

11:00-13:00 OS22 Mathematical Informatics (8)

Chair Takao Ito (Hiroshima University, Japan)

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

- OS22-1 *Adsorption Behavior of Arsenic and Selenium using NiZn Hydroxy Double Salts with Acetate, Chloride, Nitrate, and Sulfate Anions*
Kaoru Ohe*, Ryosuke Tabuchi, Tatsuya Oshima
(University of Miyazaki, Japan)
- OS22-2 *Parallel Acoustic Analysis Based on the Domain Decomposition Method with Higher-Order Element*
Amane Takei¹, Makoto Sakamoto¹, Akihiro Kudo²
(¹University of Miyazaki, Japan)
(²National Institute of Technology, Tomakomai Collage, Japan)
- OS22-3 *Sound Field Evaluation on Acoustical Experiment using Non-Steady State Analysis*
Akihiro Kudo¹, Makoto Sakamoto², Amane Takei²
(¹National Institute of Technology, Tomakomai College, Japan)
(² University of Miyazaki, Japan)

- OS22-4 *A DeepInsight Method with Morphological Analysis*
Toyoaki Tomioka¹, Satoshi Ikeda¹, Makoto Sakamoto¹, Takao Ito²
(¹University of Miyazaki, Japan), (²Hiroshima University, Japan)
- OS22-5 *Support for Museum Exhibition of Small Fungi using AR Technology*
Kakeru Takemura¹, Ota Hamasuna¹, Fumito Hamakawa¹, Satoshi Ikeda¹, Kaoru Ohe¹,
Amane Takei¹, Makoto Sakamoto¹, Shuichi Kurogi²
(¹University of Miyazaki, Japan)
(²Miyazaki Prefectural Museum of Nature and History, Japan)
- OS22-6 *Automatic Selection of High-Grade Dried Shiitake Mushrooms using Machine Learning*
Ota Hamasuna¹, Kakeru Takemura¹, Kodai Hasebe¹, Fumito Hamakawa¹, Bidesh Biswas Biki¹,
Satoshi Ikeda¹, Kaoru Ohe¹, Amane Takei¹, Makoto Sakamoto¹, Kazuhide Sugimoto²
(¹University of Miyazaki, Japan), (²SUGIMOTO Co., Ltd. Japan)
- OS22-7 *Predicting High Volatility Cryptocurrency Prices using Deep Learning*
Tsutomu Ito¹, Kodai Hasebe², Fumito Hamakawa², Bidesh Biswas Biki², Satoshi Ikeda²,
Amane Takei², Makoto Sakamoto², Md Rijajulislam³, Sabrina Bari Shital⁴, Takao Ito⁵
(¹National Institute of Technology, Ube College, Japan)
(²University of Miyazaki, Japan), (³TU Dortmund, Germany)
(⁴Daffodil International University, Bangladesh), (⁵Hiroshima University, Japan)
- OS22-8 *Simulation of Weathering Representation using Vertex and UV Information*
Tsutomu Ito¹, Fumito Hamakawa², Kodai Hasebe², Satoshi Ikeda², Amane Takei²,
Makoto Sakamoto², Takao Ito³
(¹National Institute of Technology, Ube College, Japan),
(²University of Miyazaki, Japan), (³Hiroshima University, Japan)

14:15-15:15 OS5-1 Intelligent Life and Robotics (4)

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

Co-Chair Evgeni Magid (Kazan Federal University, Russia)

- OS5-1 *Research on dynamic obstacle avoidance and complex path planning strategies based on ROS robots*
Yi-Wei Chen, Jr-Hung Guo
(National Yunlin University of Science and Technology, Taiwan)
- OS5-2 *Research on Multi-Robot Formation on Two-Dimensional Plane*
Kuo-Hsien Hsia, Chun-Chi Lai, Yi-Ting Liu, Yu-Le Chen
(National Yunlin University of Science and Technology, Taiwan)

OS5-3 *The Development of Utilization Rate and Energy Consumption Monitoring and Networking System*

Chung-Wen HUNG, Chun-Chieh WANG, Heng-En CHANG
(National Yunlin University of Science and Technology, Taiwan)

OS5-4 *MCU Based Edge Computing Platform for Liquid Level Measurement*

Chung-Wen HUNG, Chun-Liang LIU, Tai-Hsuan WU (National Yunlin University of Science and Technology, Taiwan)

15:40-16:10 OS5-2 Intelligent Life and Robotics (2)

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

Co-Chair Evgeni Magid (Kazan Federal University, Russian Federation)

OS5-5 *Potential of genetic algorithms in multi-UAV coverage problem*

Ramil Faizullin¹, Tatyana Tsoy¹, Edgar A. Martínez-García², Evgeni Magid^{1,3}
(¹Kazan Federal University, Russian Federation)
(²The Autonomous University of Ciudad Juarez, Mexico)
(³HSE University, Russia)

OS5-6 *Construction of Anthropomorphic Grippers with Adaptive Control*

Evgeny Dudorov¹, Julia Zhdanova², Ivan Zhidenko¹, Vladimir Moshkin², Alexander Eryomin³,
Evgeni Magid³, Alexander Permyakov¹
(¹JSC 'SPA 'Android technics', Russia) (²MIREA – Russian Technological University, Russia)
(³Kazan Federal University, Russia)

16:40-17:40 OS16 Industrial Artificial Intelligence Robotics (4)

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

OS16-1 *A Research on Performance Information Editing Support System for Automatic Piano*

Yoshiki Hori, Eiji Hayashi (Kyushu Institute of Technology, Japan)

OS16-2 *Development of Autonomous Mobile Field Robots – Accuracy Verification of Self-Localization through Simulation -*

Takamasa Hayashi¹, Shintaro Ogawa¹, Yuto Okawachi¹, Tan Chi Jie¹, Janthori Titan¹, Ayumu Tominaga², Eiji Hayashi¹, Satoko Seino³
(¹Kyushu Institute of Technology, Japan), (²National Institute of Technology (Kitakyushu College), Japan), (³Kyushu University, Japan)

OS16-3 *Development of AR System for Grasping String Foods on Introduction of Industrial Robot*

Yoshihiro Koyama, Eiji Hayashi (Kyushu Institute of Technology, Japan), Akira Kawaguchi (The City College of New York of The City University of New York, United States of America)

- OS16-4 *An Image Analysis of Coastal Debris Detection -Detection of microplastics using deep learning*
Yuto Okawachi¹, Ayumu Tominaga², Shintaro Ogawa¹, Takamasa Hayashi¹, Tan Chi Jie¹,
Janthori Titan¹, Eiji Hayashi¹, Satoko Seino³
(¹Kyushu Institute of Technology, Japan), (²National Institute of Technology (Kitakyushu College),
Japan), (³Kyushu University, Japan)

Room 406

10:00-11:15 OS18-1 Computer and Information Engineering (5)

Chair: Norrima Mokhtar (University of Malaya, Malaysia)

Co-Chair: Heshalini Rajagopal (UCSI University, Malaysia)

- OS18-1 *Efficient Campus Shuttle Tracking and Management Mobile Application for College Campus*
Andrea Tantay Gonzales¹, Kavitha Thamadharan¹, Neesha Jothi²
(¹INTI International College Penang, Malaysia) (²UCSI University, Malaysia)
- OS18-2 *GCN Analysis of Task-Based fMRI Data for Diagnosis of Schizophrenia*
Tejaswini Thota¹, Reuben Stephen John¹, Dr R Dhanush¹, Dr Amutha S¹
(¹ Vellore Institute of Technology, India)
- OS18-3 *AR-Based Application for Campus Navigation*
Renuka Devi Rajagopal¹, Akshay S¹, Manoj Rathinam¹, Shakthi B¹, Heshalini Rajagopal²
(¹ Vellore Institute of Technology, India), (²UCSI University, Malaysia)
- OS18-4 *Development of Robotic Assistant for Health Care Sector with A Special Focus to Aid the Geriatric Patients*
Narayanan Ganesh (Vellore Institute of Technology, India)
- OS18-5 *Development of a Desktop Application Restaurant Management System*
Gabriela Maria Ancilla, Heshalini Rajagopal, Ismail Ahmed Al-Qasem Al-Hadi
(UCSI University, Malaysia)

11:30-12:00 OS18-2 Computer and Information Engineering (2)

Chair: Norrima Mokhtar (University of Malaya, Malaysia)

Co-Chair: Heshalini Rajagopal (UCSI University, Malaysia)

- OS18-6 *Face Recognition based on Attendance System*
Koh Pei Cong¹, Heshalini Rajagopal¹, Ghassan Saleh¹, Norrima Mokhtar²
(¹UCSI University, Malaysia), (²University of Malaya, Malaysia)
- OS18-7 *U-Reserve: Development of a Facility Reservation System for UCSI University*
Esther Chong Jun Lynn¹, Neesha Jothi¹, Ismail Ahmed¹
(¹UCSI University, Malaysia)

14:15-15:30 OS18-3 Computer and Information Engineering (5)

Chair: Norrima Mokhtar (University of Malaya, Malaysia)

Co-Chair: Heshalini Rajagopal (UCSI University, Malaysia)

- OS18-8 *The Smart Document Processing with Artificial Intelligence*
Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K², Glaret Shirley Sinnappan³
(¹UCSI University, Malaysia), (²University Utara Malaysia, Kedah)
(³Tunku Abdul Rahman University of Management and Technology, Malaysia)
- OS18-9 *Digital Security Challenges Faced by Business Organizations*
Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K², Glaret Shirley Sinnappan³
(¹UCSI University, Malaysia), (²University Utara Malaysia, Malaysia), (³Tunku Abdul Rahman University of Management and Technology, Malaysia)
- OS18-10 *The Study on Perception on E-Waste Among the People*
Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K²
(¹UCSI University, Malaysia), (²University Utara Malaysia, Malaysia)
- OS18-11 *Emergence of Cybercrimes in Online Social Networks*
Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K²
(¹UCSI University, Malaysia) (²University Utara Malaysia, Malaysia)
- OS18-12 *Development of a music recommendation application by using facial emotion recognition*
Shengke Xie, Raenu Kolandaisamy, Ghassan Saleh, Heshalini Rajagopal
(UCSI University, Malaysia)

15:40-16:25 OS21 Human-Machine Interface (3)

Chair: Norrima Mokhtar (University of Malaya, Malaysia)

Co-Chair: Heshalini Rajagopal (UCSI University, Malaysia)

- OS21-1 *Enhancing Reconnaissance Missions Through Multiple Unmanned Systems in ROS*
Anees ul Husnain^{1,2}, Norrima Mokhtar¹, Takao Ito³, Siti Sendari⁴, Muhammad Farris Kyasudeen⁵, Muhammad Badri M Noor^{1,6}, Heshalini Rajagopal⁷
(¹Universiti Malaya, Malaysia), (²The Islamia University of Bahawalpur, Pakistan),
(³Hiroshima University, Japan), (⁴Universitas Negeri Malang, Indonesia), (⁵University Technology MARA (UiTM), Malaysia)
(⁶Ifcon Technology Sdn Bhd, Malaysia), (⁷UCSI University, Malaysia)
- OS21-2 *Illumination Effects on Facial Expression Recognition using Empirical Mode Decomposition*
Hashimah Ali¹, Wan Khairunizam Wan Ahmad¹, Hariharan Muthusamy²,
Mohamed Elshaikh¹
(¹Universiti Malaysia Perlis, Malaysia)
(²National Institute of Technology Uttarakhand, India)

- OS21-3 *Supercontinuum Generation Pump By a Molybdenum Disulfide Based Soliton Mode-Locked Fiber Laser*
Aeryn D. Ahmad¹, Norrima Mokhtar¹, Hamzah Arof¹, Sulaiman Wadi harun¹, Ahmad Haziq Aiman Rosol²
(¹Universiti Malaya, Malaysia), (²MJIIT, UTM, Malaysia)

16:40-17:40 GS6 Applications II (4)

Chair: Masayuki Fujiwara (Kyushu Institute of Technology, Japan)

- GS6-1 *Development of Smartphone Application for Calculating the Low Back Pain Risk*
Seigo Imura, Praveen Nuwantha, Hiroki Tamura (University of Miyazaki, Japan)
- GS6-2 *A Computational Approach for Global Trade Analysis Sensitive to Free Trade Agreement Circumstances: A Case Study Focusing on the Great Mekong Subregion*
Ahmad Altaweel¹, Bo-Young Lee², Masayuki Fujiwara¹, Jang-Sok Yoon², Hiroaki Wagatsuma¹
(¹Kyushu Institute of Technology, Japan; ²Logistics Revolution Korea, Korea)
- GS6-3 *Trigger circuit design and system integration for simultaneous measurement of human EEG, motion, and gaze*
Masayuki Fujiwara¹, Phan Hoang Huu Duc¹, Laurent Bougrain², Patrick Hénaff², Hiroaki Wagatsuma¹ (¹Kyushu Institute of Technology, Japan; ²Université de Lorraine, France)
- GS6-4 *Terminal Synergetic Controller for Car's Active Suspension System Using Dragonfly Algorithm*
Tinnakorn Kumsaen¹, Sorn Simatrang², Arsit Boonyaprapasorn³, Thunyaseth Sethaput⁴
(¹Khon Kaen University, Thailand; ²Nacres Co., Ltd, Thailand; ³Chulachomkiao Royal Military Academy, Thailand; ⁴Thammasat University, Thailand)

February 25 (Sunday)

9:40-Registration

10:00-11:00

Room 405

10:00-11:15 OS6 Intelligence and Optimization (5)

Chair: Mastaneh Mokayef (UCSI University, Malaysia)

Co-Chair Takao Ito (Hiroshima University, Japan)

- OS6-1 *Simulation-Based Enhancement of SNR in Drone Communication through Uniform Linear Array Configurations*
Gershom Phiri¹, Mastaneh Mokayef¹, MHD Amen Summakieh¹, M.K.A Ahamed Khan¹, Sew Sun Tiang¹, Wei Hong Lim¹, Abdul Qayyum²
(¹UCSI University Malaysia) (²National Heart and Lung Institute, Imperial College London, UK)
- OS6-2 *Empowering Elderly Individuals through the Intelligent Shopping Trolley*
Mastaneh Mokayef¹, Muzaiyanah Binti Hidayab¹, MHD Amen Summakieh¹, M.K.A Ahamed Khan¹, Kim Soon Chong¹, Chin Hong Wong², Chua Huang Shen³, Abdul Qayyum⁴
(¹UCSI University Malaysia) (²Fuzhou University, China) (³UOW Malaysia University, Malaysia) (⁴National Heart and Lung Institute, Imperial College, UK)
- OS6-3 *Optimized Microstrip Slot UWB Patch Antenna for Medical Imaging*
Maxime Duvacher¹, Mastaneh Mokayef², MHD Amen Summakieh², M.K.A Ahamed Khan², Sew Sun Tiang², Wei Hong Lim², Abdul Qayyum³
(¹Polytech Nantes, France) (²UCSI University Malaysia) (³National Heart and Lung Institute, Imperial College London, UK)
- OS6-4 *Development of an Innovative Undergraduate Industrial Automation and Robotics Degree Program*
M.K.A. Ahamed Khan¹, Mastaneh Mokayef¹, Ridzuan, A.¹, Irraivan Elamvazuthi, Badli Shah Yusoff², Abu Hassan Darusman³ (¹UCSI University Malaysia) (²University Technology Petronos, Malaysia) (³UNIKL Malaysia France Institute, Malaysia)
- OS6-5 *Smart Assistive Trolley for Elderly Care and Independence*
Dina Ashraf¹, Mastaneh Mokayef¹, MHD Amen Summakieh¹, M.K.A Ahamed Khan¹, Abdul Qayyum², Sivajothi A/L Paramasivam³ (¹UCSI University Malaysia) (²National Heart and Lung Institute, Imperial College London, UK) (³UOW Malaysia University College, Malaysia)

12:30-13:45 OS4-1 Pattern Recognition and Robotics III (5)

Chair: Huahao Li (Tianjin University of Science and Technology, China)

Co-Chair Hongshuo Zhai (Tianjin University of Science and Technology, China)

- OS4-1 *A Digital Twin Design Based on Robot Workstation*
Huahao Li (Tianjin University of Science and Technology, China)
- OS4-2 *A Study of Chemical Reactor Simulation System Based on PCS7*
Hongshuo Zhai (Tianjin University of Science and Technology, China)
- OS4-3 *Analysis of Learning Quality Evaluation for University Student Courses with Process Assessment*
Yuhao Zhang, Ying Gong, Xuran Wang
(Tianjin University of Science and Technology, China)
- OS4-4 *Motion Analysis and Transfer Applications Based on Posture Recognition*
Yuhao Zhang, Mingyue Li, Jianhao Jiao (Tianjin University of Science and Technology, China)
- OS4-5 *Functional Safety Assessment of the Safety Protection System Based on Petri Net*
Peng Wang, Mengyuan Hu
(Tianjin University of Science and Technology, China)

14:00-15:15 OS4-2 Pattern Recognition and Robotics III (5)

Chair: Huahao Li (Tianjin University of Science and Technology, China)

Co-Chair: Hongshuo Zhai (Tianjin University of Science and Technology, China)

- OS4-6 *Pedestrian Attribute Recognition Based on Deep Learning*
Peng Wang, Qikun Wang, Shengfeng Wang
(Tianjin University of Science and Technology, China)
- OS4-7 *Simulation of office air conditioning air supply based on COMSOL*
Peng Wang, Mengda Liu, Qikun Wang
(Tianjin University of Science and Technology, China)
- OS4-8 *Solo Wheel Technology-Self-balancing Wheelbarrow*
Ziyue Xiao, Yumei Huang, Zhencheng Chang, Mingxuan Li
(Tianjin University of Science and Technology, China)
- OS4-9 *Second-order self-balancing inverted pendulum*
Ziyue Xiao, Zhencheng Chang, Mingxuan Li, Yumei Huang
(Tianjin University of Science and Technology, China)

- OS4-10 *Design of Nanny's Abnormal Behavior Recognition Bracelet Based on Human Activity Recognition (HAR) Deep Learning Model*
Depeng Wang, Yingfan Zhu, Yande Xiang, Ziyue Xiao
(Tianjin University of Science and Technology, China)

Room 406

10:00-11:30 OS26-1 Navigating the Digital Frontier: Innovations in the Age of Industry Revolution 4.0(6)

Chair: Wei Hong Lim (UCSI University, Malaysia)

Co-Chair: Takao Ito (Hiroshima University, Japan)

- OS26-1 *An Intelligent Cargo/Warehouse Management System*
Zhongheng Sun, Zhou Yue, Xun Sun, Wenzhuo Fan, Wenxuan Zhou
(Fuzhou University, China)
- OS26-2 *A Comprehensive Approach to Design and Implement an IoT-Enabled Intelligent Shopping Cart System with Obstacle-Aware Navigation and Enhanced Customer Engagement for Elevated Consumer Experiences*
Yao Chen¹, Jiacheng Du¹, Bo Peng¹, Ningfei Wang¹, Zehan Huang¹, Wei Hong Lim², Sew Sun Tiang², Mastaneh Mokayef², Chin Hong Wong¹
(¹Fuzhou University, China) (²UCSI University, Malaysia)
- OS26-3 *Design of a Four-Port Flexible UWB-MIMO Antenna for Wearable and IoT Applications*
Jia Wei Tan, Sew Sun Tiang, Kim Soon Chong, Mohammad Arif Ilyas, Mastaneh Mokayef, Zhi Ying Yeoh, Wei Kang Lai, Wei Hong Lim
(UCSI University, Malaysia)
- OS26-4 *Investigate Power Efficiency in PLECS and MATLAB Software by Designing USB 5W Charger*
Zhi Ying Yeoh, Kim Soon Chong, Sew Sun Tiang, Mohammad Arif Ilyas, Jia Wei Tan, Wei Kang Lai, Wei Hong Lim (UCSI University, Malaysia)
- OS26-5 *Design and Simulation and Performance of Grid Connected Photovoltaic System for Small, Tall Building in Malaysia*
Wei Kang Lai, Kim Soon Chong, Sew Sun Tiang, Mohammad Arif Ilyas, Jia Wei Tan, Zhi Ying Yeoh, Wei Hong Lim
(UCSI University, Malaysia)
- OS26-6 *Design of Dual-Band Coplanar Waveguide (CPW) Printed Antenna for 1.9 - 3.6GHz Applications*
Jia Wei Tan, Sew Sun Tiang, Kim Soon Chong, Mohammad Arif Ilyas, Mastaneh Mokayef, Zhi Ying Yeoh, Wei Kang Lai, Wei Hong Lim
(UCSI University, Malaysia)

12:30-13:45 OS26-2 Navigating the Digital Frontier: Innovations in the Age of Industry Revolution 4.0 (5)

Chair: Wei Hong Lim (UCSI University, Malaysia)

Co-Chair: Takao Ito (Hiroshima University, Japan)

OS26-7 *Optimized Convolutional Neural Network Towards Effective Wafer Defects Classification*

Koon Hian Ang¹, Koon Meng Ang¹, Chin Hong Wong^{2,3}, Abhishek Sharma⁴, Chun Kit Ang¹, Kim Soon Chong¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (²Fuzou University, China) (³Maynooth University, Ireland) (⁴Graphic Era Deemed to be University, India)

OS26-8 *Tackling Photovoltaic (PV) Estimation Challenges: An Innovative AOA Variant for Improved Accuracy and Robustness*

Rayan Mohammed Noor Mohammed Bakhit¹, Abhishek Sharma², Tiong Hoo Lim³, Chin Hong Wong^{4,5}, Kim Soon Chong¹, Li Pan¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (²Graphic Era Deemed to be University, India) (³Universiti Teknologi Brunei, Brunei Darussalam) (⁴Fuzou University, China) (⁵Maynooth University, Ireland)

OS26-9 *Deep Learning in Manufacturing: A Focus on Welding Defect Classification with CNNs*

Tin Chang Ting¹, Hameedur Rahman², Tiong Hoo Lim³, Chin Hong Wong^{4,5}, Chun Kit Ang¹, Mohamed Khan Afthab Ahamed Khan¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (²Air University, Pakistan) (³Universiti Teknologi Brunei, Brunei Darussalam) (⁴Fuzou University, China) (⁵Maynooth University, Ireland)

OS26-10 *Enhancing Global Optimization Performance of Arithmetic Optimization Algorithm with a Modified Population Initialization Scheme*

Tin Chang Ting¹, Hameedur Rahman², Meng Choung Chiong¹, Mohamed Khan Afthab Ahamed Khan¹, Cik Suhana Hassan¹, Farah Adilah Binti Jamaludin¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (²Air University, Pakistan)

OS26-11 *Enhancing Precision Object Detection and Identification for Autonomous Vehicles through YOLOv5 Refinement with YOLO-ALPHA*

Guandong Li¹, Yanzhe Xie¹, Yuhao Lu¹, Jingzhen Fan¹, Yuankui Huang¹, Zongyan Wen¹, Wei Hong Lim², Chin Hong Wong¹

(¹Maynooth University, Ireland) (²UCSI University, Malaysia)

14:00-15:30 OS11 Intelligent Life and Robotics (6)

Chair: Evgeni Magid (Kazan Federal University, Russia)

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

- OS11-1 *An Overview of Kinect Based Gesture Recognition Methods*
Alexander Alexeev¹, Tatyana Tsoy¹, Edgar A. Martínez-García², Evgeni Magid^{1,3}
(¹Kazan Federal University, Russia)
(²The Autonomous University of Ciudad Juarez, Mexico)
(³HSE University, Russia)
- OS11-2 *An investigation on the impact of human-robot interactions during an autonomous obstacle avoidance task*
Riham Salman, Shifa Sulaiman, Renata Islamova, Tatyana Tsoy
(Kazan Federal University, Russia)
- OS11-3 *A Comparative Analysis of Object Detection Methods for Robotic Grasping*
Nikita Kolin, Elvira Chebotareva (Kazan Federal University, Russia)
- OS11-4 *Vision-based autonomous navigation for medical examination using a UR3e manipulator*
Bulat Abbyasov¹, Aidar Zagirov¹, Timur Gamberov¹, Hongbing Li², Evgeni Magid¹
(¹Kazan Federal University, Russia)
(²Shanghai Jiao Tong University, China)
- OS11-5 *Robot-Assisted Language Learning: Scientific Data Analysis*
Karina Sadyikova, Valeriya Zhukova, Roman Lavrenov
(Kazan Federal University, Russia)
- OS11-6 *Monitoring Beehive Sound Levels with Arduino-based System*
Kulmukhametov Ramis¹, Ramil Safin¹, Tatyana Tsoy¹, Kuo-Hsien Hsia², Evgeni Magid¹
(¹Kazan Federal University, Russia)
(²National Yunlin University of Science and Technology, Taiwan)

Room 407

10:00-11:15 OS25-1 Research Towards the Sustainable Development Goals (SDG's) (5)

Chair: Ammar A.M. Al Talib (UCSI University, Malaysia)

Co-Chair: Takao Ito (Hiroshima University, Japan)

- OS25-1 *Portable Green Energy Mobile Laptop Charging Station*
Ammar A. M. Al-Talib¹, Rodney Tan¹, Ang Aun Jie¹, Idayu M. Tahir¹, Sarah Atifah Saruchi², Cik Suhana Bt. Hassan¹, Amar Rizwan¹
(¹UCSI University) (²UMPSA, Malaysia)

- OS25-2 *Auto Indoor Hydroponics Plant Growth Chamber*
Ammar A.M. Al-Talib¹, Tew Hwa Hui¹, Sarah Atifah Saruchi², Idayu M. Tahir¹, Nor Fazilah Binti Abdullah¹
(¹UCSI University) (²UMPSA, Malaysia)
- OS25-3 *A Design and Fabrication of a Solar Agriculture Water Pumping System*
Ammar A.M. Al-Talib¹, Idayu M. Tahir¹, Ain Atiqa¹, Amar Rizwan¹, Sarah Atifah Saruchi², Yazan Abu Al shaikh¹
(¹UCSI University) (²UMPSA, Malaysia)
- OS25-4 *Design and Performance of a Power Generating Manual Treadmill*
Ammar A. M. Al-Talib¹, Sarah Atifah Saruchi², Cik Suhana Bt. Hassan¹, Nor Fazilah Binti Abdullah¹, Ain Atiqa¹, Ahmad Jelban¹
(¹UCSI University) (²UMPSA, Malaysia)
- OS25-5 *Smart Car Jack Using Internet of Things*
Idayu M.T. Noor, Ammar A.M. Al- Talib, Mahmoud E.A. Zeiad, Suhana B.H. Cik,
(UCSI University, Malaysia)

12:30-13:45 OS25-2 Research Towards the Sustainable Development Goals (SDG's) (4)

Chair: Ammar A.M. Al Talib (UCSI University, Malaysia)

Co-Chair: Takao Ito (Hiroshima University, Japan)

- OS25-6 *Gas Detection for Biogas System Using Internet Of Things (IoT)*
Ammar A.M. Al Talib, I.H.W. Yang, Idayu M.T. Noor, Haslija A.B. Ayu, Afifi. Z. Nur Muhammad
(UCSI University, Malaysia)
- OS25-7 *IoT- Based Smart Mushroom Growing Kit*
Ammar A.M. Al- Talib, C.K.J. Ting, Noor Idayu M. Tahir, Ain Atiqa, T.Y. Hui
(UCSI University, Malaysia)
- OS25-8 *Design and Analysis of Artificial Magnetic Conductor for Metal Shielding Applications in RFID Car Detection Applications*
Eryana Hussin^{1,2}, Azman Zakariya², Md. Ashraful Haque^{2,3}, Nur Izzati Ali⁴
(¹UCSI University) (²UTPSA, Malaysia) (³Daffodil International University, Bangladesh) (⁴UMP, Malaysia)
- OS25-9 *Effect of Fibre Orientation on the Mechanical Performance of Natural Fibre Polymer Composite Bicycle Frame using Finite Element Analysis*
Kok Sem Too, Cik Suhana Hassan, Nor Fazilah Abdullah, Ammar Abdulaziz Majeed Al-Talib,
(UCSI University, Malaysia)

OS25-10 *Modelling of short-circuit protection for a residential grid-connected BESS*
Kong De Kang, Farah Adilah Jamaludin, Rodney H.G. Tan
(UCSI University, Malaysia)

14:00-15:30 GS7 Applications III (6)

Chair: Kasthuri Subaramaniam (UCSI University, Malaysia)

GS7-1 *Rehabilitating Flood-Damaged Cars for Sustainable Car Rental Services: A Web-Based System*
Pon Xiao Qi, Abdul Samad Shibghatullah, Kasthuri Subaramaniam
(UCSI University, Malaysia)

GS7-2 *Optimizing E-Invoicing Rollout: Adaptive E-Invoicing Rollout (AER) Framework for Navigating Malaysia's Digital Transformation*
Koh Chee Hong, Abdul Samad Shibghatullah
(UCSI University, Malaysia)

GS7-3 *App Alert System for Smart Phones*
Chee Kin Hoe, Kasthuri Subaramaniam, Abdul Samad Shibghatullah
(UCSI University, Malaysia)

GS7-4 *Developing Hand Gesture Recognition System in Interpreting American Sign Language*
Kong Seh Chong, Kasthuri Subaramaniam, Ismail Ahmed Al-Qasem Al-H
(UCSI University, Malaysia)

GS7-5 *Miniature Enterprise Resource Planning*
Adim Khalid Aldireejah, Kasthuri Subaramaniam, Ghassan Saleh
(UCSI University, Malaysia)

GS7-6 *Developing Cloud-based Sportswear Website*
Lim Wei Yee, Kasthuri Subaramaniam, Raenu Kolandaisamy
(UCSI University, Malaysia)

Farewell Party

Abstract

PS Abstract (3)

PS1 Developing High-Speed Working Motion of the Multi Robot in DENSO

Tomoaki Ozaki (DENSO CORPORATION, Japan)

The number of labor force is expected to decrease due to the declining birthrate and aging population. Although many efforts to solve this social issue using automation technology by robots around the world have been implemented, most of the current applications of robots are still repetitive works such as picking and placing in mass production lines in factories, and small progress of the application of robots for high-mix low-volume production lines where the operations are frequently changed. In this paper, we discuss the reasons and the potential solutions for autonomous control technologies including the AI and deep learning. Moreover, the high-speed working motion of the multi robot developed by DENSO will be presented in this paper.

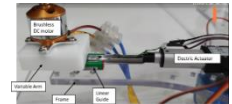


High-Speed Working Motion of the Multi-Robot

PS2 Experimenting with Variable Arm Quadrotors: Realizing Dynamic Configurations for Enhanced Flight Performance

Hazry Desa, Muhammad Azizi bin Azizan (Universiti Malaysia Perlis, Malaysia)

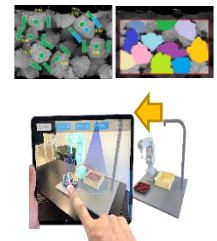
This paper introduces two innovative variable arm concepts for quadrotors, enhancing precise movement control by manipulating bending moments through arm length variations. Its key goal is to identify the optimal arm configuration for smooth and stable quadrotor maneuvers. Exploring two concept designs tailored for quadrotors, the study focuses on regulating manoeuvrability using variable arms, enabling bending moment adjustments. Results validate that the electric actuator with linear guide-type 2 variable arm ensures smooth and stable quadrotor movement.



PS3 Artificial Intelligence and Technologies of Arm-type and Mobile Robots in Industry

Haruhisa Okuda (Mitsubishi Electric Corporation, Japan)

In recent years, labor shortage has become a serious issue in industrial fields. Various technologies including robot and information processing system to realize flexible work like humans are effective solutions to this issue. Artificial intelligence technology of arm-type robots equipped with 3D sensors and force sensors has been applied in the manufacturing field to cope with different intelligent and highly precise tasks in Mitsubishi Electric. In addition, various technologies to expand the scope of application to the service field, as well as to realize highly functional delivery with mobile robots is under development. Furthermore, IoT technology is also being used for easy and quick on-site implementation and efficient operation. This speech introduces these initiatives with actual examples.



OS Abstract

OS1 Intelligent Life and Cybersecurity (6)

Chair I-Hsien Liu (National Cheng Kung University, Taiwan)

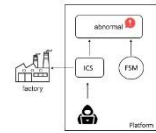
Co-Chair Chu-Fen Li (National Formosa University, Taiwan)

Co-Chair Pang-Wei Tsai (National Cheng Kung University, Taiwan)

OS1-1 Detecting abnormal operations in ICS using finite-state machines

Pei-Wen Chou, Nai-Yu Chen, Jung-Shian Li, I-Hsien Liu (National Cheng Kung University, Taiwan)

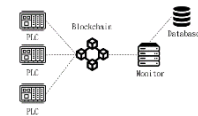
In 2021, a water treatment facility in Florida, USA, fell victim to an external malicious attack. In this incident, malicious actors attempted to manipulate the quantities of specific chemicals to impact water quality and safety. Given the intricacies of abnormal operation detection in Industrial Control Systems and the advantages of finite-state machine, we endeavored to apply this approach for the detection of abnormal ICS operations. We conducted a series of tests using the dam control system cybersecurity testbed established by TWISC@NCKU, Taiwan. The results indicate that our approach effectively enhances the efficiency of identifying non-standard operational behaviors, enabling maintenance personnel to promptly identify anomalies.



OS1-2 Industrial Control System State Monitor Using Blockchain Technology

Yun-Hao Chang, Tzu-En Peng, Jung-Shian Li, I-Hsien Liu (National Cheng Kung University, Taiwan)

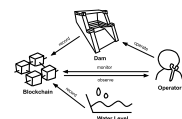
This paper introduces an innovative approach to enhance data verification and security in intelligent systems through the integration of blockchain technology. The proposed method amalgamates the transparency and decentralization inherent to blockchain with the command and oversight functionalities of PLC to ensure the utmost data integrity. The devised approach synergizes the decentralized attributes of blockchain with the control capabilities of PLCs, thus establishing robust safeguards for data integrity. Through the utilization of blockchain's tamper-resistant ledger, PLCs orchestrate data interactions and enforce real-time monitoring and control. The viability and efficacy of this innovative scheme are substantiated through empirical evaluations and simulations, conclusively affirming its practicality.



OS1-3 Enhancing Dam Security and Water Level Alerting with Blockchain Technology

YingCheng Wu, Jung-Shian Li, Chu-Fen Li, I-Hsien Liu (National Cheng Kung University, Taiwan)

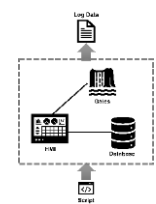
Ensuring the security, monitoring, and timely alerting of water levels in dams is a major challenge. We use blockchain technology to enhance the security and monitoring of dam infrastructure, and also improving the alerting system for water level changes. The use of blockchain technology in dam infrastructure management provides a decentralized, transparent, and tamper-resistant platform for storing and managing data. This ensures the integrity and security of critical data related to dam operations and water levels. This research investigates the enhanced security, monitoring, and alerting capabilities that this integration offers, and aims to contribute to the improved security and efficiency of dam infrastructure, leading to more reliable operations and better protection against potential disasters.



OS1-4 MiniDAM: A Dam Cybersecurity Toolkit

Tzu-En Peng, Meng-Wei Chang, Yun-Hao Chang, Jung-Shian Li, I-Hsien Liu
(National Cheng Kung University, Taiwan)

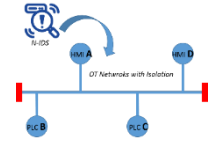
Testbeds, serving as simulations of real-world scenarios, are of paramount importance for research in cybersecurity related to critical infrastructure. In this paper, we aim to offer a comprehensive exploration of the MiniDAM and our testbed, introducing its physical settings based on real dam operational standards. Furthermore, a comparative analysis between the Secure Water Treatment (SWaT) testbed, MiniCPS, our testbed, and MiniDAM is presented. This paper also includes insights into dataset generation and the integration of other functionalities. The exposition of MiniDAM's features and capabilities serves as a foundation for enhancing resilience and provides valuable support for advancing research within the broader field of dam-related studies.



OS1-5 Case Study of Network-Based Intrusion Detection System Deployment in Industrial Control Systems with Network Isolation

Nai-Yu Chen, Pei-Wen Chou, Jung-Shian Li, I-Hsien Liu (National Cheng Kung University, Taiwan)

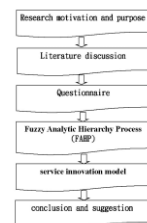
Deploying intrusion detection systems is a common cybersecurity measure, and intrusion detection systems typically operate at the ports of gateways. In critical infrastructure, industrial control systems often employ network isolation strategies, lacking the role of gateways. This research primarily explores the deployment of the Snort intrusion detection system in such an environment, combined with specific OT rules. Validation is conducted using the cybersecurity testbed of the dam control system established by TWISC@NCKU in Taiwan. The results indicate that by employing our proposed approach, it is possible to effectively detect abnormal network traffic, addressing the common issue of inadequate monitoring in environments with network isolation.



OS1-6 The AI integration service innovation model of real estate industry in Taiwan

Li-Min Chuang, Chih-Hung Chen (Chang Jung Christian University, Taiwan)

In real estate transactions, the intermediary role is often played by real estate agents. In recent years, with the integration of information and AI, the real estate industry can now provide higher quality services. This study references relevant literature and collects the services currently offered by real estate agents. The main dimensions and sub-dimensions are extracted using the Likert scale. Then, the Fuzzy Analytic Hierarchy Process (FAHP) is employed in a questionnaire study to obtain the relative weights among four main dimensions and twelve sub-dimensions. This research develops propositions and conclusions, summarizing the key factors for real estate transactions in Taiwan's real estate industry. These findings serve as important reference points for the industry.



OS2 Pattern Recognition and Robotics I (5)

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

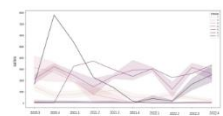
Co-Chair Yunzhong Song (Henan Polytechnic University, China)

OS2-1 A Study on Sales Patterns for Vegetable Products in Retail Stores

Yuhao Zhang ¹, Shuangshuang Ma ¹, Jiashuai Wang ¹, Fengzhi Dai ¹, Lijiang Zhang ²

(¹ Tianjin University of Science and Technology, China, ² Xinjiang Shenhua Biotechnology Co., Ltd, China)

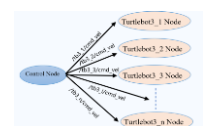
In fresh produce supermarkets, the shelf life of vegetable products is typically short, necessitating daily restocking based on historical sales data and the formulation of a rational pricing strategy to maximize the store's profits. This paper, based on sales data for vegetable products in a particular store from July 2020 to June 2023, employs various analytical methods, including multidimensional analysis, clustering, and regression, to explore the interrelationships among different types of vegetables. Furthermore, it combines cost-plus pricing and price elasticity models to establish a pricing framework that optimizes revenue for the supermarket.



OS2-2 Research and Implementation of Cooperative Control for ROS Mobile Robot

Saijie Zhang, Huailin Zhao
(Shanghai Institute of Technology, China)

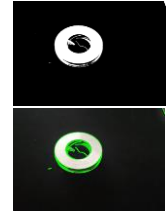
This paper discusses on the distributed control for the multiple ROS-based robots. A communication platform is built to execute the data transmission. The SLAM mapping and autonomous navigation of the robots are completed. The simulation tools of both Gazebo and Rviz are applied to analyze the multi-point navigation. The proposed distributed control system is tried and the synchronous control of the robots is realized, which achieve more accurate and more synchronous robot motion control. At last, the multi-robot following and multi-robot formatting come true.



OS2-3 An OpenCV-based Method for Workpiece Residue Image Processing

Jiaxin Wang, Hao He, Fangyv Liu, Fengzhi Dai (Tianjin University of Science and Technology, China)

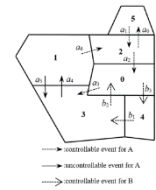
Workpiece residue refers to a thin film formed on the surface of the workpiece during the machining process, due to factors such as cutting fluid, chips, oil stains, etc., which affects the quality and performance of the workpiece. This paper proposes an OpenCV-based method for workpiece residue image processing, aiming to achieve automatic detection and analysis of workpiece residue. By building a workpiece image acquisition system, workpiece residue images of different types and degrees are collected, and the proposed method is verified and evaluated. The experimental results show that the proposed method can effectively detect and analyze workpiece residue, with high accuracy and robustness, providing an effective means for workpiece quality control.



OS2-4 On Nonblockingness Verification and Enforcement of Controlled Nondeterministic Discrete-Event Systems

Xiang Ren, Zipei Wang (Tianjin University of Science and Technology, China)

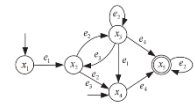
Discrete event systems, as an important kind of cyber-physical systems, have been widely used in engineering field. In this paper, we first express the dynamics of a controlled nondeterministic discrete-event system (acronym is DES) as an algebraic state-space representation using the semi-tensor product (STP) theory. And then, we discuss the problems of state-based nonblockingness verification and enforcement of nondeterministic DESs. Specifically, we obtain a criterion of verifying whether a given controlled nondeterministic DES is nonblocking. Further, we develop an efficient matrix-based approach to enforce state-based nonblockingness. We illustrate the applications of the proposed theoretical results using an example.



OS2-5 Modeling and Reachability Verification of Controlled Nondeterministic Finite-State Automata

Zipei Wang, Xiang Ren (Tianjin University of Science and Technology, China)

In this paper, we investigate the modeling and state reachability of controlled nondeterministic finite-state automata (NFA). The key feature of a controlled NFA is to admit a supervisor to intervene the behavior of original system. We first express the dynamics of a controlled NFA as an algebraic state-space representation in the framework of the semi-tensor product (STP) of matrices. Then, the necessary and sufficient condition for verifying state reachability of controlled NFA is presented. An explicit formula for calculating all paths of any two states is derived. Finally, we use an example to illustrate the application of the proposed theoretical results.



OS3 Pattern Recognition and Robotics II (9)

Chair Fangyan Li (Tianjin University of Science and Technology, China)

Co-Chair Haozhe Sun (Tianjin University of Science and Technology, China)

OS3-1 Detection and Identification of Daylily Maturity Based on YOLOv8

Fangyan Li (Tianjin University of Science and Technology, China)

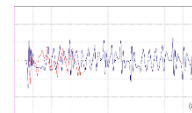
To better apply object detection and identification techniques from deep learning to the field of agricultural automation, this paper focuses on the growth process of daylilies. It employs the state-of-the-art YOLOv8 model to achieve accurate assessment of daylily maturity. The backbone network of YOLOv8 draws inspiration from the CSPDarkNet network structure to extract image features. Experimental results demonstrate that the detection accuracy of daylilies based on YOLOv8 exceeds 95.6%, with a recall rate of 90.5% and a mean average precision (mAP) reaching 0.94. Moreover, the identification speed is significantly improved.



OS3-2 Chaos Synchronization and Circuit Design of Chen System and Lü System with Different Structures

Haozhe Sun (Tianjin University of Science and Technology, China)

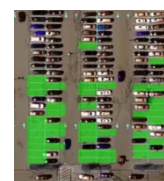
In this paper, by using nonlinear feedback control, chaos synchronization is achieved between the Chen system and the Lü system with different initial values, and the error curves and state synchronization curves of the corresponding states in the response Lü system and the drive Chen system are plotted. Finally, the simulation circuit model of the synchronization system of the drive Chen system and the response Lü system is designed by Multisim circuit simulation software. Comparing the output curves with the curves obtained by MATLAB simulation software, it can be found that the two curves achieve a good qualitative agreement. The synchronization of the drive Chen system and the response Lü system is accomplished.



OS3-3 A Parking Space Recognition Method Based on Digital Image Technology

Hao He, Fangyv Liu, Jiaxin Wang (Tianjin University of Science and Technology, , China)

In recent years, the number of cars in the city has been increasing, leading to an increasingly prominent issue of urban parking space. Consequently, the automatic identification method for parking spaces has emerged as a crucial research direction. This paper presents a design and implementation scheme for recognizing the status of parking spaces in urban areas based on digital image processing and other technologies. Real-time images of multiple parking spaces are collected and transmitted for splicing and detection purposes to determine their availability. The experimental results demonstrate the feasibility and effectiveness of the proposed method, which holds practical significance in addressing parking space detection problems through digital image processing.



OS3-4 A Design of Intelligent Handling Robot Based on AT89C52

Fangyu Liu, Jiaxin Wang, Hao He (Tianjin University of Science and Technology, China)

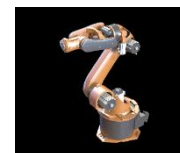
Aimed at the shortcomings of the low efficiency and the limitation of the artificial logistics handling, this paper presents a logistics handling robot based on AT89C52 single chip microcomputer. The integration of the power module, sensor, and drive motor module enables automatic obstacle avoidance and information collection. The incorporation of an ultrasonic obstacle avoidance module and an infrared tracking module enhances the capability for obstacle avoidance and path searching, and can easily cope with different workplace. The Yaskawa MPL manipulator is highly suitable for high-speed and high-precision palletizing, picking, packaging, and other industries.



OS3-5 Application and Differences of Robotic Arms, Traditional Machines and Manual Work in Production

Xue Yang, Ying Su, Yuping Mei, Haiquan Wang
(Tianjin University of Science and Technology, China)

This article aims to explore the differences between robotic arms and traditional machines and humans. Firstly, robotic arms are a kind of automated equipment with high flexibility and accuracy, which can perform a variety of complex tasks. In contrast, traditional machines lack flexibility and accuracy, while humans have problems such as low work efficiency and high error rates. Secondly, the emergence of robotic arms can solve many problems in traditional machines and humans, and improve production efficiency and quality. Finally, there is no contradiction between robotic arms, traditional machines and humans, but they can complement each other. By using robotic arms and humans reasonably, we can give full play to their respective advantages and improve the overall production efficiency and economic benefits.



OS3-6 A Deep Exploration of the Mounting Issues Related to Six Rotor UAV

Yuping Mei, Ying Su, Xue Yang (Tianjin University of Science and Technology, China)

In recent years, the hexacopter UAV has developed rapidly, especially the technological breakthrough in the field of automatic driving, which is of great significance in both military and civilian fields. The six-rotor UAV uses six rotors as the power source and adjusts the attitude by changing the rotor speed to further achieve position control. It has excellent hovering ability and sensitivity, and is equipped with a precise positioning system and advanced sensors. However, there are still common problems such as weak mounting capacity and single mounting mode. In view of this problem, this paper will test the fuselage structure, avionics system and power system one by one from two aspects: changing the fuselage structure and installing the motor position.



OS3-7 The Application of Hexacopter UAV in The Field of Climbing Evasion

Ying Su, Yuping Mei, Xue Yang (Tianjin University of Science and Technology, China)

With the development of tourism to climb peaks, the safety of high mountain walls plays an increasingly important role. In the past, the terrain of the mountain wall was too steep and too fast, and people could not patrol the mountain wall climbers, resulting in the safety of climbers could not be guaranteed, and the needs of climbers were difficult to solve in time. In order to solve the above problems, the method of real-time monitoring of UAVs and delivery of materials by UAVs was proposed. Hexacopter UAV is an unmanned small aerial vehicle equipment that can carry out vertical lifting, which is expected to improve the safety factor of climbing mountain walls and solve the needs of climbers in a timely manner.



OS3-8 Deep Learning and Embedded Based Operational Safety System for Special Vehicles

Haoran Gong, Yumei Huang, Jiahao Xie (Tianjin University of Science and Technology, China)

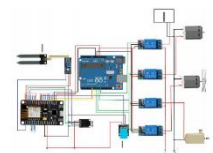
Aiming at the characteristics of special operation vehicles, such as complex working environment, large vehicle weight, long braking distance, and many visual dead angles for drivers, this project designs and implements a special vehicle operation safety system based on deep learning and embedded system. First of all, deep learning model is applied to detect the humanoid target appearing around the vehicle, get the detection frame of the humanoid target and estimate the distance from the target to the camera. According to different distance distances, relevant voice announcements are made to remind the driver to make timely actions such as avoiding or braking the vehicle.



OS3-9 "Green Fruit" - Intelligent Traceable Agricultural Product Production and Marketing Platform Based on Blockchain Technology

Yumei Huang, Jiahao Xie, Haoran Gong, Ziyue Xiao (Tianjin University of Science and Technology, China)

The production process of agricultural products has been greatly improved and optimized through the "Qingguo" intelligent agricultural greenhouse system. Using corrosion-resistant, ageing-resistant, solar-spectrum-converting plastic film, combined with Internet of Things technology, a simple, highly automated and intelligent greenhouse intelligent control system has been created. This not only improves the yield and quality of agricultural products, but also effectively reduces production costs and risks.



OS4 Pattern Recognition and Robotics III (10)

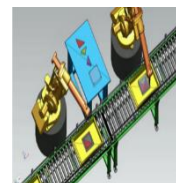
Chair **Huahao Li** (Tianjin University of Science and Technology, China)

Co-Chair **Hongshuo Zhai** (Tianjin University of Science and Technology, China)

OS4-1 A Digital Twin Design Based on Robot Workstation

Huahao Li (Tianjin University of Science and Technology, China)

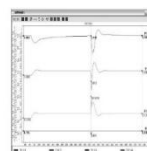
With the introduction of Made in China 2025 and Industry 4.0, digital twins have rapidly become a trend. By interacting with physical objects and virtual models, mapping is completed in the virtual simulation space to reflect the actual operation process of the entire lifecycle of the corresponding device workstation. This article starts from the research background and significance of digital twin technology, the establishment of Solidworks physical model, the construction of PDPS workstation, and virtual simulation. We have completed the construction of a robot seven color panel assembly workstation model and combined it with PDPS to simulate the workstation.



OS4-2 A Study of Chemical Reactor Simulation System Based on PCS7

Hongshuo Zhai (Tianjin University of Science and Technology, China)

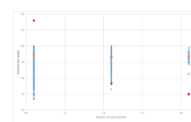
This paper introduces a simulation method of plant control, and corrects the system through PID Tuner, and finally gets a reasonable and correct simulation curve. In this paper, PCS7 software is used to build the factory model, and the simulation of four circuits of feed, pressure, liquid level and temperature is built by CFC block in the software. The automatic operation of the system is completed by SFC block. The final simulation curve obtained by PID Tuner tool based on PCS7 software is optimized.



OS4-3 Analysis of Learning Quality Evaluation for University Student Courses with Process Assessment

Yuhao Zhang, Ying Gong, Xuran Wang (Tianjin University of Science and Technology, China)

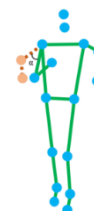
With the progressive exploration and application of formative assessment in university pedagogy, this evaluative method has become widely adopted for appraising students' everyday learning attitudes and conditions. Drawing upon pertinent data regarding classroom learning experiences of students at a specific university, this paper employs machine learning, K-means clustering, the Topsis evaluation model, and the entropy weighting method to investigate the relationship between formative assessment and the quality of university student learning, culminating in the creation of an evaluation model. This model allows us to pinpoint the key factors influencing student learning attitudes and offers support for formative assessment in the university context.



OS4-4 Motion Analysis and Transfer Applications Based on Posture Recognition

Yuhao Zhang, Mingyue Li, Jianhao Jiao (Tianjin University of Science and Technology, China)

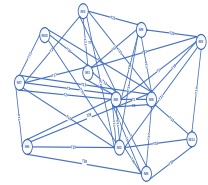
This paper investigates the posture trajectories in human motion using pose recognition technology based on the deep learning framework MediaPipe. By detecting key points on the human body and plotting and calculating these trajectories in the temporal dimension, we further conduct comparative analysis of these trajectories with professional sports coaches' motion guidance to assist athletes in correcting their posture. Additionally, this technology has been deployed on Jetson Nano, enabling its practical application in mobile scenarios and providing robust tools and methods for fields such as rehabilitation therapy, sports training, and animal behavior analysis. This study offers insights into the transfer applications of posture recognition.



OS4-5 Functional Safety Assessment of the Safety Protection System Based on Petri Net

Peng Wang, Mengyuan Hu (Tianjin University of Science and Technology, China)

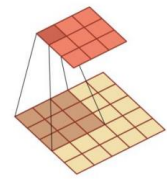
In this paper, the functional safety evaluation of the safety protection system of gasoline hydrogenation unit was carried out using Petri net. Firstly, the principle and framework of the gasoline hydrogen refueling unit was described. Secondly, the safety integrity level was introduced, and the influencing factors of the safety integrity level were summarized. Thirdly, the Petri net model and the Markov model are compared and the Petri net model is used to verify its security integrity level. Finally, the calculation result demonstrated that the SIL did not reach the target level, and then reached the target level after improvement. This analysis method can provide reference for the safety integrity level evaluation of similar devices.



OS4-6 Pedestrian Attribute Recognition Based on Deep Learning

Peng Wang, Qikun Wang, Shengfeng Wang (Tianjin University of Science and Technology, China)

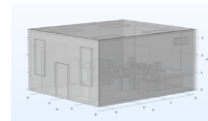
This paper studied pedestrian attribute recognition based on deep learning, for its importance in the fields of smart city construction. Firstly, the research status of pedestrian attribute recognition and common deep learning models was introduced. Secondly, considering the accuracy decline problem and gradient problem of the neural network, the residual network was used as the main body of the neural network model. Thirdly, the model was trained to classify multiple person attributes through two data sets, Market-1501 and DukeMTMC-reID. Finally, the pedestrian attribute recognition model was tested, and good results were obtained.



OS4-7 Simulation of office air conditioning air supply based on COMSOL

Peng Wang*, Mengda Liu, Qikun Wang (Tianjin University of Science and Technology, China)

This paper analyzed the summer thermal environment of an office in Tianjin University of Science and Technology based on COMSOL software. Firstly, the principle of indoor thermal environment distribution was introduced. Secondly, according to the actual position of the furniture in the office, the mathematical model is constructed based on the basic theory of computational fluid dynamics. Thirdly, the COMSOL software was used for simulation and calculation, combining boundary conditions. Finally, the simulation results are analyzed through the simulated indoor three-dimensional velocity field and temperature field. The simulation results show that the air conditioning supply can well achieve indoor occupants' comfort.



OS4-8 Solo Wheel Technology-Self-balancing Wheelbarrow

Ziyue Xiao, Yumei Huang, Zhencheng Chang, Mingxuan Li
(Tianjin University of Science and Technology, China)

As a new type of personal transportation, self-balancing unicycle has attracted wide attention with its unique design and advanced control system. We aim to study and optimize the self-balancing performance of the unicycle to improve its stability and maneuverability. Firstly, we gain an in-depth understanding of its operation principle. On this basis, an advanced control algorithm is proposed to realize real-time attitude adjustment. Second, for applications in complex environments, we propose an intelligent sensing system to enhance its environment sensing capability.



OS4-9 Second-order self-balancing inverted pendulum

Ziyue Xiao, Zhencheng Chang, Mingxuan Li, Yumei Huang
(Tianjin University of Science and Technology, China)

The team utilizes the second-order inverted pendulum cart based on LQR controller for steady pendulum control with light rods. First, the second-order inverted pendulum is used as a research object to obtain its set of dynamical equations, then, the set of dynamical equations is written in the form of state-space expressions, and finally, the second-order inverted pendulum system of a balanced trolley with a light rod is controlled by a stabilized pendulum using the LQR controller. The inverted pendulum is a typical nonlinear, underdriven and unstable system, which can realize the all-round wind resistance of the rod and occupy less space with high stability.



OS4-10 Design of Nanny's Abnormal Behavior Recognition Bracelet Based on Human Activity Recognition (HAR) Deep Learning Model

Depeng Wang, Yingfan Zhu, Yande Xiang, Ziyue Xiao (Tianjin University of Science and Technology, China)

This article designs a nanny abnormal behavior recognition bracelet. The bracelet is equipped with multiple sensors and a powerful control board, forming a complete nanny abnormal behavior recognition system, which realizes nanny abnormal behavior recognition and alarm in various environments. It uses a gyroscope to collect the three-axis acceleration information of the nanny, and uses the HAR model to infer the nanny's real-time behavior. When the abnormal behavior of the nanny is inferred, STM32 sends the GPS collected positioning information to the employer through ESP32 for timely alarm.



OS5 Intelligent Life and Robotics (6)

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

Co-Chair Evgeni Magid (Kazan Federal University, Russia)

OS5-1 Research on dynamic obstacle avoidance and complex path planning strategies based on ROS robots

Yi-Wei Chen, Jr-Hung Guo (National Yunlin University of Science and Technology, Taiwan)

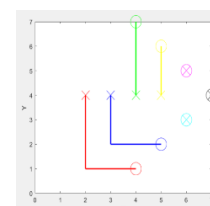
Robot Operating System (ROS) is a software system framework used by many robot systems. Although ROS provides a good development environment and related frameworks, ROS is not suitable for public places such as restaurants because of the coming and going of people. Dynamic obstacle avoidance is often handled by stopping the robot, or when there are frequent environmental map changes or when sensors such as optical radar fail, the stop action is also used. However, this often causes path obstructions or delays in completing tasks. Therefore, this study attempts to use images, auxiliary sensors, and various path avoidance strategies to solve the problem of the robot stopping and waiting for the obstacles to disappear. The problem of rapid changes in map paths.



OS5-2 Research on Multi-Robot Formation on Two-Dimensional Plane

Kuo-Hsien Hsia, Chun-Chi Lai, Yi-Ting Liu, Yu-Le Chen
(National Yunlin University of Science and Technology, Taiwan)

Mobile robots are playing an increasingly important role in both service and manufacturing industry. The management of multiple mobile robots is a very important issue on the research of mobile robotics. From a mathematical perspective, this paper discusses the problem of multiple robots on a two-dimensional plane reaching the designated positions in the shortest time to complete formation transformation. We improved the algorithm proposed by Hsia, Li and Su and proposed a new algorithm using a determinant and the Munkres allocation algorithm. Finally, the new algorithm is compared with the path distribution obtained by the Monte Carlo method under different numbers of robots and the excellence of the new algorithm has been verified.



OS5-3 The Development of Utilization Rate and Energy Consumption Monitoring and Networking System

Chung-Wen Hung, Chun-Chieh Wang, Heng-En Chang
(National Yunlin University of Science and Technology, Taiwan)

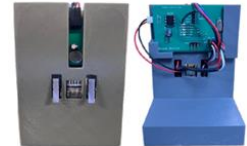
In this paper, we present a system based on microcontroller unit for measuring the utilization rate of traditional, non-networked machinery. This equipment is designed for use with older machines equipped with andon lights. It employs optocoupler circuits to capture the status of these lights and current transformers to measure their operating and standby currents. Data is transmitted to the server using the Hypertext Transfer Protocol (HTTP) in JavaScript Object Notation (JSON) format. On the server side, a PHP interprets the data, connects to a Structured Query Language (SQL) database, and stores the data using SQL commands. Users can access graphical data through a web-based interface, using it to refine production processes, reduce production costs, and minimize carbon emissions.



OS5-4 MCU Based Edge Computing Platform for Liquid Level Measurement

Chung-Wen Hung, Chun-Liang Liu, Tai-Hsuan Wu
(National Yunlin University of Science and Technology, Taiwan)

An edge computing system based on micro control unit (MCU) for liquid level measurement is proposed in this paper. The system includes a solenoid electromagnet for bottle hit and a microphone to capture sound waves. The signals are converted from time domain to frequency domain by Fast Fourier Transform (FFT), employing an artificial intelligence (AI) model to predict the water level. Artificial Neural Network (ANN) model is applied for classification on the MCU. When optimizing hyperparameters, the accuracy of each parameter combinations should be considered. Ensure the model size suits the limited MCU memory and computing capabilities. Experimental results confirm the system's effectiveness with 99% accuracy.



OS5-5 Potential of genetic algorithms in multi-UAV coverage problem

Ramil Faizullin¹, Tatyana Tsoy¹, Edgar A. Martínez-García², Evgeni Magid^{1,3}
(¹Kazan Federal University, Russian Federation)
(²The Autonomous University of Ciudad Juarez, Mexico)
(³HSE University, Russian Federation)

For a rapid area coverage multiple UAVs are often used simultaneously. However, a path planning for a UAVs group during an area coverage task is computationally challenging. In practice, heuristic algorithms are applied to solve this problem. This paper overviews approaches to an area coverage problem with a group of UAVs using genetic algorithms. The article explores modifications that may be useful for a genetic algorithm for solving the coverage problem as well as representation methods for chromosomes that reflect a path of multi-UAV. Additionally, UAV group collision avoidance strategies during area coverage are considered.



OS5-6 Construction of Anthropomorphic Grippers with Adaptive Control

Evgeny Dudorov¹, Julia Zhdanova², Ivan Zhidenko¹, Vladimir Moshkin², Alexander Eryomin³, Evgeni Magid³, Alexander Permyakov¹
(¹JSC 'SPA 'Android technics', Russian Federation)
(²MIREA – Russian Technological University, Russian Federation)
(³Kazan Federal University, Russian Federation)

A functionality of a service robot that physically interacts with a human is provided primarily by capabilities of its end effector. Rather limited capabilities of industrial robot grippers determined a gradual transition to anthropomorphic grippers. A number of degrees of freedom (DoF) of an end effector ensuring reliable grasping and holding of an arbitrary shaped object should be at least nine, preferably twelve. Such design implementation requires to switch toward underactuated grippers systems. This paper proposes a concept of constructing a group drive, which enables a motion of output links of two or more executive groups from a single motor. The presented technical solutions are based on methods of analyzing complex mechanical systems using functional circuits.



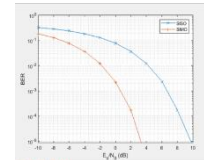
OS6 Intelligence and Optimization (5)

Chair Mastaneh Mokayef (UCSI University, Malaysia)
Co-Chair Takao Ito (Takao Ito, Hiroshima University, Japan)

OS6-1 Simulation-Based Enhancement of SNR in Drone Communication through Uniform Linear Array Configurations

Gershom Phiri¹, Mastaneh Mokayef¹, MHD Amen Summakieh¹, M.K.A Ahamed Khan¹, Sew Sun Tiang¹, Wei Hong Lim¹, Abdul Qayyum²
(¹ UCSI University Malaysia, ²National Heart and Lung Institute, Imperial College London, UK)

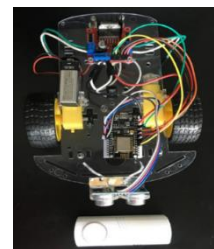
As drones navigate through shared airspace, they often encounter other drones, wireless devices, and communication systems. This coexistence creates potential sources of interference that can degrade the signal-to-noise ratio (SNR). To maintain reliable communication in drone systems, it is crucial to effectively manage and mitigate interference from other drones and wireless devices operating on the same frequency bands. By addressing these challenges, we can ensure a stable and dependable SNR for seamless communication among drones. This paper sheds light on the history of applications and challenges of utilizing flying base stations for wireless networks and analyzes different factors that affect signal-to-noise ratio (SNR) to enhance the performance of drone communication.



OS6-2 Empowering Elderly Individuals through the Intelligent Shopping Trolley

Mastaneh Mokayef¹, Muzaiyanah Binti Hidayab¹, MHD Amen Summakieh¹, M.K.A Ahamed Khan¹, Kim Soon Chong¹, Chin Hong Wong², Chua Huang Shen³, Abdul Qayyum⁴
(¹ UCSI University Malaysia, ² Fuzhou University, China, ³ UOW Malaysia University, Malaysia, ⁴ National Heart and Lung Institute, Imperial College London, UK)

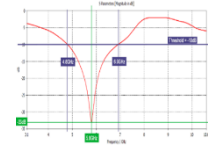
In this research, we have developed a prototype that aims to improve the weekly shopping experience for senior citizens. Our system tracks the movements of elderly individuals, eliminating the need for them to exert physical force in pushing or pulling the shopping trolley. To achieve this, we utilize a combination of sensors, including a gyroscope and magnetometer, to estimate the user's walking distance and direction. Additionally, we employ WiFi fingerprinting to accurately determine the user's position. Our experiments have yielded satisfactory results in terms of tracking accuracy and the overall functionality of the system. By addressing the specific challenges faced by senior citizens during the routine and essential process of grocery shopping, our smart shopping trolley concept seeks to enhance their experience. Through the integration of tracking technology and sensor-based solutions, we aim to make shopping more convenient and comfortable for elderly individuals. The positive outcomes observed in our experiments validate the effectiveness and feasibility of this approach.



OS6-3 Optimized Microstrip Slot UWB Patch Antenna for Medical Imaging

Maxime Duvacher¹, Mastaneh Mokayef², MHD Amen Summakieh², M.K.A Ahamed Khan², Sew Sun Tiang², Wei Hong Lim², Abdul Qayyum³ (¹Polytech Nantes, France, ²UCSI University Malaysia, ³National Heart and Lung Institute, Imperial College London, UK)

This research work presents the development of an Ultra-Wideband (UWB) microstrip patch antenna (MPA) with the specific purpose of tissue characterization. The antenna was carefully designed and simulated to operate within a frequency range of 4.8 to 6.9 GHz, optimized for its intended application. To ensure the best performance, a series of simulations and comparisons were conducted using CST Microwave Studio. Various antenna shapes were tested and evaluated to determine the most effective design. The results of these simulations were highly promising, as they revealed a simulated return loss (S_{11}) of -33dB. This indicates excellent performance and demonstrates the suitability and acceptability of the proposed antenna for medical imaging such as breast imaging, tumor detection, or monitoring physiological changes.



OS6-4 Development of an Innovative Undergraduate Industrial Automation and Robotics Degree Program

M.K.A. Ahamed Khan¹, Mastaneh Mokayef¹, Ridzuan, A.¹, Irraivan Elamvazuthi, Badli Shah Yusoff², Abu Hassan Darusman³ (¹UCSI University Malaysia, ²University Technology Petronas, Malaysia, ³UNIKL Malaysia France Institute, Malaysia)

In recent years, the need for integrated engineering courses has increased. Due to its multidisciplinary nature, Industrial Automation and Robotics degree course is an ideal example of curriculum integration. This paper discusses several issues such as course offerings, topical content, student profile, student performance and other pertinent matters related to the recent development of an Industrial Automation and Robotics undergraduate degree program at the University of Kuala Lumpur, Malaysia.

Category	DL	KB	Total
Batch July 2002	3	38	41
Batch July 2003	4	11	15

OS6-5 Smart Assistive Trolley for Elderly Care and Independence

Dina Ashraf¹, Mastaneh Mokayef¹, MHD Amen Summakieh¹, M.K.A Ahamed Khan¹, Abdul Qayyum², Sivajothi A/L Paramasivam (¹UCSI University Malaysia, ²National Heart and Lung Institute, Imperial College London, UK, ³ UOW Malaysia University College, Malaysia)

As people age, shopping can become increasingly challenging, especially when it involves pushing heavy trolleys and managing items throughout the entire trip. To address these difficulties, a prototype project was developed with the aim of introducing a robotic trolley. This innovative trolley is designed to autonomously follow senior citizens during their shopping journeys, thanks to face detection technology. The system eliminates the need for physical assistance and provides real-time feedback on the distance covered during the trip. To estimate the walking distance, the trolley incorporates an ultrasonic sensor that activates when the camera detects and tracks the user. The implementation of this project utilizes the OpenCV library, specifically tailored for Python programming. The results of this project have shown significant improvements in the lives of elderly individuals, offering them enhanced comfort and increased independence during their shopping experiences.



OS7 Deep Learning and its Applications (4)

Chair Mastaneh Mokayef (UCSI University, Malaysia)

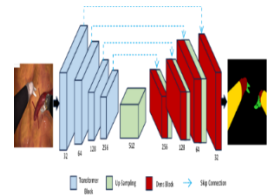
Co-Chair Takao Ito (Hiroshima University, Japan)

OS7-1 Parallel Cross Window Attention Transformer and CNN Model for Segmentation of Instrument during Surgery

Abdul Qayyum¹, M. K. A. Ahamed Khan³, Moona Mazher⁴, Imran Razzak⁵, Steven Niederer^{1,2}, Mastaneh Mokayef³, C.S. Hassan³, Ridzuan, A³

(¹Imperial College, London, UK) (²The Alan Turning Institute, UK) (³UCSI University, Malaysia) (⁴University College London, UK) (⁵University of New South Wales, Australia)

In this work, we present encoder and decoder-based hybrid parallel cross window attention-based transformer during the feature extraction, which consists of the multi-scale channel attention, convolutional layers, and Transformer layers, forming a unified block. Syn-ISS challenge dataset comprised of two tasks. In first task 1, they need to develop deep learning-based method for binary instrument segmentation and in second task multiclass instrument segmentation is required. Experiments conducted on Syn-ISS dataset achieved 0.993 F-score for task 1 and 0.993, 0.975, and 0.951 F-score for shaft, wrist, and jaw segmentation respectively for Task 2.

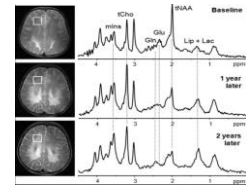


OS7-2 Magnetic Resonance Spectroscopy (MRS) Reconstruction using Style Transfer Deep Depth wise Framework

Abdul Qayyum¹, M. K. A. Ahamed Khan³, Moona Mazher⁴, Imran Razzak⁵, Steven Niederer^{1,2}, Mastaneh Mokayef⁶, C.S. Hassan⁶, Ridzuan, A⁶

(¹Imperial College, London, UK) (²The Alan Turning Institute, UK) (^{3,6}UCSI University, Malaysia) (⁴University College London, UK) (⁵University of New South Wales, Australia)

To analyze the chemical composition of tissues in brain, in vivo magnetic resonance spectroscopy allows non-invasive measurements of neurochemicals in either single voxel or multiple voxels. In this work, we present a deep depth-wise channel attention module (DCAM) based fine-tuned network for magnetic resonance spectroscopy image reconstruction. Besides, we have used channel-wise convolutions and average pooling without dimensionality reduction. We have trained the initial network from scratch on track-1 simulated dataset, however due to the limited dataset, we finetune the network on track-2 and track-3. Experiments are conducted on Edited-MRS-Rec-Challenge dataset1 that showed significantly better performance.

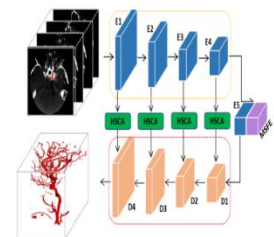


OS7-3 Federated Learning on Brain Disease Research: Segmentation of Cerebral Small Vessel Diseases (CSVD) using Multi-scale Hybrid Spatial Deep Learning Approach

Moona Mazher¹, Abdul Qayyum², M. K. A. Ahamed Khan³, Steven Niederer^{2,4}, Mastaneh Mokayef³, Ridzuan, A³, C. S. Hassan³

(¹University College London, UK) (²National Heart & Lung Institute, Imperial College, London, UK) (³UCSI University, Malaysia) (⁴Alan Turning Institute, London, UK)

In this paper, we propose a hybrid architecture for medical image segmentation to produce efficient representations from global and local features and adaptively aggregate them, aiming to fully exploit their strengths to obtain better segmentation performance in federated learning. Furthermore, we propose a multi-scale feature extraction module embedded at the bottom of the proposed model, which can efficiently extract hidden multi-scale contextual information and aggregate multi-scale features. Experiments on segmentation over three-dimensional rotational angiography of internal Carotid Artery with aneurysm (SHINY-ICARUS) challenge dataset show the effectiveness of the proposed multiscale framework.

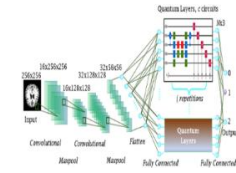


OS7-4 Hybrid Classical and Quantum Deep Learning Models for Medical Image Classification

Moona Mazher¹, Abdul Qayyum², M. K. A. Ahamed Khan³, Steven Niederer^{2,4}, Mastaneh Mokayef³, Ridzuan, A³, C. S. Hassan³

(¹University College London, UK) (²National Heart & Lung Institute, Imperial College, London, UK) (³UCSI University, Malaysia) (⁴Alan Turing Institute, UK)

In this paper, we proposed a hybrid classical and quantum convolutional neural network for Alzheimer's disease (AD) classification. The proposed model was further validated on the brain tumor classification task. The fundamental concept involves encoding data into quantum states, facilitating quicker information extraction, and subsequently utilizing this information to discern the data class. The proposed model results underscore the reliability and robustness and demonstrated by optimal performance accuracies across various datasets, the proposed model substantiates its efficacy in detecting and classifying AD disease and brain tumors.



OS8 Intelligent Control (5)

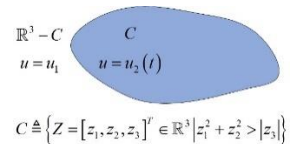
Chair Yingmin Jia (Beihang University, China)

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

OS8-1 Global Stabilization of A Class of Nonholonomic Integrators via Discontinuous Control

Lixia Yan, Yingmin Jia (Beihang University (BUAA), China)

This paper investigates the discontinuous state feedback control for stabilizing a class of nonholonomic integrators with drift terms. The control design relies on constraining state trajectory in an invariant set. To this end, we apply constant controls to drive the states moving into the invariant set and then switch to a continuous control law with suitable gain selections. It is proven in the Lyapunov sense that the proposed control scheme achieves global exponential stabilization of the states, and the control switch would only occur at most once. Numerical simulations are carried out to validate the proposed control law.



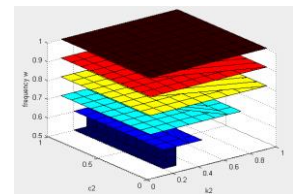
OS8-2 Frequency Dependence Performance Limit of Vibration Absorbers

Jiqiang Wang¹, Xiaoyu Yin², Weicun Zhang³

(¹Chinese Academy of Sciences, China) (²Science & Technology Bureau of Zhenhai District, China)

(³University of Science and Technology Beijing, China)

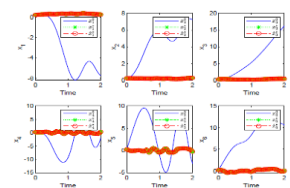
Optimal design of vibration absorbers has been extensively investigated. Most of the design methods are approached by optimizing certain performance indices, resulting in a set of optimal parameters that are independent of exogenous forcing frequencies. In practical designs, however, it is often desirable to know the performance limits over a frequency band of interest. This problem is tackled in the present paper where both lower and upper bounds are obtained. A refined upper bound is also derived that can further provide a systematic design methodology. Extensive remarks are also given exploring different avenues useful for design. Numerical examples are given to validate the corresponding designs.



OS8-3 Adaptive Concurrent Learning Algorithm Based on Pontryagin's Maximum Principle for Nonlinear System Optimal Tracking Control with State Inequality Constraints

Yuqi Zhang, Bin Zhang (Beijing University of Posts and Telecommunications, China)

In this article, an adaptive learning algorithm is derived for finite-horizon optimal tracking problems of nonlinear systems. Concurrent learning is implemented to identify the unknown parameters of the system dynamics. Tracking of the desired trajectory and convergence of the developed policy are guaranteed via stability analysis. Different from the adaptive dynamic programming (ADP) infinite-horizon method, the proposed method solves the finite-horizon optimal tracking problems. Simulation results show the effectiveness of the proposed algorithm.

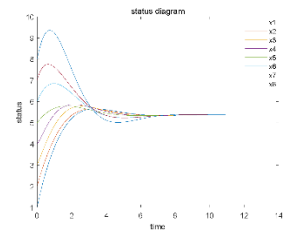


OS8-4 Privacy preserving Mean-square consensus for discrete-time heterogeneous multi-agent systems with Communication Noises

Tongqing Yang¹, Lipo Mo¹, Yingmin Jia²

(¹Beijing Technology and Business University, China) (²Beihang University (BUAA), China)

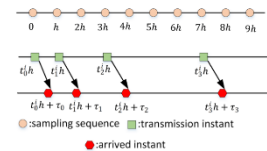
This paper studies the privacy preserving consensus of distributed heterogeneous multi-agent systems, which consists of first-order agents and second-order agents. A new protocol is designed for each agent. Then, by applying algebraic graph theory and matrix theory, it is proved that the closed-loop system could achieve consensus. After that, the designed protocol is encrypted by a cryptographic cryptosystem to prevent eavesdropping in the communication link and loss of information privacy between agents while achieving consensus. Finally, the effectiveness of the proposed consensus protocol and privacy protection algorithm are verified by numerical simulations.



OS8-5 Event-Triggered Consensus Control for Nonlinear Singular Multi-Agent Systems under Directed Topology

Lin Li, Tong Yuan, Mei Huang (University of Shanghai for Science and Technology, China)

This paper is devoted to the problem of event-triggered consensus for a class of nonlinear singular multi-agent systems under directed topology. An event-triggered sampling mechanism is constructed, which naturally avoids Zeno behavior. And then, a distributed event-triggered consensus protocol is designed. By employing the Lyapunov-Krasovskii functional method and model transformation approach, sufficient conditions that can guarantee the consensus of the considered singular multi-agent systems are obtained, while the consensus control gain matrix and the event-triggered parameter are also given. Finally, a numerical example is included to illustrate the effectiveness of the proposed method.



OS9 Software Development Support Method (4)

Chair Tetsuro Katayama (University of Miyazaki, Japan)

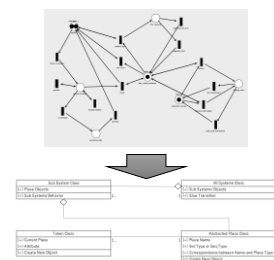
Co-Chair Tomohiko Takagi (Kagawa University, Japan)

OS9-1 An Improved Conversion Technique from EPNAT Models to VDM++ Specifications for Simulation of Abstract Software Behavior

Sho Matsumoto¹, Ryoichi Ishigami¹, Tetsuro Katayama², Tomohiko Takagi¹

(¹Kagawa University, Japan) (²University of Miyazaki, Japan)

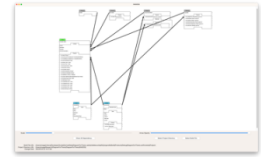
Formal software models based on EPNAT (Extended Place/transition Net with Attributed Tokens) can be converted to VDM++ specifications that enable simulation of abstract software behavior before implementation processes. However, the conversion technique has two problems, that is, (1) extracting all properties to be checked from the VDM++ specifications requires time and effort, and (2) the structure of the VDM++ specifications has less readability and maintainability. In this study, we improve the conversion technique by (1) adding a function to extract an abstract current state of software, and (2) dividing into classes that correspond to subnets of EPNAT models. This paper shows a new conversion rule, a new structure of VDM++ specifications, a simple example, and the discussion about their effectiveness.



OS9-2 Prototype of RAGESS Which Is a Tool for Automatically Generating SwiftDiagrams to Support iOS App Development

Haruki Onaga¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹
(¹University of Miyazaki, Japan) (²University of Nagasaki, Japan)

In the development of large-scale and complex mobile applications, it is difficult for developers to continually grasp the overall structure of the app. To support iOS app development, we proposed SwiftDiagram, a visualization of the static structure of Swift source code and confirmed its high usefulness. However, manually drawing SwiftDiagrams is labor-intensive. This paper implements a prototype of RAGESS (Real-time Automatic Generation of SwiftDiagram System), a tool that automatically generates SwiftDiagrams by performing static analysis on Swift source code every time an iOS app build is successful. Compared with other tools, RAGESS is confirmed to enable developers to visualize the static structure of source code effortlessly.



OS9-3 Extension to Support Types and Operation/Function Definitions in BWDM to Generate Test Case Tool from the VDM++ Specification

Shota Takakura¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹
(¹University of Miyazaki, Japan) (²University of Nagasaki, Japan)

Generating test cases from the formal specification description VDM++, which is a method for disambiguating specifications, is time-consuming and labor intensive. Therefore, our laboratory has developed BWDM, a tool that automatically generates test cases from VDM++ specifications. However, existing BWDM has problems that it only supports integer types and cannot generate test cases for operation and function definitions including recursive structure. Therefore, in order to improve the usefulness of BWDM, this study extends BWDM to solve the above problems. Consequently, it has confirmed that the use of extended BWDM can reduce the test case generation time compared to manual test case generation.

```
Function Name : judgeLeapYear
Argument Type : current_year : nat
Return Type : bool of (bool)
Number of Test Cases : 17 cases(BVA13 /SE4)

Boundary Values for Each Argument
current_year : 4294967295 4294967294 0 -1 1 4 5
99 100 101 999 400 401

Test Cases for Boundary Value Analysis
No.1 : 4294967295 -> "Undefined Action"
No.2 : 4294967294 -> "Normal year"
No.3 : 0 -> "Leap year"
No.4 : -1 -> "Undefined Action"
No.5 : 1 -> "Normal year"
No.6 : 4 -> "Leap year"
No.7 : 5 -> "Normal year"
No.8 : 99 -> "Normal year"
No.9 : 100 -> "Normal year"
No.10 : 101 -> "Normal year"
No.11 : 999 -> "Normal year"
```

OS9-4 Proposal of ASLA Which Is a Segmentation and Labeling Tool for Document Images Based on Deep Learning

Kanta Kakinoki¹, Tetsuro Katayama¹, Yoshihiro Kita², Hisaaki Yamaba¹, Kentaro Aburada¹, Naonobu Okazaki¹
(¹University of Miyazaki, Japan) (²University of Nagasaki, Japan)

The current situation of the electronic documents is only a substitute for paper. As a new way to utilize electronic documents, we focus on dividing electronic documents into regions by their elements and generating keywords and sentences as labels from the contents of the elements. However, these tasks, when performed manually, are time-consuming and labor-intensive. This study proposes a prototype of ASLA (Automatic Segmentation and Labeling tool using AI), segmentation and labeling tool for document images based on deep learning, with the aim of reducing the time required for region segmentation and label generation. To evaluate the usefulness of ASLA, we have compared the time required for region segmentation and label generation using ASLA and by hand, and then confirmed the reduction in time.



OS10 Intelligent Life and Robotics (6)

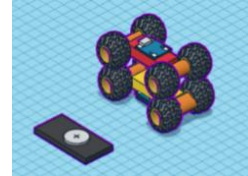
Chair Evgeni Magid (Kazan Federal University, Russia)

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

OS10-1 A Design of a Modular Mobile Robot for Rescue Operations

Baris Celiker, Shifa Sulaiman, Tatyana Tsoy (Kazan Federal University, Russia)

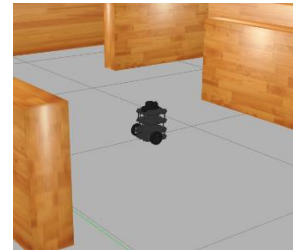
Modular robotics is one of the subfields of mobile robotics, which is emerging as a new trend in various sectors. Modular mobile robots can be reconfigured to perform a wide variety of tasks. In this paper, applications of modular mobile robots in various sectors such as industry, space, surgery, rescue and entertainment tasks are discussed. Based on the study, an improved design of a modular mobile robot for navigating through different terrains during a rescue operation is presented. Simulation study of the robot is included to demonstrate a motion capability of the modular mobile robot.



OS10-2 Implementation of Bug1 and Bug2 Path Planning Algorithms for TurtleBot Using ROS Noetic

Ilya Spektor¹, Aidar Zagirov², Ramil Safin², Evgeni Magid^{1,2}
(¹HSE University, Russia) (²Kazan Federal University, Russia)

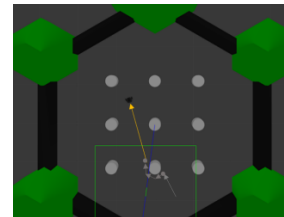
Mobile robots typically operate in a dynamically changing unknown environments. Bug family algorithms were proposed to deal with a path planning of a ground robot in a 2D configuration space of an unknown environment with local data about obstacles that could be collected using only a touch sensor. This paper presents an implementation of Bug1 and Bug2 local path planning algorithms. The implementation brings classical 2D algorithms into a 3D environment of the Gazebo simulation using the Noetic version of the Robot Operation System (ROS). A Turtlebot3 Burger model was used as a target robot and its performance was evaluated in simple convex and maze environments.



OS10-3 Implementation of Alg1 and Alg2 Path Planning Algorithms for Mobile Robots Using ROS Noetic

Anastasia Yankova¹, Timur Gamberov², Tatyana Tsoy²
(¹HSE University, Russia) (²Kazan Federal University, Russia)

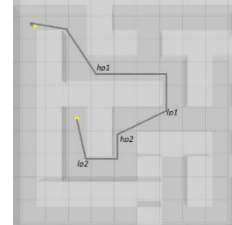
Two standard approaches for a robot path planning include a global and a local navigation. The later does not require to store an environment model in a robot memory. This paper presents implementations of two local navigation algorithms, Alg1 and Alg2, with a robot having no prior information about an environment and obstacles. It calculates a path in a real time, continuously changing its states depending on correspondent conditions. The algorithms were implemented for an existing differential drive robot Turtlebot3 Burger using Robot Operation System (ROS). Virtual experiments were performed in the Gazebo simulator employing a simple 3D environment with only convex obstacles and a small 3D maze.



OS10-4 Implementation of VisBug-21 and VisBug-22 Path Planning Algorithms Using ROS Noetic

Viktoriia Mirzoian¹, Maxim Mustafin², Evgeni Magid^{1,2}
(¹HSE University, Russia) (²Kazan Federal University, Russia)

Local navigation algorithms are crucial for autonomous robots operating in unknown environments where a presence of obstacles and dynamic changes pose significant challenges. A focus of these algorithms is to enable a real-time path calculation, allowing a robot to adapt its states dynamically based on corresponding environmental conditions, despite an absence of prior knowledge about surroundings. This paper presents an implementation of the VisBug-21 and VisBug-22 algorithms, designed to address challenges of a local navigation. The algorithms were implemented for a differential drive robot Turtlebot3 Burger using Robot Operation System (ROS). Virtual experiments were performed in the Gazebo simulator employing a simple 3D environment that contained only convex obstacles and a small 3D maze.



OS10-5 DistBug path planning algorithm package for ROS Noetic

Alexander Pak¹, Alexander Eremin², Tatyana Tsoy²
(¹HSE University, Russia) (²Kazan Federal University, Russia)

Algorithms of path-planning in an unknown environment play an important role in robotics. They do not require a prior information about obstacles' locations around a robot and allow calculating a path in a real time. This article presents an implementation of a sensory-based DistBug algorithm, which operates reactively using range data for immediate decision-making without constructing a world model. The algorithm was programmed in Python using robot operating system (ROS) and validated in the Gazebo simulator. For virtual experiments Turtlebot 3 Burger mobile robot was employed. The experiments were conducted in two types of environment: an environment with convex obstacles and a maze. The paper demonstrates analysis of experiments using several standard criteria of a path quality estimation.



OS10-6 On sensor modeling in Gazebo simulator

Niez Yuldashev, Alexandra Dobrokvashina, Roman Lavrenov (Kazan Federal University, Russia)

Sensor modeling in the Gazebo simulator is fundamental to robotics advancement. This review explores sensor modeling intricacies, methodologies, and applications, while emphasizing a critical role of a precise sensor modeling. Application scenarios demonstrate a sensor modeling's broad utility across fields including medical diagnostics, autonomous navigation, and industrial automation. Differences in research focus, methodology, and implementation underline a varied nature of sensor modeling studies. Key challenges include a need for more detailed world models. The paper guides research in sensor modeling and identifies crucial questions.



OS11 Intelligent Life and Robotics (6)

Chair Evgeni Magid (Kazan Federal University, Russia)

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

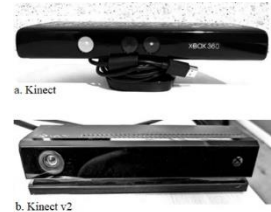
OS11-1 An Overview of Kinect Based Gesture Recognition Methods

Alexander Alexeev¹, Tatyana Tsoy¹, Edgar A. Martínez-García², Evgeni Magid^{1,3}

(¹Kazan Federal University, Russia) (²The Autonomous University of Ciudad Juarez, Mexico)

(³HSE University, Russia)

Visual sensors play an important role in a broad variety of robotic systems applications. Even though Kinect technology appeared over 10 years ago, Kinect sensors are still actively employed by researchers around the world. This paper presents an overview of Kinect and Kinect 2 sensors' applications in a human gesture based control. We analyzed existing research papers to estimate a popularity of particular feature extraction and gesture recognition methods, recommendations on a distance between an object of interest and a sensor, reported accuracy and latency of the sensor. Our analysis is supposed to facilitate a selection of a suitable combination of methods for a particular application of Kinect sensor in gesture recognition while considering its performance.



OS11-2 An investigation on the impact of human-robot interactions during an autonomous obstacle avoidance task

Riham Salman, Shifa Sulaiman, Renata Islamova, Tatyana Tsoy (Kazan Federal University, Russia)

The purpose of this research is to investigate how an interaction between humans and robots influences a safety of an autonomous obstacle avoidance task. The research collected and analyzed data from surveys and interviews using a combination of quantitative and qualitative methodologies. The findings contributed to our understanding of a complex interplay between a human-robot interaction, a perception, and a robot navigation safety. Based on these findings, the study proposed a number of recommendations for improving both physical and psychological safety aspects of an autonomous robot navigation.



OS11-3 A Comparative Analysis of Object Detection Methods for Robotic Grasping

Nikita Kolin, Elvira Chebotareva (Kazan Federal University, Russia)

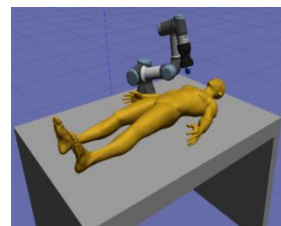
The objects grasping is one of the fundamental robotic problems. Accurate and efficient real-time object detection is crucial for successful grasping in robots equipped with monocular vision. Deep machine learning has made significant progress in solving problems of object detection and image segmentation. At the same time, classical computer vision methods do not lose their relevance and can also be used for these tasks. In this research, we conduct a comparative analysis of the effectiveness the YOLOv8-seg neural network model versions for solving the image segmentation problem with classical segmentation methods. The obtained results allowed us to formulate some recommendations on the choice of a particular method for object detection depending on the surrounding environment conditions.



OS11-4 Vision-based autonomous navigation for medical examination using a UR3e manipulator

Bulat Abbyasov¹, Aidar Zagirov¹, Timur Gamberov¹, Hongbing Li², Evgeni Magid¹
(¹Kazan Federal University, Russia) (²Shanghai Jiao Tong University, China)

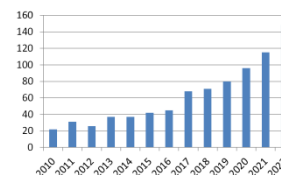
Medical robotics is an emerging field of robotics within a healthcare sector. This interdisciplinary field focuses on prototyping, building and developing advanced robots for numerous clinical application. Modern robotic technologies have a tremendous potential for performing medical examination procedures such as ultrasonography using robotic manipulators that act in an autonomous manner. A manipulator navigation plays a key role in a safe and efficient exploration of a human body. This paper presents a development of a vision-based autonomous navigation system for a 6-DOF UR3e robotic arm. The developed system is based on a 3D point cloud and uses MoveIt for path planning. Gazebo was used as a simulation framework to validate the navigation system.



OS11-5 Robot-Assisted Language Learning: Scientific Data Analysis

Karina Sadyikova, Valeriya Zhukova, Roman Lavrenov (Kazan Federal University, Russia)

Robot-assisted language learning (RALL) is a direction in education that uses robots in a foreign languages studying process. In this paper, we present results of our research work devoted to studying trends in a quantity of publications in the field of using social robots for learning foreign languages. Additionally, we analyzed some published paper in the field of RALL, which allowed us to identify several popular robot models used in practical research in recent years. Among these models were the NAO, Pepper and DARWIN OP-2 robots. We have found that these robots are actively used in an educational process for learning foreign languages. In particular, these models are used to improve language and communication skills during implicit learning and interactive games.



OS11-6 Monitoring Beehive Sound Levels with Arduino-based System

Kulmukhametov Ramis¹, Ramil Safin¹, Tatyana Tsoy¹, Kuo-Hsien Hsia², Evgeni Magid¹
(¹Kazan Federal University, Russia) (²National Yunlin University of Science and Technology, Taiwan)

An automated beekeeping is a promising approach to addressing various issues associated with a beekeeping. Among primary problems, a swarming procedure stands out as a major concern. An uncontrolled swarming can lead to significant financial losses. During a swarming period a potential for losing a bee swarm is high, therefore a noise monitoring at this period gains a significant importance. Our long term research aims at a development of an intelligent monitoring system for beehive conditions, based on a hive-generated noises analysis. This paper presents an experiment that collected data about acoustic characteristics of bees' state using an Arduino microcontroller and a MAX9814 microphone module. The obtained data analysis is discussed.



OS12 Machine Learning and its Applications (4)

Chair Masato Nagayoshi (Niigata College of Nursing, Japan)

Co-Chair Takashi Kuremoto (Nippon Institute of Technology, Japan)

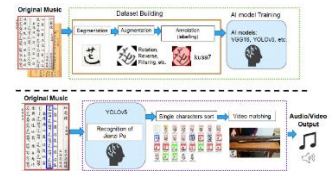
OS12-1 Restoration of Guqin Music by Deep Learning Methods

Takashi Kuremoto¹, Kazuma Fujino¹, Hirokazu Takahashi¹, Shun Kuremoto^{2,3}, Mamiko Koshiba^{*2}, Hiroo Hieda³, Shingo Mabu²

(¹Nippon Institute of Technology, Japan) (²Yamaguchi University, Japan)

(³Institute for Future Engineering, Japan)

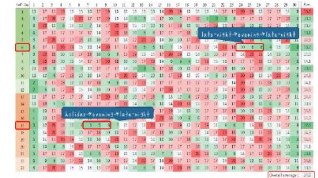
Guqin music played an important role in the history of Asia cultures. The notation of Guqin are remained more than 600, however, only 100 music are played in nowadays. The handwriting Guqin notation named Jianzi Pu is hard to be understood, however, we challenge to restore the Guqin music by deep learning methods and few Jianzi Pu images. VGG16 and YOLOv5 were adopted in the recognition experiment for Guqin music restoration. As a result, YOLOv5 realized an online output of Guqin music as its output of audio or video forms.



OS12-2 Constructive Nurse Scheduling Using Reinforcement Learning Considering Variations in Nurse Work Patterns

Masato Nagayoshi (Niigata College of Nursing, Japan), Hisashi Tamaki (Kobe University, Japan)

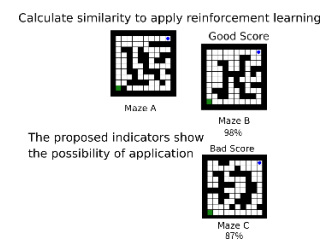
It is very difficult to create a work schedule that satisfies all the different requirements in nurse scheduling. For this reason, numerous studies have been conducted on the nurse scheduling problem. However, the created shift schedule is often not practical as it is, because adjustments including various constraints and evaluation criteria are required. Therefore, we have proposed a work revision method using reinforcement learning in a constructive nurse scheduling system. In this paper, we investigate the feasibility of creating a practical work schedule that considers different evaluations of nurses' work patterns, i.e., nurses' life stages.



OS12-3 A Basic Study on Indicator of Transfer Learning for Reinforcement Learning

Satoshi Sugikawa, Kenta Takeoka, Naoki Kotani (Osaka Institute of Technology, Japan)

Reinforcement learning requires a lot of learning time for the agent to learn. Transition learning is a method to reduce this learning time, but it has the problem that the user does not know which knowledge is effective in which environment until it is learned. Therefore, it is necessary for the user to consider the relationship between the source and destination when transferring knowledge. Therefore, this study proposes Indicator of adaptation criteria that can determine this relationship in advance. In simulations, we demonstrate the usefulness of the proposed method by using some example problems.

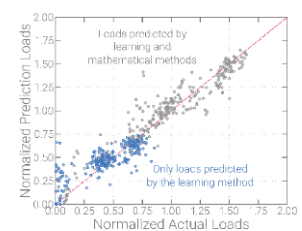


OS12-4 Machine Learning Approach to Predict Cooling Load for Existing Buildings

Makoto Ohara¹, Hideo Isozaki²

(¹International Professional University of Technology in Osaka, Japan) (²Kobe University, Japan)

The objective of this study is to predict air conditioning loads for existing buildings using operational data, weather forecasts and visitor forecasts. The proposed prediction method is based on a neural network approach. However, it is important to note that the proposed method does not learn the entire loads. Loads are divided into factors which can be predicted by traditional thermodynamics and factors which are subject to machine learning. The proposed method has been applied to an example instance using operational data from an underground mall in Kobe, and its validity has been confirmed. This result could potentially lead to more efficient use of energy in buildings.



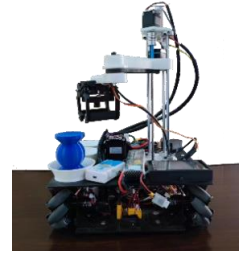
OS13 Robot Control (10)

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

OS13-1 Intelligent Logistics Handling Robot: Design, Control, and Recognition

Yanchao Bi, Jiale Cheng, Limei Wang, Yizhun Peng (Tianjin University of Science and Technology, China)

This study aims to investigate various aspects of intelligent logistics handling robots, including mechanical design, automatic control, and image recognition. With the continuous development of the logistics industry and advancements in automation technology, intelligent logistics handling robots play a crucial role in improving logistics efficiency and reducing costs. Leveraging existing technologies, we have designed and developed an omnidirectional mobile intelligent logistics handling robot equipped with a SCARA-type robotic arm. The robot integrates functions such as task acquisition, global positioning, material detection, warehouse identification, material handling, and stacking, achieving a fully automated and streamlined logistics handling process.



OS13-2 Greenhouse Design Using Visual Recognition and IoT Technology

Yuntian Xia, Yizhun Peng (Tianjin University of Science and Technology, China)

This device is to solve the traditional pesticide spraying method on the human body has a greater impact and other issues, through the STM32-based visualisation of the intelligent greenhouse to achieve automatic spraying of pesticides and remote monitoring and other functions, the establishment of a visualisation of the intelligent greenhouse monitoring platform. This equipment through the MQTT protocol, not only through the Internet of Things platform real-time monitoring of crop growth status in the greenhouse, but also through the platform to determine whether to spray pesticides, data transmission, so as to use the cross slide to control the position of the nozzle, and then through the visual recognition algorithms to improve the accuracy of the visual recognition part of the accuracy of the spraying of plants affected by insect pests, the realization of the digital intelligent greenhouse.



OS13-3 Design of Modular Photovoltaic Environmentally Friendly Portable Stroller

Suqing Duan, Yizhun Peng (Tianjin University of Science and Technology, China)

The work is centered on ROS and integrates speech recognition and natural language processing modules to enhance the environmental awareness of the stroller and monitor the baby's condition to ensure a timely and appropriate response. The Raspberry Pi is the main control unit of the stroller and connects to a cloud-based IoT platform via the MQTT protocol. The platform facilitates seamless communication between the Raspberry Pi and cloud data for efficient data visualization on mobile devices. This innovative solution solves the challenge of balancing parental responsibilities with career advancement, promoting healthier and happier babies while allowing parents to maintain a harmonious work-life balance.



OS13-4 "Teenage Mutant Ninja Turtles" - Design of a Bionic Quadrupedal Rescue Robot

Hongpi Zhao, Yingfan Zhu, Zhihan Zhao, Xin Liang, Lei Lv, Yizhun Peng
(Tianjin University of Science and Technology, China)

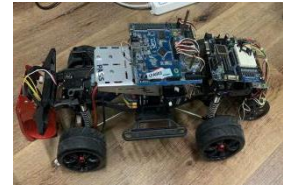
"Teenage Mutant Ninja Turtles - Bionic Quadrupedal Rescue Robot is a quadrupedal robot based on the principle of bionics, inspired by the quadrupedal animals in nature. The robot has rescue and life detection capabilities and can perform rescue operations at disaster sites. The design of the robot enables it to operate efficiently and stably in complex environments, and at the same time it has the qualities of bravery and toughness, which are in line with the image of the Teenage Mutant Ninja Turtles. The robot can be used in a wide range of application scenarios, such as earthquake, fire and other disasters, to provide more efficient and safer support for rescue work.



OS13-5 Design of Grass Lattice Planter for Complex Environment Based on Adaptive Suspension Technology

Shaokai Tian, Wenqi Fu, Yizhun Peng (Tianjin University of Science and Technology, China)

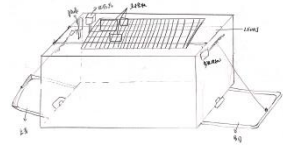
The Complex environmental grass grid growers based on adaptive suspension adopted the high-performance stm32 as the master chip, and use the Bluetooth communication module, so that users can easily control the vehicle driving, feeding and the posture of the pressing wheel through the mobile phone application. In addition, we have introduced new mechanical structures such as adaptive suspension to ensure effective planting of grass squares in complex terrain such as sloping land. Our vehicle uses a Mecanum wheel motion system to squeeze seeds by rotating the friction wheels at high speed.



OS13-6 Design of Intelligent Ecological Multifunctional Plant and Animal Breeding System

Suqing Duan, Yuntian Xia, Siyi Wang, Yizhun Peng (Tianjin University of Science and Technology, China)

The intelligent ecological multi-functional system for animal and plant cultivation integrates PLC and MCU automatic control technology. This innovative approach amalgamates aquaculture with horticulture, fostering a symbiotic environment for the breeding of animals and plants. The system's operations are categorized into four key components: mechanical structure, environmental perception, automatic control, and intelligent networking. Its comprehensive functionality encompasses plant monitoring, self-checking of temperature and humidity, group control for fertilizer replenishment, consistent temperature regulation, full-spectrum illumination, advanced filtration, fogging supplementation, versatile water management, fertilizer blending, and water purification through sterilization.



OS13-7 Design of a Fully Automated Logistics Handling Platform

Hongpi Zhao, Jianfeng Qin, Yizhun Peng (Tianjin University of Science and Technology, China)

With the progress of science and technology and the development of society, the world's countries on industrial production efficiency, intelligent manufacturing transformation continues to grow. Therefore, we designed a fully automatic logistics handling platform, which is a multi-modular device based on mechanical design, microcontroller control, visual positioning, the device can realize autonomous identification, autonomous transportation, improve production efficiency, the device has a wide range of applications, can be applied to food packaging, parts processing, intelligent manufacturing and other automation scenarios.



OS13-8 Design and Application of AI-based Brush Calligraphy and Painting Robot

Haibo Li, Yizhe Sun, Shuxin Wang, Yizhun Peng (Tianjin University of Science and Technology, China)

With the rapid development of digital technology and artificial intelligence, the innovation and exploration of traditional painting forms in the field of digital art have become increasingly captivating. The main focus of this research is to create a brush calligraphy and painting robot system based on PLT files. It digitizes user creative instructions to autonomously generate brush calligraphy and landscape paintings. This technology not only advances the deep integration of digital art and traditional culture but also opens up new perspectives and vast possibilities for artistic creation.



OS13-9 Intelligent Wheelchair System: Non-contact Heart Rate and Body Temperature Measurement

Dongpo Ma, Junsheng Zhang, Yizhun Peng (Tianjin University of Science and Technology, China)

With the continuous development of society and human civilization, people, especially the disabled and the elderly, need more and more to use modern high technology to improve their lives and improve the comfort of life. Therefore, this paper introduces a single-chip microcomputer-based non-contact body temperature and facial recognition-based heart rate measurement method and applies it to the intelligent wheelchair system. Monitor the vital signs of the elderly, and give early warnings in time when abnormal values occur, so that family members or caregivers can rescue them in time.



OS13-10 Recognition and Localization Method for Automotive Axle Holes in Assembly Robots

Junsheng Zhang, Dongpo Ma, Yizhun Peng (Tianjin University of Science and Technology, China)

During the production of automotive axle holes, the roundness error at the pipe opening leads to low detection efficiency due to manual measurements, rendering real-time inspection unfeasible. This paper proposes a method for detecting and sorting the roundness of automotive axle holes based on visual inspection. Ensuring accuracy in grasping, it establishes the kinematic model of the robot Aubo_I5. Targeting automotive axle holes for grasping, it employs adaptive threshold segmentation to highlight the section features of the axle hole. The Canny algorithm is then used to extract edge information, and finally, the least squares method is utilized to detect roundness errors for sorting the axle holes based on this error.



OS14 Robotic Manipulation (3)

Chair Kensuke Harada (Osaka University, Japan)

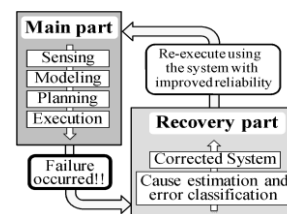
Co-Chair Akira Nakamura (Saitama Institute of Technology, Japan)

Co-Chair Tokuo Tsuji (Kanazawa University, Japan)

OS14-1 Evaluation Standard of Error Recovery Planning Focused on Revival Process from Failures in Robotic Manufacturing Plants

Akira Nakamura¹, Kensuke Harada² (¹Saitama Institute of Technology, Japan) (²Osaka University, Japan)

In recent years, many intelligent robots have been used in various fields. In many cases, these robots need to be able to perform not only repetitive tasks but also non-routine tasks. As work errors are more likely to occur in such situations, we have proposed several methods for error recovery. Our method uses both forward recovery and backward recovery to restore work. The former is a recovery method that is often used for minor modifications, and the latter is the recovery from relatively large failures that we mainly use. This paper proposes a method for selecting the best path from several possible recovery paths using a new evaluation method.



OS14-2 Robotic Food Handling Utilizing Temperature Dependent Variable-Stiffness Material

Rozilyn Marco¹, Prashant Kumar², Xinyi Zhang², Weiwei Wan², Kensuke Harada²

(¹ University of Toronto, Canada) (² Osaka University, Japan)

This paper presents a robotic gripper that addresses challenges of automated robotic food handling. Depending on the food material, the robotic gripper should adjust its finger compliance. To cope with this problem, we apply the approach on using a variable stiffness fabric on the finger surfaces of the gripper, where the finger stiffness changes depending on its temperature. This gripper design was validated empirically through force and object-grasping experiments. By using the gripper, hard objects can be grasped with the hard mode of the finger while a fragile object can be safely grasped with the soft mode.



OS14-3 Vegetable maturity evaluation for harvest robots

Reno Muhammad Fadilla, Tokuo Tsuji, Tatsuhiro Hiramitsu, Hiroaki Seki (Kanazawa University, Japan)

We propose a method for detecting vegetables in an image and classifying their maturity by color. Vegetable images are classified according to their maturity and used as training data. We represent the images in different color systems and investigate the accuracy of the classification of maturity. The proposed method can be applied to harvesting robots.



OS15 Artificial Intelligence for Embedded Systems and Robotics (6)

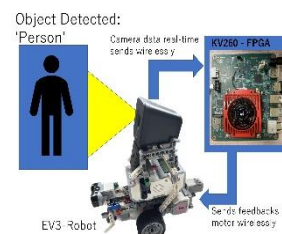
Chair Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

Co-Chair Yuma Yoshimoto (National Institute of Technology, Kitakyushu College, Japan)

OS15-1 YOLO real-time object detection on EV3-Robot using FPGA hardware Accelerator

Dinda Pramanta¹, Ninnart Fuengfusin², Arie Rachmad Syulistyo², Hakaru Tamukoh²
(¹Kyushu Institute of Information Sciences, Japan) (²Kyushu Institute of Technology, Japan)

The growing demand for robots necessitates faster and more precise processing. However, running large Artificial Intelligence (AI) models from cloud data centers to mobile robots via inference models uses considerable computation resources, which leads to power limitations, particularly for mobile robots. The use of reconfigurable semiconductor devices at the hardware level is a promising solution to this problem. We introduce the educational kit EV3-Robot with a co-design methodology utilizing Field-programmable Gate Arrays (FPGA) Kria KV260 as a hardware accelerator specifically for object detection. We apply the You Only Look Once (YOLO) model for object detection, which provides real-time results for practical applications. Additionally, we analyze the processing times of the local PC and EV3-Robot.



OS15-2 A Low Computational Cost Hand Waving Action Recognition System with Echo State Network for Home Service Robots

Hiromasa Yamaguchi, Akinobu Mizutani, Arie Rachmad Syulistyo, Yuichiro Tanaka, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

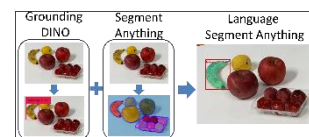
This study proposes a low computational cost hand-waving action recognition system for non-verbal communication in home service robots. The system is based on an echo state network, which requires lower computational costs than that of deep neural networks (DNNs), and processes time-series data of skeletal coordinates of humans to recognize hand-waving actions. Additionally, this study proposes and compares two types of preprocessing methods of the skeletal coordinates to ensure the robustness of the human positions on the screen: one method extracts elbow and arm angles, which are invariable regardless of the humans' positions and the other normalizes the skeletal coordinates. The experimental result shows that the proposed system has competitive accuracy and is faster than DNN-based methods and robust to varying human positions.



OS15-3 A Rapidly Adjustable Object Recognition System through Language Based Prompt Engineering

Naoki Yamaguchi, Tomoya Shiba, Kosei Isomoto, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

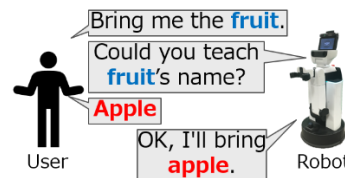
We propose the use of language-based prompt engineering to achieve rapidly adjustable object recognition in RoboCup@Home. The proposed prompt engineering involves humans adding features, such as the color and material of an object, into the text prompts inputted into Language Segment Anything. In this research, we evaluated the effectiveness of our proposed method in three benchmark tests for object recognition at RoboCup@Home held in France in 2023. The results showed that the highest scores were obtained in certain tasks, indicating that it could be applied to a range of recognition tasks.



OS15-4 Development of a SayCan-based task planning system capable of handling abstract nouns

Kosei Yamao¹, Daiju Kanaoka, Kosei Isomoto, Akinobu Mizutani, Yuichiro Tanaka, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

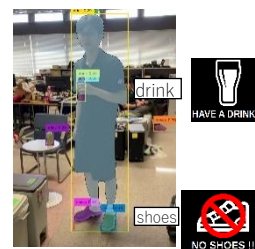
The task planning system is required to accomplish various requests from a human in real-world environments. SayCan, one of the task planning systems, has high accuracy. However, its accuracy decreases for requests that include abstract nouns of the ambiguous word/phrase, and the inference time increases as the number of skills increases. We propose a novel task planning system based on SayCan that introduces a function for listening back to abstract nouns and a rule-based skill extraction, enhancing accuracy and reducing inference time. The proposed system facilitates the interpretation of requests and enables appropriate task planning with low inference time. The effectiveness of the proposed system was demonstrated at RoboCup@Home, where it achieved high performance.



OS15-5 RoboCup@Home 2023: Stickler for the Rules Task Solutions

Tomoya Shiba, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

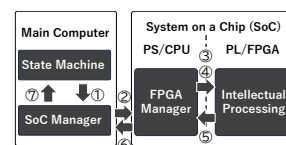
This paper proposes an approach where home service robots use only two recognition models that can be capable of prompt tuning to detect rule violations in the home. The robots are increasingly required to perform more advanced and complex perceptions beyond their traditional roles such as cleaning. Advanced tasks such as serving and security, for example, usually require multiple AI systems, including person detection, object detection and more. Our approach simplifies this by leveraging the combined capabilities of Grounding DINO and SAM to detect rule violations effectively. The success of our method was proven at RoboCup@Home 2023, where it secured the highest score among all participating teams.



OS15-6 Offloading Intellectual Processing from Home Service Robots to Edge Devices

Yuma Yoshimoto, Mizuki Kawashima, Shun Yonehara (National Institute of Technology, Kitakyushu College, Japan)

In this study, we focus on extending the operational time of home service robots by offloading intellectual processing to circuit devices such as Field Programmable Gate Arrays (FPGAs), which in turn reduces power consumption. The core of our approach involves developing a method for implementing intellectual processing on FPGAs, coupled with a dynamic circuit reconfiguration technique. This enables the FPGA to adaptively respond to frequent task changes. We present: (a) methods for transitioning circuits from a robot's control computer to FPGA in response to varying tasks, and (b) an evaluation of the effectiveness of using FPGA to extend operational time under these rapidly changing task conditions.



OS16 Industrial Artificial Intelligence Robotics (4)

Chair Eiji Hayashi (Kyushu Institute of Technology, Japan)

OS16-1 A Research on Performance Information Editing Support System for Automatic Piano

Yoshiki Hori, Eiji Hayashi (Kyushu Institute of Technology, Japan)

In 1996, Hayashi et al. from our laboratory developed an automatic piano playing device that requires data with nuances for each note to perform in a human-like piano playing. However, this device lacks the function to infer such nuanced data. Therefore, prior research focused on developing a system to infer data with nuances for each note. Yet, this system required manual inference, consuming a significant amount of time. In this study, we have constructed a system capable of automatically performing inference using deep learning. This system not only improves the accuracy of piano playing inference but also contributes to the efficiency of the inference process.



OS16-2 Development of Autonomous Mobile Field Robots – Accuracy Verification of Self-Localization through Simulation -

Takamasa Hayashi¹, Shintaro Ogawa¹, Yuto Okawachi¹, Tan Chi Jie¹, Janthori Titan¹, Ayumu Tominaga², Eiji Hayashi¹, Satoko Seino³

(¹Kyushu Institute of Technology, Japan) (²National Institute of Technology (Kitakyushu College), Japan), (³Kyushu University, Japan)

In recent years, the increase in marine debris has become a significant challenge in terms of its collection. Coastal debris, a type of marine debris, can be collected by human hands, but the variety in shapes, types, and sizes presents limitations to human-only collection efforts. To address this, I focused on developing an autonomous mobile robot, establishing a simulation environment was considered crucial for facilitating smooth progress. This paper focuses on self-localization, an essential aspect for autonomous movement. We replicated an actual coastal cleaning site within the simulation environment and evaluated the accuracy of self-localization using an EKF (Extended Kalman Filter) with multiple sensors.



OS16-3 Development of AR System for Grasping String Foods on Introduction of Industrial Robot

Yoshihiro Koyama, Eiji Hayashi (Kyushu Institute of Technology, Japan), Akira Kawaguchi (The City College of New York of The City University of New York, United States of America)

In recent years, the food service industry has been facing a labor shortage. However, the introduction of industrial robots is not easy due to the high cost of equipment and system integration. Therefore, we are developing an Augmented Reality (AR) application for the purpose of introducing robots to small and medium-sized companies. By using this application to perform tasks necessary for introducing robots, such as teaching, cost reductions can be expected when introducing industrial robots. In a previous study, an AR-based grasping and serving simulation system was developed for solidified foods such as fried chicken and rice balls. In this study, we focused on string-shaped food items such as spaghetti, and attempted to develop an AR system for grasping and serving a string-shaped object by controlling a gripper.

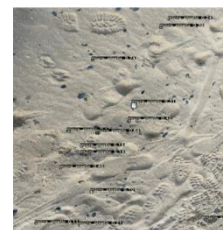


OS16-4 An Image Analysis of Coastal Debris Detection -Detection of microplastics using deep learning

Yuto Okawachi¹, Ayumu Tominaga², Shintaro Ogawa¹, Takamasa Hayashi¹, Tan Chi Jie¹, Janthori Titan¹, Eiji Hayashi¹, Satoko Seino³

(¹Kyushu Institute of Technology, Japan) (²National Institute of Technology (Kitakyushu College), Japan) (³Kyushu University, Japan)

To address the issue of litter drifting ashore, this study developed a deep learning-based microplastic detection system. The system employed yolov7 as its deep learning network, complemented by SAHI (Slicing Aided Hyper Inference) as an additional vision library. yolov7 is renowned for its efficacy in real-time object detection. Our experimental framework involved four tests, utilizing two variations of yolov7 - the standard model and yolov7-e6e - in conjunction with SAHI. The effectiveness of each test was quantified using metrics such as Intersection over Union (IoU), Precision, Recall, F-measure, and Detection Time in seconds. For our dataset, we gathered images from actual cleanup locations, such as Hokuto Mizukumi Park. The model's discriminator underwent 700 training iterations, with a learning rate set at 0.001.



OS17 Electronics and Kansei Engineering Based on ETT theory (5)

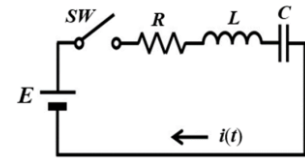
Chair: Tetsuo Hattori (Kagawa University, Hiroshima Institute of Technology, Japan)

Co-Chair: Yusuke Kawakami (NIT (Kagawa College), Japan)

OS17-1 A High-Speed Estimation Method of Parameters in Impulse Response

Toshiki Tanaka, Ivan Tanev (Doshisha University, Japan), Tetsuo Hattori (Kagawa University, Japan)

This paper proposes a high-speed parameters estimation method for compartment model where output function is described by the convolution between input function and impulse response, which is like a time-invariant linear system. The proposed method uses linear regression analysis based on equations that can be obtained from the differentiation of convolution (DOC). In this paper, taking the parameters estimation problem of PET (Positron Emission Tomography) inspection system and RLC series electrical circuit for examples, we show that the method can estimate parameters in those impulse responses.

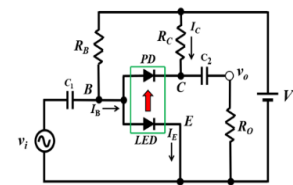


OS17-2 A Consideration on Amplification Function in BJT Evers-Moll Model and PTT (I)

---- V-I Characteristics ----

Shimon Hattori, Osamu Matoba (Kobe University, Japan), Tetsuo Hattori (Kagawa University, Japan), Toshiki Tanaka (Kinkei System, Japan), Yusuke Kawakami (NIT (Kagawa College), Japan)

In 1989, the notion of PTT (Photon Transport Transistor) has been proposed by B.J. Van Zeghbroeck et al., at IBM Research Center at that time. PTT is an optical coupling device of light emitting diode (LED) or laser diode and light receiving diode (Photo Diode, PD) where the carrier of the base layer is light (Photon) only. Later in 1996, W. N. Cheung and Paul J. Edwards have shown that PTT can be a very low noise amplifier in a positive feedback circuit, based on theoretical calculations of the noise figure. In this paper we consider the amplification principle showing the VI characteristics of the PTT and bipolar junction transistor (BJT).

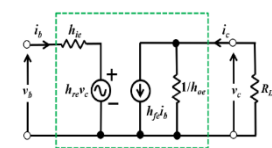


OS17-3 A Consideration on Amplification Function in BJT Evers-Moll Model and PTT (II)

---- H Parameters in the Small Signal Amplifier Circuit----

Shimon Hattori, Osamu Matoba (Kobe University, Japan), Tetsuo Hattori (Kagawa University, Japan), Toshiki Tanaka (Kinkei System, Japan), Yusuke Kawakami (NIT (Kagawa College), Japan)

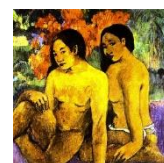
The notion of PTT (Photon Transport Transistor) has been proposed in 1989 as an optical coupling device of light emitting diode (LED) or laser diode and light receiving diode (Photo Diode, PD), where the carrier of the base layer is light (Photon) only. In this paper we consider the amplification principle of the PTT and BJT (bipolar junction transistor), by illustrating those h parameters of equivalent small signal amplifier circuit. Moreover, this paper also discusses the similarities and differences between PTT and BJT, based on the derived h parameters.



OS17-4 Color Image Arrangement Using Histogram Matching

Yusuke Kawakami (NIT (Kagawa College), Japan), Tetsuo Hattori (Kagawa University, Japan), R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan (R.O.C.))

For the arrangement processing of image using its histogram, we previously have presented a Histogram Matching method based on Gaussian Distribution (HMGD). However, in the case where the brightness histogram of input image has multiple peaks, the HMGD processing does not always bring good results. In this paper, we present an improved histogram matching method using the reference histogram that is made by appropriate moving average processing over the histogram of input image. Also in this paper, we show the experimental results.



OS17-5 Methodology for Creativity Oriented STEM Education Based on ETT Theory

Tetsuo Hattori, Toshihiro Hayashi, Mai Hattori, Yoshiro Imai (Kagawa University, Japan), Asako Ohno (Osaka Sangyo University, Japan), Takeshi Tanaka (Hiroshima Institute of Technology, Japan)

Recently, the necessity of integrated and comprehensive methodology for STEM (Science, Technology, Engineering and Mathematics) education is growing. In this paper, we propose an educational methodology utilizing the viewpoint of Equivalent Transformation Thinking (ETT) theory which has been proposed by Dr. Kikuya Ichikawa in 1955 as a principle of creativity. Especially, we show that the viewpoint is very useful not only for new technology invention but also for STEM Education in the sense that it deepens insights of the contents to be learned, motivates students to study further, and inspires their creativity.



OS18 Computer and Information Engineering (12)

Chair Norrima Mokhtar (University of Malaya, Malaysia)

Co-Chair Heshalini Rajagopal (UCSI University, Malaysia)

OS18-1 Efficient Campus Shuttle Tracking and Management Mobile Application for College Campus

Andrea Tantay Gonzales¹, Kavitha Thamadharan¹, Neesha Jothi²
(¹ INTI International College Penang, Malaysia) (²UCSI University, Malaysia)

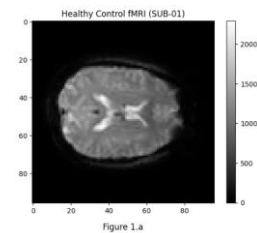
Shuttle Stalk, a Real-Time Campus Shuttle Booking and Tracking System was a proposed solution which enables the students to register for the shuttle service through the mobile application, reducing the administrative burden and to track its current location in real-time, allowing them to plan their journeys more effectively. The application developed serves as a comprehensive solution for both students and administrators, providing real-time shuttle tracking and streamlined management capabilities.



OS18-2 GCN Analysis of Task-Based fMRI Data for Diagnosis of Schizophrenia

Tejaswini Thota¹, Reuben Stephen John¹, Dr R Dhanush¹, Dr Amutha S¹
(¹Vellore Institute of Technology, India)

This study focuses on schizophrenia, characterized by distorted reality and delusions. We propose utilizing a Graph Convolutional Network (GCN) model on a task-based fMRI data to differentiate schizophrenia instances, with and without auditory hallucinations, utilizing healthy participants for comparison. Various node embedding algorithms are compared to extract structural properties, and statistical features for differentiation. The study focuses on identifying specific auditory stimuli that significantly differentiate individuals. Model validation deploys k-fold stratified crossvalidation, with evaluation metrics, including accuracy, precision, recall, F1 macro, and MCC guide the assessment of the GCN model.



OS18-3 AR-Based Application for Campus Navigation

Renuka Devi Rajagopal¹, Akshay S¹, Manoj Rathinam¹, Shakthi B¹, Heshalini Rajagopal²
(¹Vellore Institute of Technology, India) (²UCSI University, Malaysia)

The "Campus Navigator" is an innovative augmented reality (AR) application designed for seamless campus navigation. It combines geolocation technology, QR code recognition, and predefined geospatial anchors to transition users from outdoor to indoor spaces. Augmented reality overlays provide real-time wayfinding guidance, eliminating the need for traditional maps. The user-centric design and user feedback integration enhance accessibility and user satisfaction. Real-world testing demonstrates promising performance, accuracy, and user engagement. The Campus Navigator transforms campus navigation, with potential for broader applications.



OS18-4 Development of Robotic Assistant for Health Care Sector with A Special Focus to Aid the Geriatric Patients

Narayanan Ganesh (Vellore Institute of Technology, India)

Human manual efforts in their day-to-day tasks are reduced by robotic helpers. This paper analyzes the robot created to assist the aged people. The created robot can be controlled by voice commands with its own inbuilt microphone to pick up human speech orders. This robot can do a variety of movements, turns, grab operations, move an object from one location to another. Personal assistant robot is built using Microcontrollers. The results reveal that the developed robot will be one of the best companions for the geriatric patients and will be an alternate solution will make a new mark in the health care sector.



OS18-5 Development of a Desktop Application Restaurant Management System

Gabriela Maria Ancilla, Heshalini Rajagopa, Ismail Ahmed Al-Qasem Al-Hadi (UCSI University, Malaysia)

The number of restaurants has grown rapidly around the world, the awareness of managing it efficiently has increased. This necessity yields the idea to invent a restaurant management system (RMS). This RMS will bring several benefits such as greater management of a restaurant, reduced resources cost, raise profit, and time-saving by allowing the admin to manage the restaurant easily through the functionality provided in the system. The provided features include adding, updating, and deleting information, stock calculation and auto re-order stock items, ingredients management, and finance calculation.



OS18-6 Face Recognition based on Attendance System

Koh Pei Cong¹, Heshalini Rajagopal¹, Ghassan Saleh¹, Norrima Mokhtar²
(¹UCSI University, Malaysia) (²University of Malaya, Malaysia)

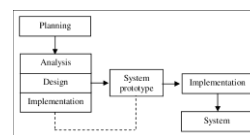
The use of face recognition technology for attendance tracking has grown popular in recent years. Hence, the main goal of this project is to produce an accurate, fast, and robust face recognition based on an attendance system. The system detects the user's unique features, understand the identity of the user through face recognition technology, and thus records the attendance from the face recognition dataset to the user that matches the user, in an attempt to help the user automatically check in with real-time attendance date. The system includes features such as face detection, face recognition, distance estimation, and attendance recording.



OS18-7 U-Reserve: Development of a Facility Reservation System for UCSI University

Esther Chong Jun Lynn¹, Neesha Jothi¹, Ismail Ahmed¹ (¹UCSI University, Malaysia)

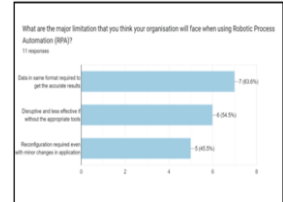
In today's technology-driven era, there is a growing emphasis on efficient and convenient methods to enhance user satisfaction. UCSI University, Kuala Lumpur, currently employs a manual facility reservation system that requires in-person or email submissions. This outdated approach often results in double booking and underutilization of resources. Therefore, this project aims to develop a web-based facility reservation system named U-Reserve. This system is developed by HTML, CSS, JS, JSP, Servlet, and MySQL, focusing on colour tone and font type. These considerations are vital in providing an improved user experience. With U-Reserve, not only the reservation requests and cancellations being streamlined, but informed decisions regarding facility management can also be made by a data-driven dashboard.



OS18-8 The Smart Document Processing with Artificial Intelligence

Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K², Glaret Shirley Sinnappan³
 (1UCSI University, Malaysia) (2University Utara Malaysia, Malaysia)
 (3Tunku Abdul Rahman University, Malaysia)

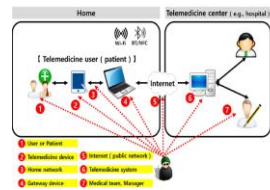
This study focuses on the challenges and potential for Intelligent Document Processing (IDP) with Artificial Intelligence (AI) to manage unstructured data. A large amount of data in many different forms, such as information from the IoT, cybersecurity and more are produced during this modern Digital Age which has been widely distributed through a wide range of unformatted formats. IDP utilizes AI technologies like Machine Learning (ML), Natural Language Processing (NLP), and Computer Vision (CV), with the aim of converting unstructured data into structured, usable information. The IDP, are explored in the findings and discussion section that emphasizes its capability to automatically perform redundant tasks, reduce operating costs as well as improve employee productivity.



OS18-9 Digital Security Challenges Faced by Business Organizations

Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K², Glaret Shirley Sinnappan³
 (1UCSI University, Malaysia) (2University Utara Malaysia, Malaysia)
 (3Tunku Abdul Rahman University, Malaysia)

Over the decades, the forms of cyber-attacks have evolved from disruption level, cybercriminal, followed by cyber espionage and lastly threatening level. Digital security has played a significant role in protecting enterprises from any form of cyber-attacks, especially in today’s era of digitalization. Aligning with the global effort in emerging the concept of Industrial Revolution 4.0 (IR4.0) in organizations, where sensitive data and confidential information can be accessed at a fingertip of an employee. This paper discusses the difficulties of implementing digital security solutions in an enterprise in terms of external potential cyber threats, internal cyber security roadblocks within the organization and how Covid-19 pandemic imposed challenges towards cyber security in the organizations.



OS18-10 The Study on Perception on E-Waste Among the People

Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K²
 (1UCSI University, Malaysia) (2Utara Malaysia, Malaysia)

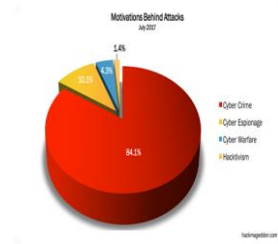
E-waste is piling up at an alarming rate, which results in our environment's pollution, while only a few are being disposed of correctly. This research aims to discover people's awareness of e-waste and how to handle it. An online survey was done among 75 respondents, who were asked about their general knowledge of e-waste. Most respondents are aware of the effects of e-waste but lack knowledge on how to tackle them, including questions concerning e-waste management and its causes. In conclusion, the general public must be educated on e-waste to reduce and dispose of e-waste efficiently and effectively.



OS18-11 Emergence of Cybercrimes in Online Social Networks

Raenu Kolandaisamy¹, Heshalini Rajagopal¹, Indraah K²
(¹UCSI University, Malaysia) (²University Utara Malaysia, Malaysia)

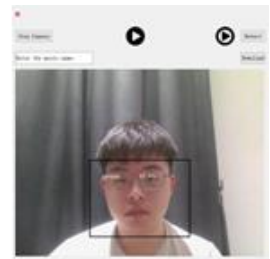
The rise of social networking websites has been seen in recent years. Everyone will be spending most of their time on social networking websites such as Facebook, Instagram and Whatsapp. The great advantage that this social networking website offers benefited many of the users. It can help people to promote themselves or their business to gain more popularity and also customers through these social networking websites. There are many cybercrimes that can be identified which are identity theft, hacking, fraud and so on. The emergence of cybercrimes has created an awareness so that the users will know what the common attacks are and how they can be prevented from being lure and being a victim of this attack. This research will discuss about the attacks and how these attacks can be prevented by the users.



OS18-12 Development of a music recommendation application by using facial emotion recognition

Shengke Xie, Raenu Kolandaisamy, Ghassan Saleh, Heshalini Rajagopal (UCSI University, Malaysia)

Music is an important part of human life and culture, and it can affect people's emotions and moods. However, choosing music from a large library can be a challenging and time-consuming task. In this paper, we propose a facial expression recognition-based music recommendation system that can recommend suitable music which matches the user's current mood. The system uses a camera to capture the user's face and a convolutional neural network model which trained facial emotion recognition database to recognize seven basic emotions: anger, disgust, fear, happiness, sadness, surprise and neutral. The paper contributes to the research of facial emotion recognition and music recommendation and provides a convenient way for people to enjoy music.



OS19 Natural Computing (3)

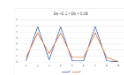
Chair Marion Oswald (Vienna University of Technology, Austria)

Co-Chair Yasuhiro Suzuki (Nagoya University, Japan)

OS19 -1 A Model of Reaction-diffusion phenomena with Multiset Processing

Yasuhiro Suzuki (Nagoya University Japan)

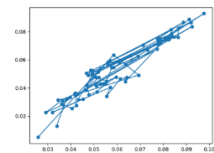
We propose a model of reaction-diffusion phenomena using Abstract Rewriting System on Multisets ARMS, which is a model of Multiset Processing. Although proposed model is simple, computer simulations confirm that the Turing pattern is generated.



OS19-2 Extract tactile qualities from time series data

Yasuhiro Suzuki (Nagoya University, Japan)

We proposed the Tactile Score to describe time-varying tactile sensation by the time variation of vertical force. Tactile quality is essential in hardness/softness, roughness, and temperature. Hardness and softness can be extracted from the shape of the Tactile Score. Roughness can be extracted from the pattern of hardness and softness. The arbitrary time series data can be interpreted as a tactile score by considering the time variation of the vertical force, and the hardness and softness are extracted from the time series data interpreted as the tactile score. This method can extract different features from conventional data science methods.



OS19-3 Healthcare applications of vibrotactile stimulation developed by Tactile Score

Yasuhiro Suzuki, Rie Taniguchi (Nagoya University, Japan)

We constructed a system to convert the tactile score into vibratory tactile sensation. We conduct basic biological experiments on electronic tactile stimuli and apply the results to medical and healthcare applications. We use two types of electronic tactile stimuli. One is direct vibrating tactile stimulation, and the other is airborne vibrating tactile stimulation. Verification experiments of this system have confirmed cosmetic effects such as skin collagen aggregation, improvement of hypertension and diabetes, and reduction of pain and nerve paralysis. In addition, a clinical study was conducted in which patients with dementia were exposed to vibrotactile sensation (low-frequency sound) via air vibration and an improvement in cognitive function was confirmed.



OS20 Advances in Field Robotics and Their Applications (15)

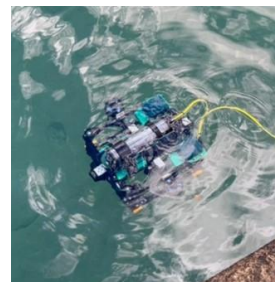
Chair Kazuo Ishii (Kyushu Institute of Technology)

Co-Chair Keisuke Watanabe (Tokai University)

OS20-1 Image Collection Experiments of a Handy AUV for Offshore Structure Inspection

Keisuke Watanabe, Koki Amano, Shingen Urano, Yasutaka Taniguchi, Konosuke Watanabe (Tokai University, Japan)

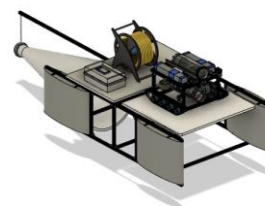
In recent years, in Japan, with the decline in the working population, there has been a noticeable shortage of labor at construction sites and offshore operations. On the other hand, with the aim of realizing a GX society, it is expected that offshore wind power generation platforms will rapidly increase and be deployed offshore. Since it is not easy to access offshore platforms, it is necessary to automate equipment inspection work, and it is expected that the use of AUVs will be particularly desirable for underwater inspection work. The most basic inspection work is assumed to be to collect images of underwater structures. Therefore, in this study, we created an AUV and conducted an image collection experiment using a pier owned by our university as an example to confirm its functionality.



OS20-2 Design of Disassembly-reassembly Type USV for Coral Reef Research

Keisuke Watanabe, Koki Amano, Gaku Minato, Yasutaka Taniguchi, Konosuke Watanabe (Tokai University, Japan)

Researchers are conducting physical surveys by diving and swimming to study the effects of microplastics and global warming on coral reefs. The area, time, and water depth that can be investigated by diving are extremely limited. In addition, to collect microplastics, it is necessary to tow the nets, but chartering a ship is expensive. Therefore, the authors are developing a system that simultaneously operates a USV and a UUV to simultaneously observe the sea surface and underwater. In this paper, we conducted a conceptual design, carried out fluid force measurements, trajectory tracking experiments, and image recognition using AI, with the aim of realizing a lightweight USV that can be divided during transportation to coral reef areas and reassembled on site for operation.



OS20-3 Optimization method to improve visual SLAM in dynamic environment

Yufei Liu, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Aiming at the problem that the robustness of the classic visual SLAM system is greatly affected by dynamic feature points in the environment, a method of eliminating dynamic feature points using a target detection algorithm is proposed. Use the target detection algorithm YOLOv5 to identify and classify the collected feature points. Then remove the extracted dynamic feature points, use the remaining static feature points for map construction and positioning, and finally test on the TUM data set. The results show that this algorithm effectively improves the positioning accuracy and robustness of the visual SLAM system.



OS20-4 Design of flexible mechanism for flexible manipulator

Huang Jiawei, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Based on the study of the kinematic limitations of the rigid manipulator structure and the characteristics of the existing flexible manipulator in different categories, this paper proposes a structure assumption of flexible manipulator based on the advantages of high load of rigid joint and high flexibility of flexible manipulator. This paper designed a flexible manipulator structure driven by wires. Using the forward kinematics analysis the sport model of the structure. The motion range of the end of the manipulator arm and the length changes of the wires were simulated with the movement of the model.



OS20-5 Driver Drowsiness Detection Method based on Deep Learning

Shi Puwei, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Drowsiness driving will pose a serious threat to the lives of drivers and others. Determining the state of the driver through face recognition has the advantages of low cost and convenience. Therefore, this study deploys the face recognition model to the mobile phone, and finally realizes the recognition of the driver's Drowsiness by the front camera of the mobile phone. The whole research is divided into three parts. The first part is to train the face 68-keypoints recognition model based on the YOLO face algorithm. The second part is to deploy the trained model to the mobile phone using ONNX and NCNN. The third part is to calculate EAR and MAR using several facial key points, and finally complete the recognition of the driver's drowsiness state using EAR and MAR.

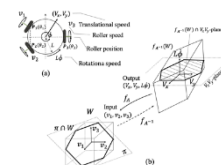


OS20-6 An Analysis of Translational Motion for a Mobile Robot with Line-Symmetric Rollers Arrangement

Kenji Kimura¹, Kazuo Ishii²

(¹National Institute of Technology, Matsue College, Japan) (²Kyushu Institute of Technology, Japan)

In fields such as logistics, robots are required to have efficient mobility. There are various types of rollers used in mobile robots. Among them, omni-rollers have excellent omnidirectional mobility and are easy to control. In this study, mechanism kinematics has been proposed that assumes arbitrary changes in the roller arrangement position on a circular mechanism and the roller arrangement has been evaluated from the viewpoint of speed efficiency. Furthermore, we aim to evaluate the mobility of mobile robots by focusing on their translational components. Moreover, we have examined the behavior of the area of the area generated by the end point of the robot velocity vector and evaluated the velocity efficiency.



OS20-7 Development of Teaching Materials for Robot Programming for Junior High School Students: Student-Based Educational Activities

Kenji Kimura, Youta Takano (National Institute of Technology, Matsue College, Japan)

With the extensive use of robots in recent years, an age of co-existence between humans and robots is expected to arrive in the future. Therefore, providing robot education in the early stages of elementary and junior high school is necessary to stimulate students' interest in robots. Furthermore, educational institutions are becoming more active in robot education as a part of their contribution to the local community. For elementary school students, a Beauto Racer (Vstone) has been adopted as a teaching material for robot education, and teaching materials have been developed for teaching line tracing. In this study, we will develop educational materials for junior high school students on maze exploration using a Beauto Rover (Vstone). The students of NIT, Matsue College took the initiative in this activity.

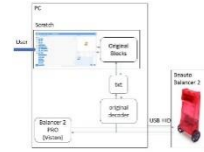


The purpose is to improve their teaching skills.

OS20-8 Design and Software Production of Robotics Educational Design for Elementary and Junior High School Student

Youta Takano, Kenji Kimura (National Institute of Technology, Matsue College, Japan)

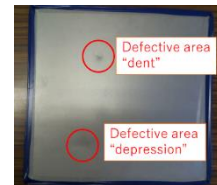
The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been promoting cross-curricular learning including STEAM education in its educational policy for 2021. The purpose of this study is to have students experience not only control engineering but also basic programming techniques, and to have them become interested in mathematical subjects in general, which are the basis for control engineering. The educational design and accompanying software were designed using Beauto Balancer2 (Viston) educational robot and Scratch, a visual programming editor developed by the Scratch Foundation. In addition, workshops were conducted and the lesson design was evaluated by a questionnaire.



OS20-9 Development of visual inspection system for low-reflective material utilizing of a string shadow

Keiji Kamei¹, Tomorou Kawahara¹, Yoshiyuki Daimaru²
(¹Nishinippon Institute of Technology, Japan) (²Nissan Motor Kyushu, Japan)

Visual inspection of products in manufacturing plant is usually conducted by workers. However, that inspection process by workers occasionally happen oversight due to careless check, so that automatic visual inspection system is needed from manufacturer. Products made of low-reflective material are difficult to inspect by light reflection because contours of defect areas are got blurred. To solve this problem, we propose to inspect products utilizing of a string shadow. Form our research, a string shadow was different between contours of defect area and its of non-defect. On the other hand, former research did not success to detect defect area due to determination algorithm for defect. In this paper, we apply linear approximation of a string shadow to defect detection. From the experimental results, we succeed in detecting defects.



OS20-10 Development of IoT-Based Remote Monitoring Module for Greenhouse Environment to Facilitate Crop Growth Data Analysis

Moeko Tominaga, Yasunori Takemura, Junya Era, Wataru Kaishita
(Nishinippon Institute of Technology, Japan)

Eiji Mizoe, Tomoyasu Furukawa (Kumamoto Fruit and Vegetable Shippers Association Co. Ltd., Japan)

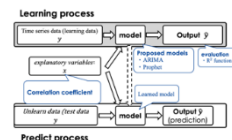
As the shortage of agricultural workforce becomes a concern, IoT proves effective in alleviating labor burdens. Monitoring, storing, and analyzing the growing environment, especially for new crops, is crucial for subsequent agricultural cycles. However, small farms often face challenges in data collection due to cost constraints, particularly with new crops. An agricultural IoT system was developed for small farmers, featuring a module for collecting, accumulating, and visualizing time-series data from sensors. To demonstrate feasibility, the IoT system was implemented and validated by intermittently monitoring banana and coffee growth parameters in a Kumamoto greenhouse over two years. Results confirmed that the proposed IoT remote monitoring module empowers farmers to monitor crop growth environments.



OS20-11 Development greenhouse environment prediction system using IoT data

Yasunori Takemura, Naoya Nishida, Moeko Tominga (Nishinippon Institute of Technology, Japan)
Eiji Mizoe, Tomoyasu Furukawa (Kumamoto Fruit and Vegetable Shippers Association Co. Ltd., Japan)

Currently, the decrease in the working population is a significant problem in agriculture in Japan. In addition, the prices of imported vegetables and fruits have been rising due to international trade problems such as the weak yen. This study has developed an environmental data storage system using IoT to assist the labor force and to understand the cultivation data of crops that have not been cultivated in Japan. Using this big data, we have constructed and evaluated a forecasting system. In this study, we focus on the domestic cultivation of bananas grown in the tropics as the subject to obtain data and make predictions. For learning, a system was constructed to infer the next day's temperature by time-series analysis, using as input data obtained from the IoT. In this paper, we report a comparison of two time series analysis algorithms.



OS20-12 The Development of SaaS for Quantifying the Amount of Drifted Debris on the Coast

Ayumu Tominaga, Ryohei Komori (National Institute of Technology Kitakyushu College, Japan)
Eiji Hayashi (Kyushu Institute of Technology, Japan)

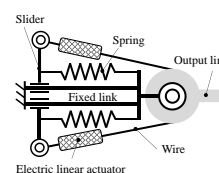
In the process of collecting drifted debris along a coastal area, it has been required to quantify the collection results. This study introduced a Software as a Service (SaaS) equipped with image processing capabilities for the detection and identification of debris in photographs. The SaaS was developed to facilitate the automated weighing of the collected debris. In the beach cleanup event in June 2023, 317 images capturing debris found during the coastal cleanup were gathered on a cloud server from 90 participants via this SaaS. These images were subsequently analyzed by object recognition AI executed on a cloud server, leading to the detection and identification of 954 instances of debris. This result represents the actual amount of debris collected during this cleanup event, and indicates that the achievements of the event were quantified via the SaaS.



OS20-13 Development of an antagonistic wire-driven joint mechanism capable of rapid motion and variable stiffness

Katsuaki Suzuki¹, Yuya Nishida², Kazuo Ishii²
(¹Kumamoto Industrial Research Institute, Japan, ²Kyushu Institute of Technology, Japan)

The advancement of digital transformation in manufacturing is expected to demand novel tasks for industrial machinery unlike before. When adding mechanisms or actuators to enhance machine functionality, concerns arise about potential system enlargement and increased complexity. The design concept of integrating multiple functions into mechanisms using a few actuators and components serves as one means to address these issues. We aim to elucidate the structural arrangement capable of achieving three functions, including normal motion, rapid motion, and variable stiffness, using two electric actuators. In this paper, we introduce a newly devised antagonistic wire-driven joint mechanism aimed at improving the variable stiffness function within the articulated mechanism we have developed, enabling three functionalities.



OS20-14 Gakken Hills Interdisciplinary Ekiden Competing with Humans, Animals, and Robots

Takuya Fujinaga¹, Moeko Tominaga², Daigo Katayama³, Kazuo Ishii³

(¹Fukuoka University, ²Nishinippon Institute of Technology, ³Kyushu Institute of Technology, Japan)

With the advancement of science and technology, the societal implementation of robots has been expected. In recent years, the number of robots existing in human living spaces has increased, and interaction between humans and robots has become an important issue. The purpose of this study is to propose a future society where humans, animals, and robots coexist. We organize relay races, or ekiden in Japanese, where they compete together as runners to discuss the future society. The competition rules have been established for this ekiden to ensure that each runner can compete fairly. For example, an advantage is given to the time of humans, animals, and robots, so that the results are the same. This paper explains the competition rules and reports the competition results of the 8th race held in 2023.



OS20-15 Development of a Low-Cost Underwater Robot for Research and Education

Takuya Fujinaga (Fukuoka University Japan)

Underwater robots are frequently utilized for underwater observation. When used as tools, commercially available underwater robots are sufficient. However, when utilized for research, development, or education, the required specifications vary based on the purpose, necessitating custom development. Generally, the development of underwater robots demands a significant amount of funds, posing a high barrier for research, development, and education. The aim of this study is to reduce these barriers, facilitating broader implementation of research, development, and education in the field of underwater robotics. This paper explains the development requirements, process and cost of a low-cost underwater robot designed for a robotics competition and discusses key considerations during development.



OS21 Human-Machine Interface (3)

Chair Norrima Mokhtar (University of Malaya, Malaysia)

Co-Chair Heshalini Rajagopal (UCSI University, Malaysia)

OS21-1 Enhancing Reconnaissance Missions Through Multiple Unmanned Systems in ROS

Anees ul Husnain^{1,2}, Norrima Mokhtar¹, Takao Ito³, Siti Sendari⁴, Muhammad Farris Kyasudeen⁵, Muhammad Badri M Noor^{1,6}, Heshalini Rajagopal⁷

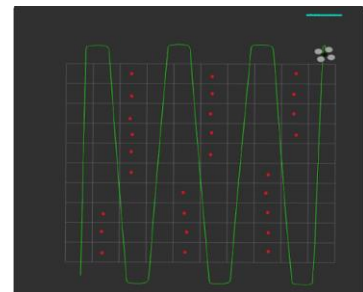
(¹ Universiti Malaya, Malaysia), (² The Islamia University of Bahawalpur, Pakistan)

(³Hiroshima University, Japan), (⁴ Universitas Negeri Malang, Indonesia)

(⁵ University Technology MARA (UiTM), Malaysia)

(⁶ Ifcon Technology Sdn Bhd, Malaysia), (⁷UCSI University, Malaysia)

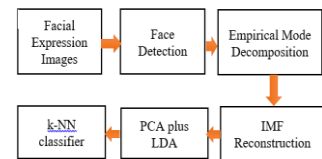
The synergistic collaboration between UAVs and UGVs addresses the limitations of individual platforms, offering a versatile solution for reconnaissance tasks in diverse environments. The proposed system employs ROS as the underlying architecture to facilitate seamless communication and coordination among multiple UAVs and UGVs. Optimal coverage is ensured through efficient exploration and coverage of the reconnaissance area, under by comparing raster-scan, expanding spiral and zig-zag area exploration approaches. The article concludes by discussing potential extensions, such as the integration of machine learning techniques for enhanced autonomy and the scalability of the system for larger-scale missions by presenting a ROS-based framework that maximizes the synergy between UAVs and UGVs.



OS21-2 Illumination Effects on Facial Expression Recognition using Empirical Mode Decomposition

Hashimah Ali¹, Wan Khairunizam Wan Ahmad¹, Hariharan Muthusamy², Mohamed Elshaikh¹
 (¹Universiti Malaysia Perlis, Malaysia)
 (²National Institute of Technology Uttarakhand, India)

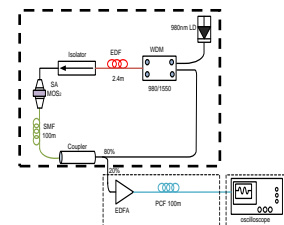
Thus, this paper aims to investigate the illumination effects (brightness variations) on facial expression recognition using empirical mode decomposition reconstruction techniques. In this framework, firstly, the noisy facial expression images were simulated with the illumination effects using different brightness levels of 30%, 40%, 50%, 60%, and 70%. Then, the EMD will decompose the noisy facial expression images into a small set of intrinsic mode functions (IMF), namely IMF1, IMF2, IMF3, and residue. Based on property held by EMD, the signals are decomposed into several IMF components, each with a different time scale. Because the last several IMFs represent the majority of illumination effects, various reconstruction techniques for IMFs have been investigated at various brightness levels. Feature reduction techniques Principal component analysis (PCA) and linear discriminant analysis (LDA) have been employed to reduce the high-dimensional space of IMF features into low-dimensional IMF features. The reduced IMF reconstructions were then used as input to the k-nearest neighbour classifier to recognise the seven facial expressions. A series of experiments have been conducted on the JAFEE database using various reconstruction IMFs together with PCA plus LDA. Based on the results obtained, the reconstruction of IMF1 + IMF2 + IMF3 shows the highest accuracy in high illumination conditions, which is 99.06%.



OS21-3 Supercontinuum Generation Pump By a Molybdenum Disulfide Based Soliton Mode-Locked Fiber Laser

Aeryn D. Ahmad¹, Norrima Mokhtar¹, Hamzah Arof¹, Sulaiman Wadi harun¹, Ahmad Haziq Aiman Rosol²
 (¹Universiti Malaya, Malaysia), (²MJIT, UTM, Malaysia)

In this work, a highly stable soliton mode-locked Erbium-doped fiber laser (EDFL) is passively obtained using a molybdenum disulfide (MoS₂) thin film as a saturable absorber (SA). The MoS₂ thin film obtained via electrochemical deposition technique is integrated into an EDFL cavity to generate mode-locked pulses operating at 1.88 MHz with a pulse duration of 3.03 ps. Supercontinuum (SC) light is generated using the proposed soliton mode pulses operating at 1560.4 nm as they are injected into a 100 m long highly nonlinear photonic crystal fiber (HN-PCF) after it is amplified to the output power of 17.8 dBm. The SC light operates in a wavelength range starting from 1360 nm to more than 1750 nm with the intensity above -35 dBm. The proposed supercontinuum laser can be seen as a promising light source for metrology and sensing applications.



OS22 Mathematical Informatics (8)

Chair Takao Ito (Hiroshima University, Japan)

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

OS22-1 Adsorption Behavior of Arsenic and Selenium using NiZn Hydroxy Double Salts with Acetate, Chloride, Nitrate, and Sulfate Anions

Kaoru Ohe, Ryosuke Tabuchi, Tatsuya Oshima (University of Miyazaki, Japan)

Arsenic(As) and selenium(Se) has become an increasingly serious water contamination worldwide, so the development of adsorbents to improve the adsorption performance of As and Se is desired. In this study, hydroxy double salt NiZn-AcO, -Cl, -NO₃, and -SO₄, with acetate, chloride, nitrate, and sulfate anions between layers and the adsorption behavior of As and Se was investigated. The Langmuir isotherm model, characteristic of monolayer adsorption, fit the data best with $R^2 > 0.94$. The adsorption capacity (q_{max}) of As(V) by NiZn-Cl was about twice that of the other adsorbents. The q_{max} of Se(IV) by NiZn-AcO, NiZn-Cl, and NiZn-NO₃ was almost the same value as that of Se(VI) and 1.4-1.7 times larger than that of NiZn-SO₄. The prepared adsorbent was confirmed to be useful for the removal of As and Se.

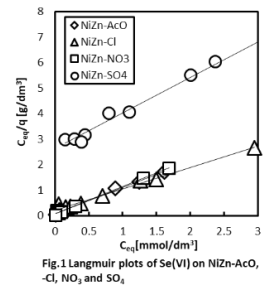


Fig.1 Langmuir plots of Se(VI) on NiZn-AcO, -Cl, -NO₃ and -SO₄

OS22-2 Parallel acoustic analysis based on the domain decomposition method with higher-order element

Amane Takei¹, Makoto Sakamoto¹, Akihiro Kudo²

(¹University of Miyazaki, Japan) (²National Institute of Technology, Tomakomai Collage, Japan)

Numerical analysis approaches, such as the finite element method, are widely used for the estimation of the sound field in architectural spaces. Large-scale analyses, using numerical models with over 10 trillion elements, are required for the analysis of a large space such as a concert hall with higher-frequency bands. Large spaces are often limited to low-frequency analysis. In this study, the number of elements is reduced by wave acoustic analysis using higher-order elements. Based on the results using higher-order elements, it is shown that it is possible to analyze a real environment model such as a live music club and a concert hall.

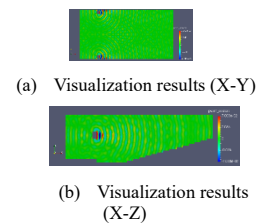


Fig.1 Numerical result using concert hall model

OS22-3 Sound field evaluation on the acoustical experiment using non-steady state analysis

Akihiro Kudo¹, Makoto Sakamoto², Amane Takei²

(¹National Institute of Technology, Tomakomai College, Japan) (² University of Miyazaki, Japan)

Identifying acoustic effects of sound waves emitted by a sound source on the listener is important for understanding the localization of sound as perceived by the listener. In this presentation, we will analyze the effect of the presence of a chair on the psychoacoustic effect using a practical model simulating a psychoacoustic experiment consisting of a loudspeaker, a listener, and a chair. Non-steady state analysis is required to analyze changes in acoustic effects over time. To analyze the interference of sound waves in the vicinity of the listener, a short Gaussian pulse-like solitary wave is set up on the loudspeaker's vibrating surface. Since sound waves in the audible band are used for these simulations, a mesh size of less than 25 mm is used. The laboratory is 3m of depth and width, and 2.5m of height, which means that the computational whole target consists of over 15 million elements. This simulation requires a large number of calculations, so a parallel computing method with ADVENTURE_Sound that is an open-source software for sound simulation, is used to run the simulation. From the simulation results of the non-stationary analysis and consider the effect of the presence of the chair on the sound image localization.

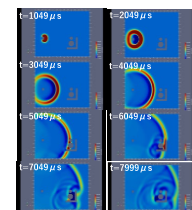
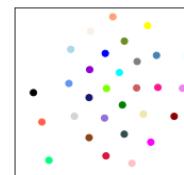


Fig.1 Example of results of non-steady state analysis with gaussian pulse

OS22-4 A DeepInsight method with Morphological Analysis

Toyoaki Tomioka¹, Satoshi Ikeda¹, Makoto Sakamoto¹, Takao Ito²
(¹Faculty of Engineering, University of Miyazaki, Japan) (²Hiroshima University, Japan)

The DeepInsight method is a comprehensive approach aimed at applying convolutional neural networks (CNN) to non-image data. This study specifically focuses on using the DeepInsight method to forecast stock prices, which involve time series data. To achieve this, we employ morphological analysis to extract the necessary word feature for predicting stock prices from news articles. Additionally, t-SNE is utilized to reduce the dimensionality of the high-dimensional data, transforming it into a more manageable, low-dimensional format suitable for stock price prediction. After reducing dimensionality in both news text data and stock price time series data using t-SNE, and subsequently applying CNN for learning from the transformed representations, predictions were made with an accuracy of approximately 60%.



OS22-5 Support for Museum Exhibition of Small Fungi using AR Technology

Kakeru Takemura¹, Ota Hamasuna¹, Fumito Hamakawa¹, Satoshi Ikeda¹, Kaoru Ohe¹, Amane Takei¹, Makoto Sakamoto¹, Shuichi Kurogi²
(¹University of Miyazaki, Japan) (²Miyazaki Prefectural Museum of Nature and History, Japan)

There are 25 species of bioluminescent fungi that have been confirmed in Japan, and 12 species have been confirmed in Miyazaki Prefecture. Those fungi are very small. Therefore, it is difficult to observe the structure of fungi exhibited in museums with the naked eye. The purpose of this research is to display 3DCG models of mushrooms using AR (Augmented Reality) technology in order to facilitate observation of these small mushrooms exhibited in museums. Two hundred visitors to the museum were asked to use the application and complete a survey. In order to measure the ease of observation of different app functions and mobile devices used in the survey, we divided the respondents into four groups.



OS22-6 Automatic Selection of High-Grade Dried Shiitake Mushrooms using Machine Learning

Ota Hamasuna¹, Kakeru Takemura¹, Kodai Hasebe¹, Fumito Hamakawa¹, Bidesh Biswas Biki¹, Satoshi Ikeda¹, Kaoru Ohe¹, Amane Takei¹, Makoto Sakamoto¹, Kazuhide Sugimoto²
(¹University of Miyazaki, Japan) (²SUGIMOTO Co., Ltd. Japan)

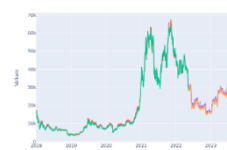
SUGIMOTO Co., Ltd. collects dried shiitake mushrooms directly from approximately 600 producers in Takachiho. Shiitake mushrooms are at their peak in spring and fall, and at peak times, more than 1 ton of mushrooms can be brought in each day. However, shiitake mushrooms are still sorted manually, and sorting this much requires a lot of effort. In this paper, we aim to efficiently determine the quality of shiitake mushrooms using image processing and deep learning.



OS22-7 Predicting High Volatility Cryptocurrency Prices using Deep Learning

Tsutomu Ito¹, Kodai Hasebe², Fumito Hamakawa², Bidesh Biswas Biki², Satoshi Ikeda², Amane Takei², Makoto Sakamoto², Md Riajuliislam³, Sabrina Bari Shital⁴, Takao Ito⁵
(¹National Institute of Technology, Ube College, Japan) (²University of Miyazaki, Japan)
(³TU Dortmund, Germany) (⁴Daffodil International University, Bangladesh) (⁵Hiroshima University, Japan)

Even if you want to make a profit from cryptocurrency, you are worried that you will lose money, and it is difficult to afford it. There are a vast number of papers that study such unpredictable price fluctuations of cryptocurrency. Currently, it is mainstream to use deep learning to predict the price of cryptocurrency. The goal of this research is to predict the price of cryptocurrency over the long-term using deep learning. The algorithms used are LSTM, GRU, and Bi-LSTM. The cryptocurrency targeted are Bitcoin, Ethereum, Litecoin, and Cardano. Finally, we will compare it with previous research and verify the performance of our model.



OS22-8 Simulation of Weathering Representation using Vertex and UV Information

Tsutomu Ito¹, Fumito Hamakawa², Kodai Hasebe², Satoshi Ikeda², Amane Takei², Makoto Sakamoto², Takao Ito³ (¹National Institute of Technology, Ube College, Japan) (²University of Miyazaki, Japan), (⁴Hiroshima University, Japan)

In recent years, three-dimensional computer graphics (3DCG) technology has been developed. In addition, a plethora of research have been published on weathering representations such as rust and moss for realistic representation. However, when outputting simulation results on an image, an enormous number of images are required to display different simulation results in a three-dimensional space. In this paper, a simulation method using vertex information of a 3D model and simple images is proposed. In this method, when the number of vertices is sufficient, the simulation result output does not use images, thus reducing the data increase. This figure is one of the experimental results.



OS23 Industrial Revolution (5)

Chair Hazry Desa (Universiti Malaysia Perlis (UniMAP), Malaysia)

OS23-1 Investigating the Engineering Interventions in the Conservation of Malaysia Heritage Structures: A Review on Preserving Historical Edifices Through Advance Civil Engineering Techniques

Muhammad Azizi Azizan, Nurfadzillah Ishak, Hazry Desa (COE-UAS, UniMAP, Malaysia)

This review delves into the realm of Malaysia's heritage conservation, spotlighting the transformative impact of advanced artificial robotic aid in civil engineering techniques. Through the integration of Fiber-Reinforced Polymers and nanotechnology, historical edifices are fortified, seamlessly blending modern engineering with architectural elegance. Non-destructive testing (NDT) methods, including ground-penetrating radar and Finite Element Analysis (FEA), empower conservationists with deep insights into structural intricacies, guiding targeted interventions. In the digital sphere, 3D laser scanning captures intricate details, while Virtual Reality (VR) simulations facilitate immersive exploration and decision-making. This harmonious fusion of cutting-edge engineering ensures the enduring legacy of Malaysia's architectural treasures.



OS23-2 Drones and Data: A Comprehensive Exploration of UAVs in Data Mining

Muhammad Azizi Azizan, Nurfadzillah Ishak, Hazry Desa (UniMAP, Malaysia)

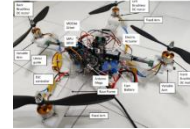
Encapsulates a comprehensive investigation into the symbiotic relationship between Unmanned Aerial Vehicles (UAVs) and data mining, as encapsulated in the discourse titled "Drones and Data." The technological transitions facilitated by UAVs, emphasizing the integration of machine learning algorithms, cloud-based data processing, and the collaborative synergy between stakeholders. Therefore, this study a glimpse into the intricate web of applications and technological advancements at the intersection of UAVs and data mining. It serves as a scholarly guide through the evolving landscape of "Drones and Data," UAVs play a central role in unlocking unprecedented insights and efficiencies, reshaping the future of data mining.



OS23-3 Development of Variable Arm to Control the Manoeuvrability of Quadrotor

L. Y. Hong, H. Desa and M. A. Azizan (UniMAP, Malaysia)
M. H. Tanveer (Kennesaw State University, USA)

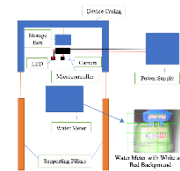
This paper introduces a variable arm concept for quadrotors, enabling manoeuvrability by adjusting arm length. Variations in arm's length impact thrust-generated bending moments, tilting and directing quadrotor movement. The main aim is to create a quadrotor with adaptable arm length to efficiently control maneuvers, reducing the need for extra thrust during flight. The focus is on designing a quadrotor capable of extending or retracting its arms. The proposed idea centers on using the variable arm to alter bending moments and control manoeuvrability. Testing a quadrotor with this adjustable arm showed successful performance in agile manoeuvres. Results confirm the variable arm's ability to induce body rotation, effectively regulating quadrotor manoeuvrability.



OS23-4 Development of IOT-Enabled Smart Water Metering System

S. D. Wen, H. Desa and M. A. Azizan (UniMAP, Malaysia)
A. -S. T. Hussain (Al-Kitab University, Iraq) M. H. Tanveer, R. Patan (Kennesaw State University, USA)

This paper presents a smart IoT water meter for automated readings, aiming to create both a device and a compatible mobile app. Instead of manual reading, the IoT-enabled meter, using a camera and CNN, accurately captures data. It utilizes ESP32 CAM for collection, a laptop as a gateway, and MQTT for transfer. Data is stored in Firebase and analyzed via the app. A functional prototype tested in a housing area collects data, monitored through the app. The analysis evaluates method suitability, offering future improvement recommendations.



OS23-5 Object Detection and Instance Segmentation with YOLOV8: Progress and Limitations

L. J. Lee, H. Desa and M. A. Azizan (UniMAP, Malaysia)
A. -S. T. Hussain (Al-Kitab University, Iraq) M. H. Tanveer (Kennesaw State University, USA)

This research employs object detection and instance segmentation algorithms to distinguish between objects & backgrounds and to interpret the detected objects. The YOLOV8 (You Only Look Once) framework and COCO dataset are utilized for detecting and interpreting the objects. Additionally, the accuracy of detection, segmentation, and interpretation is tested by placing objects at various distances from the camera. The algorithm's performance was evaluated, and the results were documented. In the experiments, a sample of 11 objects was tested, and 8 of them were successfully detected at distances of 45cm, 75cm, 105cm, and 135cm. For instance, segmentation, segmentation maps appeared clean when detecting a single object but faced challenges when multiple objects overlapped.

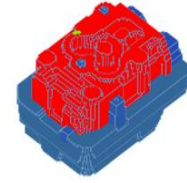


OS24-4 Research on Gas Pore Prediction Method Based on Sand Core Characteristic Time

Xiaolong Wang¹, Qihua Wu², Jiwu Wang¹, Jinwu Kang³, Na Li², Yucheng Sun²

(¹Beijing Jiaotong University, China) (²Weichai Power Co., Ltd. China) (³Tsinghua University, China)

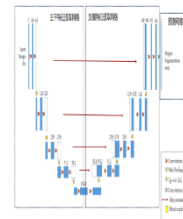
In the production of castings, gas pores are a prevalent defect, particularly in components where air-tightness is crucial, such as cylinder blocks and heads. These defects primarily arise from the intrusion of gases into the casting during the combustion of resin in the sand core. Due to the complexity of the sand core's gas evolution and venting process, predicting gas pores using numerical simulation poses significant computational and time challenges. This paper introduces a rapid prediction method for gas pores based on the characteristic time of the sand core. By setting the heat transfer boundaries, initial conditions, and termination criteria for computation, the thermal conductivity of the sand core is adjusted. The termination computation time is used as the characteristic time of the sand core. This time is then compared with a critical characteristic time to predict the distribution of gas pores. As the analysis of more sand cores is incorporated, the precision of the critical characteristic time improves, leading to more accurate predictions of gas pores in castings.



OS24-5 Optimization Analysis of a Deep Learning-Based Model for Predicting Temperature Fields in the Solidification Process of Castings

Yahui Yang, Jiwu Wang (Beijing Jiaotong University, China) Jinwu Kang (Tsinghua University, China)

In the foundry industry, accurate prediction of the temperature field of castings during solidification is essential to ensure high product quality and improve productivity. This study provides an in-depth investigation of the Unet deep learning model developed specifically for this purpose, focusing on the impact of key training parameters such as optimiser selection, batch size, number of iterations and loss function selection on the prediction performance of the Unet model. The findings provide practical insights on how these parameters can be selected and tuned to improve the accuracy and reliability of model predictions. The results of this study not only provide new ideas for the practice of deep learning applications in the foundry industry, but also help to improve the accuracy and efficiency of the production process.



OS25 Research Towards the Sustainable Development Goals (SDG's) (10)

Chair Ammar A.M. Al Talib (UCSI University, Malaysia)

Co-Chair Takao Ito (Hiroshima University, Japan)

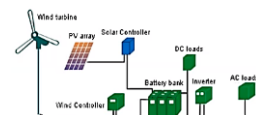
OS25-1 Portable Green Energy Mobile Laptop Charging Station

Ammar A. M. Al-Talib¹, Rodney Tan¹, Ang Aun Jie¹, Idayu M. Tahir¹, Sarah Atifah Saruchi², Cik Suhana Bt.

Hasan¹, Amar Rizwan¹

(¹UCSI University) (²UMPSA, Malaysia)

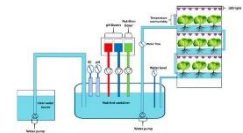
Mobile phones and laptop computers require electrical power to recharge when the battery is down.. As a result, it would be very useful if a portable charging station derived from renewable energy harvesting could be built, so that individuals could recharge their phones and laptops whenever needed. The objective of this project is to design and develop a green energy mobile and laptop charging station that uses wind and solar energy and evaluate the performance of the designed station under different working conditions. The efficiency of the power generated to charge the station is achieving 95.6% for solar charging, which is considered a high efficiency for a renewable energy charging station. Based on the analysis of the charging station results, it has been proven that it can provide sufficient power and is safe for use as a portable mobile laptop charging station.



OS25-2 Auto Indoor Hydroponics Plant Growth Chamber

Ammar A.M. Al-Talib¹, Tew Hwa Hui¹, Sarah Atifah Saruchi², Idayu M. Tahir¹, Nor Fazilah Binti Abdullah¹
(¹UCSI University) (²UMPSA, Malaysia)

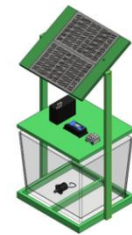
The objective of this project is to build an auto indoor hydroponics plant growing chamber that has an auto monitoring and controlling system. A ESP32 based hydroponics electrical system is built with the attachment of hardware components such as temperature and humidity sensor, light intensity sensor, water level sensor, and water flow rate sensor. The software development of the system is through Arduino IoT Cloud platform, which has an overall suitability in terms of features, cost, and user intuitiveness for starters. Results have shown that ESP32 can ensure stable power supply.. After testing and validation, all of the electrical components are stored in a power enclosure box to prevent contact with liquid. In short, the developed auto indoor hydroponics plant growth chamber has effectively demonstrated the ability in easing the plant cultivation procedure for agricultural community.



OS25-3 A Design and Fabrication of a Solar Agriculture Water Pumping System

Ammar A.M. Al-Talib¹, Idayu M.Tahir¹, Ain Atiqa¹, Amar Rizwan¹, Sarah Atifah Saruchi², Yazan Abu Al shaikh¹
(¹UCSI University) (²UMPSA, Malaysia)

This study explores the use of a solar driven water pump. PV technology replaces conventional electricity and diesel pumps by using solar energy to power DC or AC water pumps. The main objective of this study is to design and construct a solar-powered agriculture water pumping system and to evaluate its performance. The solar agriculture water pumping system used in this project consists of a 40-watt monocrystalline solar cell with an efficiency conversion of between 23% – 24%. This can supply power to a 16.8 W DC Flow Submersible Pump. It could lift the water up to 5m and a flow range of 700 Liter/Hour. The system also includes a PWM 30A Solar Charge Controller to regulate the input power to a 12V, 7.2A Sealed Rechargeable Battery. Finally, a 20m long watering kit with nozzles irrigation system is connected to a 12V DC Submersible Pump to water the plants.



OS25-4 Design and Performance of a Power Generating Manual Treadmill

Ammar A. M. Al-Talib¹, Sarah Atifah Saruchi², Cik Suhana Bt. Hasan¹, Nor Fazilah Binti Abdullah¹, Ain Atiqa¹, Ahmad Jelban¹
(¹UCSI University) (²UMPSA, Malaysia)

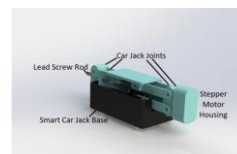
Treadmills are one of the most popular training equipment in the gym and at home. The working principle of treadmills is by moving the belt with the human knee bending, which creates mechanical energy to turn the belt. A gear or pulley and belt system connects to the generator along the axel line of the rolling bars. The power generated by the DC generator is stored in a battery pack and could be used to charge phones or other equipment. It has been found that treadmills can provide an efficiency of 95% when the DC motor is used and 92% when the AC motor is used. The main objective of this study is to design and fabricate a powder-generating manual treadmill and to analyze the performance of the system under different operation conditions.



OS25-5 Smart Car Jack Using Internet of Things

Idayu M.T. Noor, Ammar A.M. Al- Talib, Mahmoud E.A. Zeiad, Suhana B.H. Cik,
(UCSI University, Malaysia)

This paper presents a modified car jack design that is safe, easy to operate, and reduces physical effort for lifting and lowering vehicles during automobile repair, especially for roadside situations. The study explores the integration of Internet of Things (IoT) technology in automotive tools, particularly in the development of smart car jacks. The proposed smart car jack offers convenience and enhanced control over vehicle maintenance tasks. Comparative analysis between smart car jacks and traditional jacks reveals several advantages of the former. Smart jacks demonstrate higher lifting capacities and efficiency due to their use of hydraulic systems and advanced motorized mechanisms. The most significant differentiator is the integration of technology in smart car jacks. Equipped with microcontrollers, sensors, and mobile applications, they offer remote control and real-time monitoring features. These technological advancements provide users with enhanced convenience and safety, setting smart jacks apart from their traditional counterparts.



OS25-6 Gas Detection for Biogas System Using Internet-of-Things (IoT)

Ammar A.M. Al Talib, I.H.W. Yang, Idayu M.T. Noor, Haslija A.B. Ayu, Afifi. Z. Nur Muhammad
(UCSI University, Malaysia)

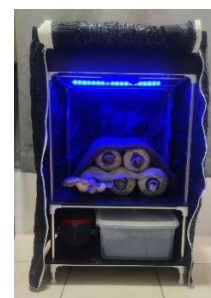
The melting of the polar icecaps, rising sea levels, increase in allergies and infectious disease outbreaks, those are only a few effects of global warming. Global warming remains one of the most detrimental by-products of industrialization. Fossil fuels contribute to the majority of greenhouse gases emitted but remain a popular option for the generation of energy. An easy fix for this conundrum is to utilize other forms of fuel for energy generation which burns cleaner and renewable as opposed to fossil fuels. The solution would be to use biomethane generated from waste products which burn cleaner and comes from a renewable source. In this paper, an IoT based biogas monitoring system for biogas reactors is proposed. An ESP-32 microcontroller system is deployed and tested to detect the presence of gas production. A dashboard plotting the data obtained from sensors is designed to help user monitor parameters.



OS25-7 IoT Based Smart Mushroom Growing Kit

Ammar A.M. Al- Talib, C.K.J. Ting, Noor Idayu M. Tahir, Ain Atiqa, T.Y. Hui
(UCSI University, Malaysia)

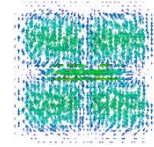
This project introduces an IoT-based smart mushroom growing kit to meet the rising global demand for high-quality mushrooms. Various species of mushrooms can be efficiently grown in different environmental conditions with the help of IoT devices that enable farmers to regulate the climate condition according to the specific needs of each type of mushroom. The kit employs sensors and actuators, including temperature, humidity, MQ-135, and ultrasonic sensors, along with an ESP32 camera, controlled by a microcontroller. The collected data is transmitted to an IoT platform via Wi-Fi, facilitating real-time monitoring and control through a user-friendly dashboard on Blynk website and Blynk app. This innovative system optimizes mushroom cultivation by adjusting environmental conditions, offering efficiency and profitability. Users can remotely monitor and regulate the growth environment through their smartphones, enhancing the overall mushroom cultivation experience.



OS25-8 Design and Analysis of Artificial Magnetic Conductor for Metal Shielding Applications in RFID Car Detection Applications

Eryana Hussin^{1,2}, Azman Zakariya², Md. Ashraful Haque^{2,3}, Nur Izzati Ali⁴
(¹UCSI University) (²UTPSA, Malaysia) (³Daffodil International University, Bangladesh) (⁴UMP, Malaysia)

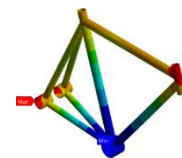
This paper presents the design of symmetrical Artificial Magnetic Conductor (AMC) for metal shielding in RFID applications. It integrates a simple straight dipole as the RFID tag representation, optimizing signal fidelity within metallic environments. Tailored for low-frequency RFID use, the multiple-array AMC addresses UHF bandwidth limitations by incorporating slots, ensuring a compact design and expanded bandwidth. This proposed structure enhances performance of the dipole which includes return loss, directivity, and bandwidth.



OS25-9 Effect of Fiber Orientation on the Mechanical Performance of Natural Fiber Polymer Composite Bicycle Frame using Finite Element Analysis

Kok Sem Too, Cik Suhana Hassan, Nor Fazilah Abdullah, Ammar Abdulaziz Majeed Al-Talib
(UCSI University, Malaysia)

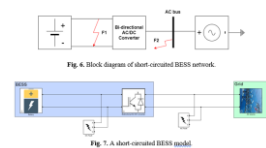
In this research, the performance of oil palm empty fruit bunch (OPEFB) fibre-reinforced epoxy composite with varying fibre orientation and stacking sequence as the material for mountain bike frame was studied utilizing ANSYS software. The choice of OPEFB fibre was motivated by the fact that the waste by-product of oil palm extraction in Malaysia alone might reach 70-80 million tons per year, with 90% of oil palm biomass lost as waste. The properties of epoxy OPEFB composite in principal 1, 2, and 3 directions were calculated using Whitney and Riley estimates. 10 stacking sequences and five loading conditions were taken. The results have shown that the fibre orientation of epoxy OPEFB composite on the bicycle frame had little effect on the performance contrary to the number of plies in the laminate or number of laminates which had major effects.



OS25-10 Modelling of Short-Circuit Protection for A Residential Grid-Connected BESS

Kong De Kang, Farah Adilah Jamaludin, Rodney H.G. Tan
(UCSI University, Malaysia)

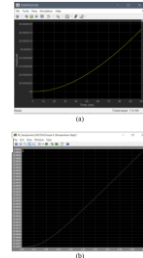
This research paper presents the power protection study on a grid-connected Battery Energy Storage System (BESS) in a typical Malaysia low-voltage (LV) residential network. The BESS model and control algorithm is developed in MATLAB/Simulink environment to provide a platform for short circuit fault analysis of BESS. The BESS model can charge and discharge its energy with an algorithm-controlled bidirectional AC/DC converter. The paper also presents two cases for BESS short circuit. The protection level on BESS is also optimized by introducing a time-delay characteristics model to coordinate circuit breakers in compliance with standards outlined in IEEE Std 1375-1998, IEC/EN 60898-2, IEC/EN 60947-2, UL 1077, and CSA 22.2. No.235. As a conclusion, BESS was interrupted within stipulated time. In case of internal short circuit protection failure, a backup protection will act on isolating BESS from the grid provided that the discharged current exceeds system capacity.



OS26-4 Investigate Power Efficiency in PLECS and MATLAB Software by Designing USB 5W Charger

Zhi Ying Yeoh, Kim Soon Chong, Sew Sun Tiang, Mohammad Arif Ilyas, Jia Wei Tan, Wei Kang Lai, Wei Hong Lim (UCSI University, Malaysia)

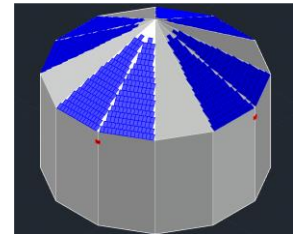
In power electronics, accurately assessing simulation tools is key for precise, reliable electronic system designs. This study compares MATLAB Simulink and PLECS in modeling a 5W USB charger's power characteristic. The charger, using an AC-DC full bridge rectifier and DC-DC flyback topology, delivers a stable 5VDC at 1A. The analysis focuses on power efficiency and thermal characteristics, incorporating real-life components for detailed insights. Results show PLECS, specialized in power electronics, surpasses MATLAB in accuracy and consistency. This research aids in understanding simulation tools' effectiveness, guiding engineers and researchers in power efficiency evaluations for electronic systems.



OS26-5 Design and Simulation and Performance of Grid Connected Photovoltaic System for Small, Tall Building in Malaysia

Wei Kang Lai, Kim Soon Chong, Sew Sun Tiang, Mohammad Arif Ilyas, Jia Wei Tan, Zhi Ying Yeoh, Wei Hong Lim (UCSI University, Malaysia)

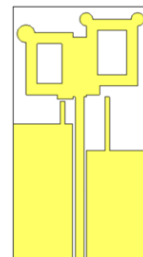
In Malaysia's rapidly urbanizing landscape, sustainable energy for small, tall buildings is increasingly vital. This study addresses this need through the design, simulation, and performance analysis of grid-connected photovoltaic systems tailored for these unique structures. Utilizing AutoCAD and PVSyst for design and simulation, the research details rooftop array dimensions, PV panel wiring, and system components aligned with MS 1837-2018 standards. Results indicate the designed system can save 526.70MWh annually, costing RM 339,306.98, with a 9.8% return on investment (ROI) and a 13-year breakeven point, emphasizing its sustainability and economic viability.



OS26-6 A Design of Dual-Band Coplanar Waveguide (CPW) Printed Antenna for 1.9 - 3.6GHz Applications

Jia Wei Tan, Sew Sun Tiang, Kim Soon Chong, Mohammad Arif Ilyas, Mastaneh Mokayef, Zhi Ying Yeoh, Wei Kang Lai, Wei Hong Lim (UCSI University, Malaysia)

A dual-band coplanar waveguide (CPW) printed antenna for IoT application is proposed, mounted on a low-profile RT/duroid 5880 substrate with dielectric constant of 2.2, loss tangent of 0.0009 and a standard height of 0.787mm. This design aims to cover the major frequency bands from LTE to Bluetooth/Wi-Fi band/WiMax/Zigbee, Extended IMT and 5G whereby the bandwidth range between 1.7 GHz to 3.6 GHz. The antenna is miniaturized through the CPW technique and has a rectangular size of 60 x 30 x 1.187mm³. The design and simulation of the result records a return loss of -25.12dB, peak gain of 4.23dBi, voltage standing wave ratio (VSWR) close to 1, omnidirectional radiation, and current distribution. Radiation efficiency reaches approximately 94%, with a total efficiency of 89.4% between 1.9GHz-3.6GHz.



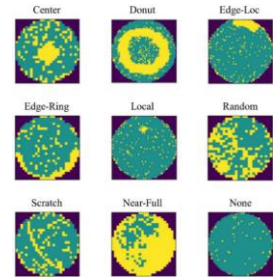
OS26-7 Optimized Convolutional Neural Network Towards Effective Wafer Defects Classification

Koon Hian Ang¹, Koon Meng Ang¹, Chin Hong Wong^{2,3}, Abhishek Sharma⁴, Chun Kit Ang¹, Kim Soon Chong¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (²Fuzou University, China) (³Maynooth University, Ireland)

(⁴Graphic Era Deemed to be University, India)

Semiconductor defect inspection is crucial for yield improvement but is hindered by manual inspection's subjectivity and error. This paper employs Convolutional Neural Networks (CNNs) for automated wafer defect classification, addressing the challenges of time-intensive training and complex hyperparameter tuning. We propose the Arithmetic Optimization Algorithm (AOA) to efficiently optimize CNN hyperparameters like momentum, initial learning rate, maximum epochs, and L2 regularization. Our method reduces the trial-and-error in hyperparameter tuning. Using the AOA-optimized ResNet-18 model, our simulations show superior performance in defect classification compared to the unoptimized model, demonstrating its effectiveness and practical potential.

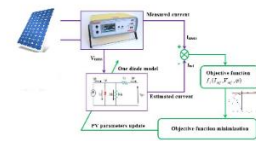


OS26-8 Tackling Photovoltaic (PV) Estimation Challenges: An Innovative AOA Variant for Improved Accuracy and Robustness

Rayan Mohammed Noor Mohammed Bakhit¹, Abhishek Sharma², Tiong Hoo Lim³, Chin Hong Wong^{4,5}, Kim Soon Chong¹, Li Pan¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (²Graphic Era Deemed to be University, India) (³Universiti Teknologi Brunei, Brunei Darussalam) (⁴Fuzou University, China) (⁵Maynooth University, Ireland)

Optimizing photovoltaic (PV) cell/module modeling is key to advancing solar power and achieving net zero carbon goals. Challenges in accurate PV parameter estimation arise from environmental variability, aging, and incomplete manufacturer data. Traditional Arithmetic Optimization Algorithm (AOA) often struggles with premature convergence due to imbalanced exploration and exploitation. This paper presents an enhanced AOA variant, incorporating chaotic maps and oppositional-based learning to better balance the optimization process. Our extensive simulations show that this improved AOA variant significantly enhances accuracy and robustness in PV cell/module parameter estimation compared to the conventional method.



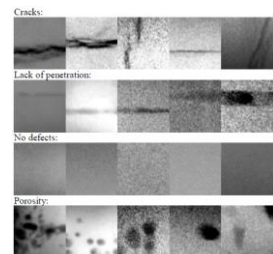
OS26-9 Deep Learning in Manufacturing: A Focus on Welding Defect Classification with CNNs

Tin Chang Ting¹, Hameedur Rahman², Tiong Hoo Lim³, Chin Hong Wong^{4,5}, Chun Kit Ang¹, Mohamed Khan Afthab Ahamed Khan¹, Sew Sun Tiang¹, Wei Hong Lim¹

(¹UCSI University, Malaysia) (² Air University, Pakistan) (³Universiti Teknologi Brunei, Brunei Darussalam)

(⁴Fuzou University, China) (⁵Maynooth University, Ireland)

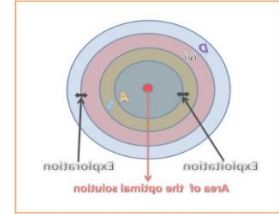
Welding is integral to modern manufacturing, yet the complex process often leads to defects, impacting the quality of the final product. Recent advances in deep learning, particularly Convolutional Neural Networks (CNNs), have shown remarkable results in applications like defect recognition. This study evaluated AlexNet, ResNet-18, ResNet-50, ResNet-101, MobileNet-v2, ShuffleNet, and SqueezeNet for their effectiveness in identifying welding defects, using accuracy, precision, sensitivity, specificity, and F-score as metrics. The dataset covered defects like cracks, lack of penetration, porosity, and a no-defect class. Our analysis shows that most of these architectures deliver promising results in accuracy, sensitivity, specificity, precision, and F1-score, highlighting their potential in defect recognition.



OS26-10 Enhancing Global Optimization Performance of Arithmetic Optimization Algorithm with a Modified Population Initialization Scheme

Tin Chang Ting¹, Hameedur Rahman², Meng Choung Chiong¹, Mohamed Khan Afthab Ahamed Khan¹, Cik Suhana Hassan¹, Farah Adilah Binti Jamaludin¹, Sew Sun Tiang¹, Wei Hong Lim¹
(¹UCSI University, Malaysia) (²Air University, Pakistan)

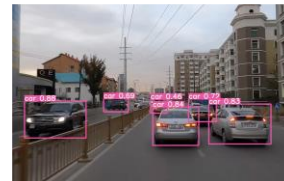
Arithmetic Optimization Algorithm (AOA) is widely used to solve global optimization problems. However, it often faces premature convergence challenges in complex optimization scenarios. A key factor affecting AOA's performance is the solution quality of the initial population. The conventional initialization scheme, despite its prevalence, lacks reliability in ensuring high-quality solutions due to inherent stochastic processes. To address this issue, we propose a modified initialization scheme that improves initial population quality by integrating chaotic maps and oppositional-based learning. Through extensive simulation studies, we demonstrate that the enhanced AOA, equipped with this new initialization scheme, exhibits superior performance in solving a range of benchmark functions with improved accuracy.



OS26-11 Enhancing Precision Object Detection and Identification for Autonomous Vehicles through YOLOv5 Refinement with YOLO-ALPHA

Guandong Li¹, Yanzhe Xie¹, Yuhao Lu¹, Jingzhen Fan¹, Yuankui Huang¹, Zongyan Wen¹, Wei Hong Lim², Chin Hong Wong¹
(¹Maynooth University, Ireland) (²UCSI University, Malaysia)

Advancing swiftly in contemporary society, the rapid growth of autonomous driving technology suggests its potential adoption across continents. The realization of fully autonomous driving relies on proficiently detecting, classifying, and tracking road objects such as pedestrians and vehicles. This research employs the YOLOv5 neural network, enhancing it with YOLO-ALPHA. Modifications, encompassing freeze and attention mechanisms, serve to refine accuracy and expedite training. Furthermore, adjustments to the activation function aim to stabilize precision and recall. The integration of a FCN based on semantic segmentation theory contributes to improved accuracy in detecting road conditions during autonomous driving. Consequently, this enables the successful and highly accurate functionality of automatic identification.



OS27 Post-narratological Approaches to Cognition in Humans and Robots (5)

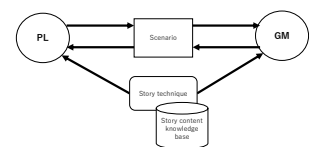
Chair: Jumpei Ono (Aomori University, Japan)

Co-Chair: Hiroki Fxyma (Kobe University, Japan)

OS27-1 A Game Framework Based on the Disinformation Warfare in Russo-Ukrainian War

Jumpei Ono (Aomori University, Japan), Takashi Ogata (Iwate Prefectural University, Japan)

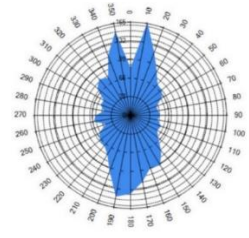
From 2022, when Russia began its invasion of Ukraine, to the present, the number of speeches and information directly/indirectly related to Russo-Ukrainian war has continued to increase in mass communication venues such as SNS and TV. This study proposes a game that simulates the spread of disinformation by focusing on the information published by Ukraine as a list of disinformation speakers, especially on the topics they talk about. The game is intended to provide players with psychological immunity against disinformation through the simulation of disinformation dissemination.



OS27-2 Comparative Analysis of Eye Tracking between Veteran and Novice during Radiological Interpretation

Yuka Naito, Jun Nakamura (Chuo University, Japan),
Yoshinobu Ishiwata (Yokohama City University, Japan)

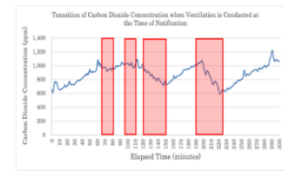
With the development of AI, AI may substitute for physicians in radiological interpretations in the future. The purpose of this paper is to identify factors that could form the foundation for algorithms enabling AI to explore pathological findings. This study focuses on the "angles of gaze trajectory" and conducts a comparative analysis between veteran and novice. The results indicate commonalities and variances in the angles of gaze trajectory between veteran and novice, particularly around 10, 350, and 180 degrees. Both Veteran and Novice have a relatively higher frequency of gaze movement around 10 and 350 degrees compared to other angles. Veteran has a relatively higher frequency of gaze movement around 180 degrees compared to other angles, while novice has a relatively lower frequency around 180 degrees.



OS27-3 Development of Notification System to Prevent Working Productivity from Declining Caused by Increased Carbon Dioxide Concentration

Yohei Kamoda, Jun Nakamura (Chuo University, Japan)

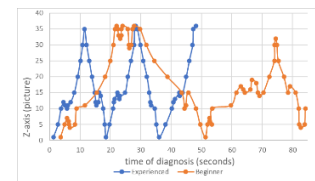
In association with the change of work style to remote, the home environment should be considered in terms of carbon dioxide concentration (CDC) which has negative effects on the human body, such as less cognitive abilities. To challenge this problem, the author developed an alert system that supports remote workers to be notified of an increase in CDC, by combining Raspberry Pi, CDC sensor, and Slack. As a result, the developed alert system was able to support the user in keeping the CDC in the room below the set threshold. In addition, the system shows that a significant increase in CDC can be observed in the room when it comes to insufficient ventilation.



OS27-4 Visualization of the Skilled Physician's Gaze Characteristic during Diagnosis

Taiki Sugimoto, Jun Nakamura (Chuo University, Japan)
and Yoshinobu Ishiwata (Yokohama City University, Japan)

This study examines gaze movement differences in diagnosis between skilled and unskilled physicians, aiming to identify factors influencing diagnostic speed and enhance artificial intelligence's diagnostic capabilities. Results reveal that experienced physicians, on average, spent 61% less diagnostic time than beginners, covering 49% of the gaze distance on the X and Y-axes. (comparison of the cumulative distance of gaze on the screen). Despite increased movement on the Z-axis (comparison of the scrolling speed of the CT scan results), skilled physicians moved 2-3 times faster, effectively narrowing attention and identifying specific areas.



OS27-5 Comparative Analysis of Methods for Visualizing the Sensory Experience of Food and Beverages

Hiroki Fxyma (Kobe University, Japan)

This research explores and compares various methodologies employed in the visualization of taste experiences associated with food and beverages. The study delves into sensory analysis techniques, technological innovations, and artistic representations used to convey the complex and subjective nature of flavor. Through a comprehensive review of existing literature and practical experimentation, the paper evaluates the efficacy of different approaches in capturing and communicating the nuanced aspects of taste, aroma, and texture. The findings aim to contribute to the advancement of sensory science, culinary arts, and consumer research by providing insights into the strengths, limitations, and potential applications of diverse taste visualization methods. As the interdisciplinary field of gastronomy continues to evolve, this research serves as a valuable resource for professionals, researchers, and enthusiasts seeking to enhance our understanding and appreciation of the multisensory aspects of food and beverage consumption.



GS abstracts

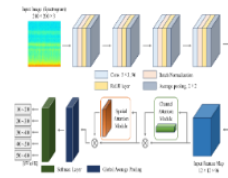
GS1 Machine learning & Neural Network & Artificial Life (7)

Chair Hiroki Tamura (University of Miyazaki, Japan)

GS1-1 Deep Learning Based Prediction of Heat Transfer Coefficient Using Spectrogram Images from Boiling Sound

Fuga Mitsuyama, Ren Umeno, Tomohide Yabuki, Tohru Kamiya (Kyushu Institute of Technology, Japan)

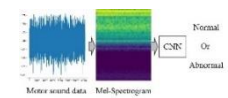
Recently, cooling methods based on water boiling have attracted attention as a thermal solution for electronic equipment. In this situation, it is necessary to measure Heat Transfer Coefficient (HTC) to design more efficient cooling systems. In this paper, we propose a method to predict of the HTC from boiling sound data using deep learning techniques. Measuring HTC requires a variety of sensors and modifications to the equipment, which can be costly. Predicting HTC by sound alone can therefore reduce these costs. The accuracy improved by 1.12% compared to the conventional method through the development of Convolutional Neural Network (CNN) incorporate Convolutional Block Attention Module (CBAM).



GS1-2 A Study on Classification of Faulty Motor Sound Using Convolutional Neural Networks

Jamil Md Shafayet, Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

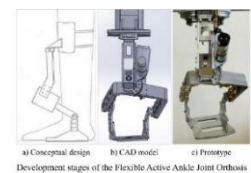
This paper is focused towards determining the use of audio classification methods to detect faulty motors by their sound, both with an abnormal noise and noise-free scenarios, so that the requirement of human inspection can be reduced in factories. Here, the soundwaves of motors, having both normal and faulty mechanical parts were acquired using an electronic stethoscope. The audio files were recorded in '.wav' format which later split into chunks. Noise reduction is widely used in audio classification tasks. Among various available methods, the Autoencoder was implemented for noise reduction. Our proposal method is to use various soundwave analysis methods for generating features such as in Mel-Frequency Cepstral Coefficient, Mel-spectrogram, and Spectrogram, and comparing the resulting accuracy. Convolutional neural networks are employed for the purpose of classification. Our proposed method resulted in approx. 97% accuracy in classifying 2 classes having 93 samples of motors and 2.23% loss in noise reduction with autoencoder.



GS1-3 Design and Development of a Flexible Active Ankle Joint Orthosis for Locomotion Assistance

Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

Active ankle joint orthosis is an artificial wearable device that is closely fitted to the human ankle and combines human intelligence and intentions with the powered robot joints. However, most of the existing designs have only focused on one degree of freedom (DOF) of the ankle joint: namely plantarflexion-dorsiflexion. Alternatively, a modular power-assist flexible active ankle orthosis is proposed, addressing anthropomorphic architecture of design, and supporting multiple DOFs of ankle for locomotion assistance of the physically weak individuals. The proposed ankle joint orthosis was designed with the aid of CAD tools followed by fabrication of a working model. Electrically powered systems with gear transmissions were adapted to support the principal motions during normal Gait. In parallel, the design of the control algorithm was carried out based on the EMG signals. The future advancements have been focused on developing a novel control method that provides sufficient flexibility to assist a wide variety of lower-limb motions.



GS1-4 A study on the Real-Time Biomechanical Analysis of Lamber Burden Utilizing Stereoscope Cameras

Taufik Hidayat Soesilo, Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

Lamber region is susceptible to strain and stress due to various physical activities and occupational task. To study about the lamber burden, researchers have developed many tools but most of existing design can only use static imaging or doesn't provide real-time update. Our proposed system records and examines the change of body posture in real time by utilizing the capabilities of stereoscope cameras. By using MediaPipe algorithms, 2D keypoints representing body joint can be extracted from images. Afterward, using the Direct Linear Transform (DLT) the corresponding 3D keypoints can be calculated using obtained 2D keypoints. With the 3D keypoints the body angles can be computed and used to calculate the wight of the lumbar burden using the digital human model software JACK-like calculation. Finally, our proposed system reached to its aim to study about lamber burden and adjust the person needs in real-time.



GS1-5 Verification of Determination Possibility using Convolutional Autoencoder for Machine Tool Abnormality Detection

Yuta Sumoto, Praveen Nuwantha, Hiroki Tamura (University of Miyazaki, Japan)

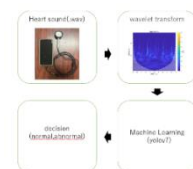
The purpose of this research is to clarify the cause of failure and to improve the accuracy of abnormality detection by predicting the noise added to the machine tool from the results of the convolutional autoencoder. Data obtained from an acceleration sensor mounted on the machine tool are reconstructed using a convolutional autoencoder, and the average absolute error is calculated. The maximum value of the average absolute error of the training data is used as the threshold value for abnormality detection. Multiple simulated data with different amplitude values based on a composite sine wave with a specific frequency, white noise, and random numbers within a specified amplitude value were verified. In this paper, the characteristics of each type of noise and the parameters of the optimal model were examined from error rate and error distribution.



GS1-6 Basic Research for High-speed Heart Sound Determination using AI

Riku Nakashima, Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

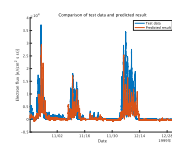
In recent years, many researchers focus on enhancing the current situation of the home healthcare system. In this paper, we developed a system that uses AI to quickly determine whether auscultation sounds are normal or not. In our analysis, heart sounds were imaged, and their abnormalities were identified using machine learning tools. The proposal approach uses a YOLO_v7 model based anomaly detection and the Wavelet Transform was employed to analyze the acquired heart sound data. Our proposal system resulted with an 89% accuracy rate on the basis of 5 seconds of heartbeat data, in various recording environments.



GS1-7 Prediction of High-Energy Electron Flux at Geosynchronous Orbit using a neural network technique

Ami Iwabu, Kentaro Kitamura (Kyusyu Institute of Technology, Japan)

The radiation belt, where the high-energy particles are predominant in near earth space from the low earth orbit (LEO) to the geostationary orbit (GEO), sometimes causes satellite malfunction. Therefore, the objective of this study is to predict the high-energy electron flux at GEO with the energy above 2 MeV after 24 hours with higher accuracy for the safety satellite operation in terms of the space weather science. In this study the various kinds of solar wind data from satellite observations and ground geomagnetic observation data in 1999 were used for the Recurrent Neural Network (RNN). Prediction results were evaluated by the prediction efficiency, which is derived from both predicted and actual variation data. As a result, the prediction using combined data of solar wind and geomagnetic data shows highest prediction efficiency of 0.72.

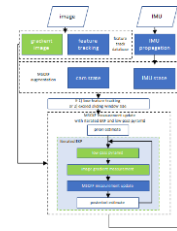


GS1-8 Image Gradient-based Monocular Visual-Inertial Odometry

Tae Ihn Kim¹, Jae Hyung Jung², Chan Gook Park²

(¹Hyundai Motor Company, Republic of Korea), (²Seoul National University, Republic of Korea)

This paper presents an image gradient-based monocular visual-inertial odometry (VIO) algorithm, using image gradient measurements, robust to illumination change. Our proposed algorithm follows the multi-state constraint Kalman filter (MSCKF) framework, a sliding windowed extended Kalman filter (EKF). We expand the measurements from the reprojected feature locations on the image coordinates to the corresponding image gradients in the measurement selection. The iterated EKF and low-pass pyramid are adapted to reduce the linearization error in the MSCKF measurement update process. We verify that our proposed algorithm outperforms both conventional indirect and direct MSCKF-based VIO algorithms by evaluating the pose estimation performance using a real-world dataset, including illumination change.



GS2 Image Processing I (5)

Chair Yui Tanjo (Kyushu Institute of Technology, Japan)

GS2-1 A Method for Embedding Multiple Photographic Images in a Photographic Image

Naoki Kouno, Kanya Goto, Toru Hiraoka (University of Nagasaki, Japan)

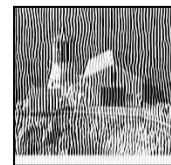
A method has been proposed for embedding another photographic image (image B) in a photographic image (image A). An image (image A') is generated by embedding information of image B in image A, and then an image (image B') is restored by extracting information from image A'. The conventional methods can only embed one photographic image in one photographic image. Therefore, we extend the conventional method and propose a method for embedding multiple photographic images in one photographic image. In our method, as more images B are embedding in image A, the image quality of image A' deteriorates, but the image quality of images B' dose not deteriorate. To verify the effectiveness of our method, experiments using various photographic images were performed.



GS2-2 Generation of Flowing-Line Images Using Vertical and Horizontal Smoothing Filters

Karin Kuroki, Toru Hiraoka (University of Nagasaki, Japan)

We propose a non-photorealistic rendering method for automatically generating flowing-line images from photographic images. Flowing-line images consist of unidirectional lines with smooth curves. Our method is executed by an iterative calculation using vertical and horizontal smoothing filters. To verify the effectiveness of our method, we conducted an experiment using various photographic images to confirm that flowing-line patterns can be generated on the entire image. Additionally, we conducted an experiment to visually examine how flowing-line patterns generated by changing the values of the parameters in our method change.



GS2-3 Human Motion Recognition from Multiple Directions and Its Gait Cycles Analysis

Miki Ooba, Yui Tanjo (Kyushu Institute of Technology, Japan)

It is crucial for individuals to keep walking and stay healthy to prevent receiving nursing care. This paper proposes a method of recognizing walk motions and analyzing the gait cycle of a human focusing on his/her posture. We use 43 structural features defined from human joint coordinates obtained using OpenPose and 18 figural features from human domain images and their difference images. The feature vector containing these 61 features is used for the recognition of walk motion by Random Forest. In the experiment, we applied the method to recognizing six types of motions and analyzed the walk gait cycles of five persons, and obtained satisfactory results.



GS2-4 A Method of Improving the QOL of the People with Visual Impairment by MY VISION

Shun Kitazumi, Yui Tanjo (Kyushu Institute of Technology, Japan)

Visually impaired people face several difficulties in indoor activities, such as spending excessive time in locating objects. This paper proposes a method for assisting object acquisition by detecting desired objects and guiding users to them. The method requests a user to express the object he/she wants to acquire verbally and utilizes speech recognition to detect the specified object. Subsequently, the system guides in voice the user's hand to the location of the desired object. The performance of the method is experimentally shown. The method contributes to enhancing the comfort of indoor activities of visually impaired and, in this way, improves their quality of life.



GS2-5 Human Behavior Segmentation and Recognition Using a Single-camera

Jing Cao, Yui Tanjo (Kyushu Institute of Technology, Japan)

In recent years, elderly people living alone account for a large proportion of the elderly population, and the issue of safety has also been a matter of great concern for the public. Considering the importance of monitoring the behavior and activities of the elderly and detecting abnormal movements, this paper proposes a method that can segment human behavior into each action and identify the action from the videos taken by a single camera. It uses features that can represent the shape of the human area in the depth direction, as well as the features such as motion direction and speed. The performance and effectiveness of the method are verified by experiments.



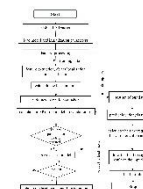
GS3 Image Processing II (3)

Chair Seiji Ishikawa (Kyushu Institute of Technology, Japan)

GS3-1 Online Classroom Student Engagement Analysis using Enhanced YOLOv5

Shuai Wang, Abdul Samad Shibghatullah (UCSI University, Malaysia)

The rise of online education has highlighted the urgency of addressing cyberbullying in virtual classrooms. This paper presents an innovative method for early cyberbullying detection through the analysis of students' engagement and emotional responses in online classrooms. The SFER-YOLOv5 model, a fusion of Student Facial Expression Recognition and an enhanced YOLOv5 object detection model, introduces key optimizations, including Soft NMS for Non-Maximum Suppression, integration of a Channel Attention (CA) module, and use of Enhanced Intersection over Union (EIOU) as the bounding box regression loss function. This approach proactively identifies reduced engagement and emotional irregularities, providing a framework to mitigate cyberbullying in online classrooms.



GS3-2 A Method of Recognizing Body Movements Based on a Self-viewpoint Video

Ichirou Moribe, Yui Tanjo (Kyushu Institute of Technology, Japan)

The most critical human sensory function resides in vision. This study focuses on utilizing visual information, specifically self-perspective footage, to identify individual movements. Existing researches require third-party filming to recognize body movements and states. The proposed method, on the other hand, simply attaches a camera to the human head and enables the recognition of the subject's actions. Consequently, it becomes easier to monitor daily movements of a human and gather his/her data on body kinetics. This approach would be beneficial in scenarios involving individuals engaging in risky behavior or, during a certain emergency, providing valuable assistance.



GS3-3 Supporting Safe Walk of a Visually Impaired Person at a Station Platform based on MY VISION

Shintaro Yamada, Yui Tanjo, Seiji Ishikawa (Kyushu Institute of Technology, Japan)

When individuals with visual impairment go out, public transportation such as trains and buses is commonly used. However, many of them experience accidents, such as falling from train platforms or tripping due to unexpected contact with other passengers. To solve this problem, we propose method using the MY VISION system which detects the obstacle that may pose risks to individuals with visual impairment. The proposed method detects obstacles such as passengers pillars and platform edges at train stations. We employ an RGB-D camera for capturing frontal view of a user, use depth images to detect the edge of obstacles and level differences, and give warning to the visually impaired user based on the distance between him/her and the detected obstacle. Experimental results show satisfactory performance of the method.



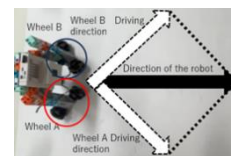
GS4 Robotics (6)

Chair Jiwu Wang (Beijing Jiaotong University, China)

GS4-1 Development and evaluation of a learning support robot for vector learning

Kosei Machida, Shinichi Imai (Tokyo Gakugei University, Japan)

Vectors studied in high school are a new concept that differs from those studied in previous scalars. Therefore, it has been pointed out that difficulties arise in the conceptual formation of vectors. This study aims to develop a learning support robot that can visualize vector information by robot movements, and to acquire vector concepts for students through classroom practice using the robot. The robot operates on a piece of imitation paper, marking the start and end points and connecting them with arrows to visualize the vectors. In a class using the robot, the student predicts the sum of the vectors, and the robot confirms it. A questionnaire was administered before and after the class. The results revealed significantly higher mean values when comparing the pre- and post-assessments.



GS4-2 Feasibility Study on Methods to Measure the Strain on Young Children's Bodies.

Sachiko Kido, Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

This paper investigates the effective methods of measuring the burden on the infant's body. Initially, the "the burden on the body and the lumbar spine burden are the same" was defined. The calculations and comparisons were carried out based on the two methods: the AnyBody Modeling System and the smartphone application Yo-bukun (a lumbar spine burden measurement application). Videos of a five-year-old girl squatting and balancing were filmed, and the lumbar burden was calculated using the AnyBody Modelling System. In addition, while the video was being filmed, an iPhone running the Yo-bukun lumbar burden measurement application was placed close to the heart in order to measure lumbar burden and the amount of burden was calculated. The results were compared with the respective average values and validated.

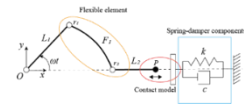


GS4-3 An Integration of Contact Force Models with Multibody Dynamics Analyses for Human Joint Mechanisms and Effects of Viscoelastic Ground Contact

Shintaro Kasai¹, Dondogjamts Batbaatar², Hiroaki Wagatsuma¹

(¹Kyushu Institute of Technology, Japan) (²Mongolian University of Science and Technology, Mongolia)

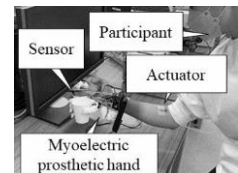
In human movement and rehabilitation analyses, human joint dynamics is a key to consider the incorporation of spring-damper components, flexible bodies and contact forces analytically. In the present study, an analytical method for human gaits were introduced to integrate those essential elements, and viscoelastic properties of musculoskeletal system were modeled with the absolute nodal coordination formula (ANCF) method representing flexible body motions. A contact force model simulates interactions between different body segments and the environment. The proposed system is applied to a slider crank mechanism, demonstrating its capabilities in human joint motion analysis using integrated dynamic model within the framework of multibody dynamics (MBD), which realizes dynamic/inverse dynamics for human biomechanics.



GS4-4 Haptic Sensation Enhancement via the Stochastic Resonance Effect and Its Application to Haptic Feedback for Myoelectric Prosthetic Hands

Yoshitaka Mizumoto, Taro Shibanoki (Okayama University, Japan)

In this paper, we propose a highly realistic haptic feedback method for myoelectric prosthetic hands. Although several haptic feedback methods have been studied, this study attempts to create realistic sensory feedback through prosthetic hands by not only using feedback methods but also by improving the haptic sensation based on the stochastic resonance effect. In the experiment, contact information obtained from a microphone attached to the fingertip of a prosthetic hand was transferred through a vibrotactile stimulator near the elbow socket, and white noise vibration was also applied near the elbow socket to verify the improvement of tactile sensitivity of the fingertips. The results demonstrated the possibility of transmitting tactile information for myoelectric prostheses through sensory enhancement of the user.



GS4-5 PID Parameter Tuning of a Low-Cost DC Motor Speed Control for Mobile Robot Application

Munkh-Erdene Ayurzana, Erkhembayar Gankhuyag, Naranbaatar Erdenesuren, Dondogjamts Batbaata (Mongolian University of Science and Technology, Mongolia)

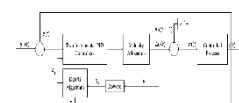
Precise control of DC motors is vital for robotics, industrial automation, and mechatronics. Traditional PID (Proportional-Integral-Derivative) control methods, while widely used, often require offline parameter tuning, which can be time-consuming and suboptimal for real-time applications. This paper proposes a GUI (Graphical User Interface) based approach for PID tuning of a DC motor model. The proposed method utilizes a MATLAB-based parameter estimation model with GUI to continuously monitor and update PID controller parameters based on real-time data from the Arduino-controlled DC motor setup.



GS4-6 Reinforcement Learning DDPG Algorithm Based Wheeled Mobility Aid Robot Control Methods

Junkai Li, Mohd Rizon Mohamad Juhari, Tiang Sew Sun (UCSI University, Malaysia)

Ensuring stability and precise trajectory tracking is crucial when employing wheeled walker robots to enhance mobility for individuals with limited walking ability. We propose a novel trajectory tracking method for wheeled walking robots by combining the Deep Deterministic Policy Gradient (DDPG) algorithm in reinforcement learning with a Proportional Integral Differential (PID) controller. We verify the effectiveness of the research scheme and control strategy through joint simulation experiments. The results demonstrate that the DDPG-based PID controller can automatically adjust parameters to ensure trajectory accuracy and exhibits a strong anti-interference capability.



GS5 Applications I (4)

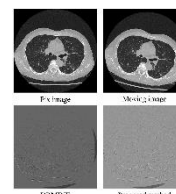
Chair Jiwu Wang (Beijing Jiaotong University, China)

GS5-1 Unsupervised image registration based on Residual-connected DRMINE for diagnostic metastatic bone tumors

Shogo Baba¹, Tohru Kamiya¹, Takashi Terasawa², Takatoshi Aoki²

(¹Kyushu Institute of Technology, Japan), (²University of Occupational and Environmental Health, Japan)

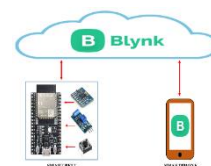
Computed tomography (CT) scans produce more than 100 images in an examination, which imposes a significant burden on radiologists and entails a potential risk of misdiagnosis. In this study, we focus on the preliminary stage of Computer-Aided Diagnosis (CAD) development specialized in bone metastasis extraction, with a particular emphasis on rigid registration. We propose a novel rigid registration technique by augmenting DRMINE, which estimates mutual information using neural networks, with skip connections and normalization. The proposed method was influenced by the capture area, but it indicated the potential to provide stable registration as the standard deviation decreased for all Full Width at Half Maximum (FWHM).



GS5-2 Developing a smart Belt for Monitoring Elderly Activities Based on Multi-Modal Sensors Integration and Internet of Things

Abdul Jalil, Pujianti Wahyuningsih, Najirah Umar, Muhammad Risal, Suwatri Jura, A. Edeth Fuari Anatasya (Universitas Handayani Makassar, Indonesia)

This study aims to develop a smart belt for monitoring elderly activities at home based on the integration of multi-modal sensors and the Internet of Things (IoT). The multi-modal sensors used in this study to collect the elderly information are the IMU sensor, vibration sensor, push-button, and ESP32 to process the data. Furthermore, the IoT framework used to transmit the elderly information data from the smart belt to the family's smartphone is a Blynk. In this study, the smart belt can monitor the elderly activities when walking, sitting down, lying down, and sleeping, after that, can give a security warning when the smart belt detects the elderly doing abnormal activities. This study's results show that the smart belt is effectively used to monitor elderly activities to help families when taking care of the elderly at home.



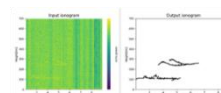
GS5-3 A penalized motion detection model for extracting ionospheric echoes from low signal-to-noise ratio Ionogram video images

Yuu Hiroshige¹, Akiko Fujimoto¹, Akihiro Ikeda², Shuji Abe³, Akimasa Yoshikawa³

(¹Kyushu Institute of Technology, Japan) (²National Institute of Technology, Kagoshima College, Japan)

(³Kyushu University, Japan)

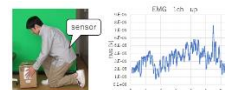
Measuring the altitude distribution of electron density in the upper atmosphere, known as the ionosphere, using High-Frequency radio wave reflections often causes the low signal-to-noise ratio of ionospheric echoes due to radio frequency interference. We propose a model for converting low-signal-to-noise-ratio ionospheric echo video images (Ionogram) into noise-reduced images using image processing techniques, for tracing the ionospheric echoes from Ionogram. The proposed method consists of three processing parts: noise removal optimized for individual Ionogram images, extraction of ionospheric echoes by penalized background subtraction technique, and fine-tuning of ionospheric echo signals using a minimum spanning tree algorithm. The proposed model successfully reproduces fine Ionograms with 98% recall and 99% precision.



GS5-4 Verification Experiments on the Lower Back Burden caused by Posture and Environment during Lifting Operations

Tomoka Kimura, Yutaro Fujino, Sachiko Kido, Praveen Nuwantha Gunaratne, Hiroki Tamura (University of Miyazaki, Japan)

One of the measures to prevent back pain is the use of appropriate posture corrections. In general, the Squat method (method of keeping the knees bent and the waist as straight as possible) is recommended over the Stoop method (method of keeping the knees straight and the waist bent). The results of previous studies using acceleration and muscle potentials have shown that the lifting with knees in a kneeling position reduces the amount of load born by the lower back. However, few studies discuss the case where there is an obstacle between the subject and the object to be lifted and further, the scenarios where the object is away from the body's center of gravity. Therefore, this research focus on analyzing two types of movements using the AnyBody musculoskeletal mechanics analysis software and the Delsys surface EMG and verifying the amount of lower back burden when there is an obstacle between the lifting object and the subject. This paper presents the verification results.



GS6 Applications II (4)

Chair Masayuki Fujiwara (Kyushu Institute of Technology, Japan)

GS6-1 Development of Smartphone Application for Calculating the Low Back Pain Risk

Seigo Imura, Praveen Nuwantha, Hiroki Tamura (University of Miyazaki, Japan)

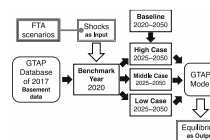
This study primarily relies on a smartphone application, developed within our research institute known as Yo-bukun, for the real-time estimation of lumbar burden. The Yo-bukun is capable of estimating the lumbar burden of a subject (the user) by placing an app. installed smartphone in the subject's chest pocket, while the subject is lifting/relocating an object. The subject's movements are assessed through sensors embedded in the smartphone and certain aspects of their physical information initially fed into the app. are used in the estimation formula for determining lumbar burden. In the current scenario, Yo-bukun lacks the capability to ascertain whether the user is holding an object or not; consequently, it can only estimate the lumbar burden for limited cases of a subject holding an object. To address such limitations, the proposed system integrates voice recognition to facilitate lumbar burden estimation, considering the presence or absence of an object. Further, it was incorporated with the capability to recalculate lumbar burden after measurements, enabling prospective studies.



GS6-2 A Computational Approach for Global Trade Analysis Sensitive to Free Trade Agreement Circumstances: A Case Study Focusing on the Great Mekong Subregion

Ahmad Altaweel¹, Bo-Young Lee², Masayuki Fujiwara¹, Jang-Sok Yoon², Hiroaki Wagatsuma¹
 (¹Kyushu Institute of Technology, Japan) (²Logistics Revolution Korea, Korea)

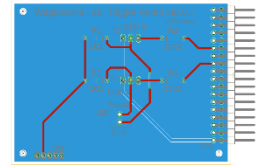
In the Global Trade Analysis Project (GTAP), GDP and economic statistical indices can be analyzed for forecasting future trends of them in multiple countries by using the GTAP database and GEMPACK utilities, which realize the numerical calculation based on the concept of Computable General Equilibrium (CGE) models. Even by such well-prepared tools with the official database, an appropriate forecasting is still difficult due to the sensitivity to Free Trade Agreement (FTA) circumstances. FTA scenarios with a uniform tariff reduction can be assumed in general, while an abrupt and unreasonable change may occur in the simulation depending on the network structure of trading countries and upper and lower bounds of tariffs in the time course. In the present study, we focused on the Great Mekong subregion (GMS) and explored possible methods to calculate substantially.



GS6-3 Trigger circuit design and system integration for simultaneous measurement of human EEG, motion, and gaze

Masayuki Fujiwara¹, Phan Hoang Huu Duc¹, Laurent Bougrain², Patrick Hénaff², Hiroaki Wagatsuma¹
(¹Kyushu Institute of Technology, Japan) (²Université de Lorraine, France)

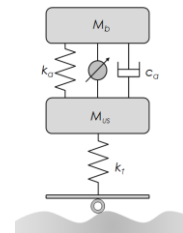
The simultaneous measurement of human EEG, motion, and gaze has the potential to lead to the discovery of new scientific insights. In order to achieve these simultaneous measurements, it is necessary to manage triggers and time information between measurement devices, as well as to correct time offsets. However, the management of accurate triggers and time information requires the design of a dedicated circuit board and the integration of TTL signal voltage information. In this study, we report on the fabrication of a trigger circuit and an experimental system using it to solve these problems. We created a home-made trigger circuit board for voltage integration and combined it with a commercially available microcomputer to realize an integrated trigger circuit and measurement system.



GS6-4 Terminal Synergetic Controller for Car's Active Suspension System Using Dragonfly Algorithm

Tinnakorn Kumsaen¹, Sorn Simatrang², Arsit Boonyaprapasorn³, Thunyaseth Sethaput⁴
(¹Khon Kaen University, Thailand) (²Nacres Co., Ltd, Thailand) (³Chulachomkloa Royal Military Academy, Thailand) (⁴Thammasat University, Thailand)

This research introduces a terminal synergetic controller (TSC) designed for the active suspension system of automobiles through the implementation of the dragonfly algorithm (DA). The proposed controller aims to enhance the dynamic performance of a car's suspension using the DA in tuning the system parameters. The stability of the designed controller is proved through the application of Lyapunov stability theory. Through iterative optimization processes, the TSC approach seeks to achieve an optimal balance between ride comfort and vehicle handling. The simulation results demonstrate that the proposed controller enhances convergence properties and alleviates the presence of chattering. The results indicate that the proposed approach with the optimal parameters provided insights into its potential application in improving the overall suspension system.



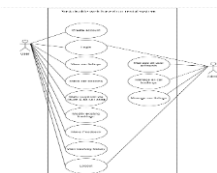
GS7 Applications III (6)

Chair Kasthuri Subaramaniam (UCSI University, Malaysia)

GS7-1 Rehabilitating Flood-Damaged Cars for Sustainable Car Rental Services: A Web-Based System

Pon Xiao Qi, Abdul Samad Shibghatullah, Kasthuri Subaramaniam (UCSI University, Malaysia)

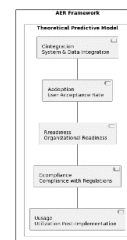
The web-based system aims to redefine transportation norms by unlocking the potential of flood-damaged cars. It seeks to reutilize these cars, providing affordable and sustainable transportation options while minimizing landfill waste. The system development approach that the researcher used for this system is Rapid Application Development (RAD) Model. The reason that the researcher chose this methodology is because it enables her to develop the system under limited time while ensuring the quality of the system. There is four stages in Rapid Application Development (RAD) methodology life cycle, which is requirement planning phase, user design phase, rapid construction phase and cutover phase.



GS7-2 Optimizing E-Invoicing Rollout: Adaptive E-Invoicing Rollout (AER) Framework for Navigating Malaysia's Digital Transformation

Koh Chee Hong, Abdul Samad Shibghatulla (UCSI University, Malaysia)

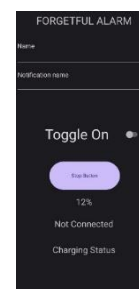
This study presents the Adaptive E-Invoicing Rollout (AER) Framework, developed to guide Malaysia's impending e-Invoicing mandate. It is crafted through a meticulous literature review and expert consensus, highlighting crucial variables such as integration capability, adoption rate, readiness, and compliance. These elements are central to the predictive model, designed to forecast and facilitate successful e-Invoicing implementation. The findings from our extensive review and model application confirm the framework's effectiveness in diverse business environments, demonstrating its adaptability and strategic value. The AER Framework significantly contributes to digital finance strategies, providing an innovative, empirically based tool for not only Malaysia but also other regions in the globe pursuing digital economic transformations.



GS7-3 App Alert System for Smart Phones

Chee Kin Hoe, Kasthuri Subaramaniam, Abdul Samad Shibghatullah (UCSI University, Malaysia)

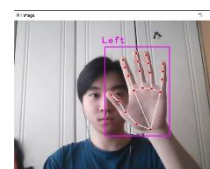
This development is to develop a prototype mobile app that notifies the user to take their phones after shutting down the car. This development is being done to gather feedback from participants who frequently forget to take their phones such as dementia sufferers, careless youngsters and users who park in a dark space. As for the results of the survey, it was extensively researched and analyzed to find out the problems and requirements of users for the app. For the methodology, after extensive consideration the researcher decided to use Modified Waterfall model a derivative from the famous waterfall model. The main factors that influenced the decision is the suitability of the methodology, the confidence of the researcher to use the methodology and the time constraint to develop the app. There are 6 phases in the modified waterfall model which are Requirement Analysis, System Design, Implementation, Testing, Deployment and Maintenance. After developing the app, the user acceptance test was done to see whether how the general public would accept the app. For the result, the app was accepted by most of the participants and they would like the researcher to do further development to improve and maintain the app. Based on the results of the development the researcher can conclude that this app can benefit users in helping them to remember to take their phones from their car. Rather than using the old fashion way which is remember to take the phone. With this app, user can rest assured as they will be always be reminded to take their phones from their car.



GS7-4 Developing Hand Gesture Recognition System in Interpreting American Sign Language

Kong Seh Chong, Kasthuri Subaramaniam, Ismail Ahmed Al-Qasem Al-H (UCSI University, Malaysia)

This research is going to study and gather more information on the hand gesture recognition system in order to bridge the communication between non-signers and signers by implementing the sign language into the system. The system may help people with physical disabilities such as deaf, mute and etc, to have an efficient and direct communication with others without the needs of interpreters. Through the studying of the hand gesture recognition system, there are two main frameworks which are OpenCV and MediaPipe that hold significant value in the system as it is mostly used in computer vision related problem. With this system developed, it can help many signers to avoid the problem of indirect interaction and also enable those who want to learn sign language by practicing hand gesture through the system. The system development approach that the researcher used for this system is Agile Methodology. The reason that the researcher chooses this methodology is because the development of this system mostly deals with the datasets as well as the accuracy of the detection and recognition of hand gestures. Hence, an ability to adapt to changes of agile methodology is needed if there are any problems happen in the system. There are seven of the stages in Agile Methodology life cycle, which are planning phase, designing phase, implementation phase, testing phase, deployment phase, review phase and launch phase. All these seven phases of the Agile methodology will be having some deliverables as their output.



GS7-5 Miniature Enterprise Resource Planning

Adim Khalid Aldirejah, Kasthuri Subaramaniam, Ghassan Saleh (UCSI University, Malaysia)

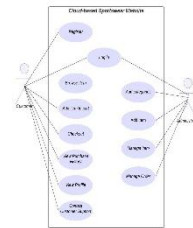
Organizations aim for maximum efficiency, acquiring a competitive edge, and quickly completing their goals in today's competitive business environment. The achievement of these business objectives depends heavily on enterprise resource planning (ERP). ERP is a software program that combines several elements needed for a company's administration and operation, spanning several sectors like supply chain management, manufacturing, and finance. ERP makes work easier, saves time and money, and gives managers operational insights by automating corporate activities within a single platform. As a result, ERP has become essential for businesses of all sizes that want to advance and maintain their position as industry leaders. This research proposal intends to analyze the key traits, implementation concerns, and challenges associated with ERP systems while also outlining potential fixes. By creating a convenient and affordable mini-ERP solution, the initiative further intends to increase the accessibility of ERP systems to small and medium-sized enterprises (SMEs). The study of current ERP systems, their development, and their advantages and disadvantages will form the basis of the research. It will also investigate the difficulties SMEs have in using common ERP solutions.



GS7-6 Developing Cloud-based Sportswear Website

Lim Wei Yee, Kasthuri Subaramaniam, Raenu Kolandaisamy (UCSI University, Malaysia)

This research is going to develop a cloud-based sportswear website that can handle high volumes of traffic during events or seasonal sales, assist customers in selecting the right size for their sportswear, the interface should have options, size charts, fitting instructions, and recommendations. A study on the existing system will be conducted, design, develop and evaluate on the sportswear website also will be carried out. The system development approach used on this website is Rapid Application Development (RAD) model. The reason to choose RAD is because this method is time efficient, flexibility and adaptability. With RAD, functional software is delivered quickly. We can quickly build prototypes, iterate on them, and gather feedback from stakeholders with a website project. There are four of the steps in Rapid Application Development (RAD) methodology life cycle, which is define the requirements, prototypes, rapid construction and feedback gathering, and cutover.



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]			Altaweel	Ahmad	GS6-2	42/110
A.	Ridzuan	OS6-4	43/61	Amano	Koki	OS20-1	29/82
		OS7-1	31/62			OS20-2	29/82
		OS7-2	31/62	Ancilla	Gabriela Maria	OS18-5	40/79
		OS7-3	31/62	Ang	Aun Jie	OS25-1	47/93
		OS7-4	31/63	Ang	Chun Kit	OS26-7	46/99
A.B.	Ayu Haslija	OS25-6	48/95			OS26-9	46/99
A. Edeth Fuari	Anatasya	GS5-2	36/109	Ang	Koon Hian	OS26-7	46/99
Abbyasov	Bulat	OS11-4	47/69	Ang	Koon Meng	OS26-7	46/99
Abdullah	Nor Fazilah	OS25-9	48/96	Aoki	Takatoshi	GS5-1	36/109
Abe	Shuji	GS5-3	37/109	Ahmed	Ismail	OS18-7	40/79
Abdul Jalil		GS5-2	36/109	Arof	Hamzah	OS21-3	42/87
Abdullah	Nor Fazilah	OS25-2	48/94	Ashra	Dina	OS6-5	43/61
		OS25-4	48/94	Ayurzana	Munkh-Erdene	GS4-5	24/108
Aburada	Kentaro	OS9-2	22/65	Azizan	Muhammad	OS23-1	24/90
		OS9-3	22/65		Azizi		
		OS9-4	22/65			OS23-2	24/90
Aiman Rosol	Ahmad Haziq	OS21-3	42/87			OS23-3	24/91
Al-Hadi	Ismail Ahmed	GS7-4	49/112			OS23-4	24/91
Al-Qasem	Al- Ismail Ahmed	OS18-5	40/79			OS23-5	24/91
	Hadi						
Al shaikh	Yazan Abu	OS25-3	48/94	[B]			
Al-Talib	Ammar A.	OS25-1	47/93	B.	Shakthi	OS18-3	40/78
		OS25-2	48/94	Baba	Shogo	GS5-1	36/109
		OS25-3	48/94	Bari Shital	Sabrina	OS22-7	38/89
		OS25-4	48/94	Batbaatar	Dondogjamts	GS4-3	24/108
		OS25-5	48/95			GS4-5	24/108
		OS25-6	48/95	Bi	Yanchao	OS13-1	26/71
		OS25-7	48/95	Biki	Bidesh Biswas	OS22-6	38/89
		OS25-9	48/96			OS22-7	38/89
Aldireejah	Adim Khalid	GS7-5	49/113	Boonyaprapasorn	Arsit	GS6-4	42/111
Ali	Hashimah	OS21-2	41/87	Bougrain	Laurent	GS6-3	42/111
Ali	Nur Izzati	OS25-8	48/96				
Alexeev	Alexander	OS11-1	47/68	[C]			

Cao	Jing	GS2-5	23/106			OS23-2	24/90
Celiker	Baris	OS10-1	28/66			OS23-3	24/91
Chang	Heng-En	OS5-3	39/59			OS23-4	24/91
Chang	Meng-Wei	OS1-4	21/52			OS23-5	24/91
Chang	Yun-Hao	OS1-2	21/51	Dhanush	R.	OS18-2	40/78
		OS1-4	21/51	Dobrokvashina	Alexandra	OS10-6	28/67
Chang	Zhencheng	OS4-8	44/57	Du	Jiacheng	OS26-2	45/97
		OS4-9	44/58	Duan	Suqing	OS13-3	26/71
Chebotareva	Elvira	OS11-3	47/68			OS13-6	26/72
Chen	Chih-Hung	OS1-6	21/52	Dudorov	Evgeny	OS5-6	39/60
Chen	Nai-Yu	OS1-1	21/51	Duvacher	Maxime	OS6-3	43/61
		OS1-5	21/52				
Chen	Yao	OS26-2	45/97	[E]			
Chen	Yi-Wei	OS5-1	38/58	Edgar A.	Martínez-	OS5-5	39/59
Chen	Yu-Le	OS5-2	38/58		García		
Cheng	Jiale	OS13-1	26/71			OS11-1	47/68
Chiong	Meng Choung	OS26-10	46/100	Elshaikh	Mohamed	OS21-2	41/87
Chong	Kim Soon	OS6-2	43/60	Elamvazuthi	Irraivan	OS6-4	43/61
		OS26-3	45/97	Era	Junya	OS20-10	30/84
		OS26-4	45/98	Erdenesuren	Naranbaatar	GS4-5	24/108
		OS26-5	45/98	Eremin	Alexander	OS10-5	28/67
		OS26-6	45/98	Eryomin	Alexander	OS5-6	39/60
		OS26-7	46/99				
		OS26-8	46/99	[F]			
Chong	Kong Seh	GS7-4	49/112	Fadilla	Reno	OS14-3	36/74
Chong Jun	Esther	OS18-7	40/79	Faizullin	Ramil	OS5-5	39/59
Lynn				Fan	Jingzhen	OS26-11	46/100
Chou	Pei-Wen	OS1-1	21/51	Fan	Wenzhuo	OS26-1	45/97
		OS1-5	21/52	Fu	Wenqi	OS13-5	26/72
Chuang	Li-Min	OS1-6	21/52	Fuengfusin	Ninnart	OS15-1	22/74
				Fujimoto	Akiko	GS5-3	37/109
[D]				Fujinaga	Takuya	OS20-14	31/86
D. Ahmad	Aeryn	OS21-3	42/87			OS20-15	31/86
Dai	Fengzhi	OS2-1	25/52	Fujino	Kazuma	OS12-1	34/70
		OS2-3	25/53	Fujino	Yutaro	GS5-4	37/110
Daimaru	Yoshiyuki	OS20-9	30/84	Fujiwara	Masayuki	GS6-2	42/110
Darusman	Abu Hassan	OS6-4	43/61			GS6-3	42/111
Desa	Hazry	PS2	20/50	Furukawa	Tomoyasu	OS20-10	30/84
		OS23-1	24/90			OS20-11	30/85

Fxyrna	Hiroki	OS27-5	33/102			OS25-9	48/96
						OS26-10	46/100
[G]				Hasebe	Kodai	OS22-6	38/89
Gamberov	Timur	OS10-3	28/66			OS22-7	38/89
		OS11-4	47/69			OS22-8	38/90
Gankhuyag	Erkhembayar	GS4-5	24/108	Hattori	Shimon	OS17-2	32/77
Gao	Yuxuan	OS24-3	20/92			OS17-3	32/77
Gong	Haoran	OS3-8	27/55	Hattori	Mai	OS17-5	32/78
		OS3-9	28/55	Hattori	Tetsuo	OS17-2	32/77
Gong	Ying	OS4-3	44/56			OS17-3	32/77
Gonzales	Andrea Tantay	OS18-1	40/78			OS17-4	32/77
Goto	Kanya	GS2-1	23/105			OS17-5	32/78
Gunaratne	Praveen	GS1-2	34/103	Hayashi	Eiji	OS16-1	39/75
		GS1-3	34/103			OS16-2	39/76
		GS1-4	35/104			OS16-3	39/76
		GS1-5	35/104			OS16-4	40/76
		GS1-6	35/104			OS20-12	30/85
		GS4-2	23/107	Hayashi	Takamasa	OS16-2	39/76
		GS5-4	37/110			OS16-4	40/76
		GS6-1	42/110	Hayashi	Toshihiro	OS17-5	32/78
Guo	Jr-Hung	OS5-1	38/58	He	Hao	OS2-3	25/53
						OS3-3	27/54
						OS3-4	27/54
[H]							
Hamakawa	Fumito	OS22-5	37/89	Hénaff	Patrick	GS6-3	42/111
		OS22-6	38/89	Hidayab	Muzaiyanah	OS6-2	43/60
		OS22-7	38/89	Hieda	Hiroo	OS12-1	34/70
		OS22-8	38/90	Hiroshige	Yuu	GS5-3	37/109
Hamasuna	Ota	OS22-5	37/89	Hiramitsu	Tatsuhiro	OS14-3	36/74
		OS22-6	38/89	Hiraoka	Toru	GS2-1	23/105
Haque	Ashraful	OS25-8	48/96			GS2-2	23/105
Harada	Kensuke	OS14-1	36/73	Hoe	Chee Kin	GS7-3	49/112
		OS14-2	36/73	Hoh	Ian	OS25-6	48/95
Hassan	Cik Suhana	OS7-1	31/62	Hong	Koh Chee	GS7-2	49/112
		OS7-2	31/62	Hong	L. Y.	OS23-3	24/91
		OS7-3	31/62	Hori	Yoshiki	OS16-1	39/75
		OS7-4	31/63	Hsia	Kuo-Hsien	OS5-2	38/58
		OS25-1	47/93			OS11-6	47/69
		OS25-4	48/94	Hu	Mengyuan	OS4-5	44/57
		OS25-5	48/95	Huang	Mei	OS8-5	36/64

Huang	Jiawei	OS20-4	29/83	Ito	Takao	OS21-1	41/86
Huang	Yuankui	OS26-11	46/100			OS22-4	37/89
Huang	Yumei	OS3-8	27/55			OS22-7	38/89
		OS3-9	28/55			OS22-8	38/90
		OS4-8	44/57	Ito	Tsutomu	OS22-7	38/89
		OS4-9	44/58			OS22-8	38/90
Huang	Zehan	OS26-2	45/97	Iwabu	Ami	GS1-7	35/104
Hung	Chung-Wen	OS5-3	39/59				
		OS5-4	39/59	[J]			
Hussain	A. -S. T.	OS23-4	24/91	Jamaludin	Farah Adilah	OS25-10	49/96
		OS23-5	24/91			OS26-10	46/100
Hussin	Eryana	OS25-8	48/96	Jamil	Md Shafayet	GS1-2	34/103
				Jelban	Ahmad	OS25-4	48/94
[I]				Jia	Yingmin	OS8-1	35/63
Ikeda	Akihiro	GS5-3	37/109			OS8-4	36/64
Ikeda	Satoshi	OS22-4	37/87	Jiao	Jianhao	OS4-4	44/56
		OS22-5	37/89	Jothi	Neesha	OS18-1	40/78
		OS22-6	38/89			OS18-7	40/79
		OS22-7	38/89	Jung	Jae Hyung	GS1-8	35/105
		OS22-8	38/90				
Imai	Shinichi	GS4-1	23/107	[K]			
Imai	Yoshiro	OS17-5	32/78	K.	Indraah	OS18-8	41/80
Imura	Seigo	GS6-1	42/110			OS18-9	41/80
Ishak	Nurfadzillah	OS23-1	24/90			OS18-10	41/80
		OS23-2	24/90			OS18-11	41/81
Ishigami	Ryoichi	OS9-1	22/64	Kaishita	Wataru	OS20-10	30/84
Ishii	Kazuo	OS20-3	29/82	Kakinoki	Kanta	OS9-4	22/65
		OS20-4	29/83	Kamoda	Yohei	OS27-3	33/101
		OS20-5	29/83	Kamei	Keiji	OS20-9	30/84
		OS20-6	30/83	Kamiya	Tohru	GS1-1	34/103
		OS20-13	31/85			GS5-1	36/109
		OS20-14	31/86	Kanaoka	Daiju	OS15-4	23/75
Ishikawa	Seiji	GS3-3	25/107	Kang	Jinwu	OS24-4	21/93
Ishiwata	Yoshinobu	OS27-2	33/101			OS24-5	21/93
		OS27-4	33/101	Kasai	Shintaro	GS4-3	24/108
Islamova	Renata	OS11-2	47/68	Katayama	Daigo	OS20-14	31/86
Isomoto	Kosei	OS15-3	22/74	Katayama	Tetsuro	OS9-1	22/64
		OS15-4	23/75			OS9-2	22/65
Isozaki	Hideo	OS12-4	34/70			OS9-3	22/65

		OS9-4	22/65	Kong	De Kang	OS25-10	49/96
Kawaguchi	Akira	OS16-3	39/76	Koshiba	Mamiko	OS12-1	34/70
Kawahara	Tomorou	OS20-9	30/84	Kotani	Naoki	OS12-3	34/70
Kawakami	Yusuke	OS17-2	32/77	Kouno	Naoki	GS2-1	23/105
		OS17-3	32/77	Koyama	Yoshihiro	OS16-3	39/76
		OS17-4	32/77	Kuan	Chyntia	OS25-7	48/95
Kawashima	Mizuki	OS15-6	23/75	Kudo	Akihiro	OS22-2	37/88
Khan	M.K.A Ahamed	OS6-1	43/60			OS22-3	37/88
		OS6-2	43/60	Kumar	Prashant	OS14-2	36/73
		OS6-3	43/61	Kumsaen	Tinnakorn	GS6-4	42/111
		OS6-4	43/61	Kuremoto	Shun	OS12-1	34/70
		OS6-5	43/61	Kuremoto	Takashi	OS12-1	34/70
		OS7-1	31/62	Kurogi	Shuichi	OS22-5	37/89
		OS7-2	31/62	Kuroki	Karin	GS2-2	23/105
		OS7-3	31/62	Kyasudeen	Muhammad	OS21-1	41/86
		OS7-4	31/63		Farris		
		OS26-9	46/99				
		OS26-10	46/100	[L]			
Kido	Sachiko	GS4-2	23/107	Lai	Chun-Chi	OS5-2	38/58
		GS5-4	37/110	Lai	Wei Kang	OS26-3	45/97
Kim	Tae Ihn	GS1-8	35/105			OS26-4	45/98
Kimura	Kenji	OS20-6	30/83			OS26-5	45/98
		OS20-7	30/83			OS26-6	45/98
		OS20-8	30/84	Lavrenov	Roman	OS10-6	28/67
Kimura	Tomoka	GS5-4	37/110			OS11-5	47/69
Kita	Yoshihiro	OS9-2	22/65	Lee	Bo-Young	GS6-2	42/110
		OS9-3	22/65	Lee	L. J.	OS23-5	24/91
		OS9-4	22/65	Li	Chu-Fen	OS1-3	21/51
Kitamura	Kentarou	GS1-7	35/104	Li	Fangyan	OS3-1	27/53
Kitazumi	Shun	GS2-4	23/106	Li	Guandong	OS26-11	46/100
Koh	Pei Cong	OS18-6	40/79	Li	Haibo	OS13-8	26/72
Kolandaisamy	Raenu	GS7-6	49/113	Li	Hongbing	OS11-4	27/69
		OS18-8	41/80	Li	Huahao	OS4-1	44/56
		OS18-9	41/80	Li	Jung-Shian	OS1-1	21/51
		OS18-10	41/80			OS1-2	21/51
		OS18-11	41/81			OS1-3	21/51
		OS18-12	41/81			OS1-4	21/51
Kolin	Nikita	OS11-3	47/68			OS1-5	21/52
Komori	Ryohei	OS20-12	30/85	Li	Junkai	GS4-6	24/108

Li	Lin	OS8-5	36/64	M Noor	Muhammad	OS21-1	41/86
Li	Mingxuan	OS4-8	44/57		Badri		
		OS4-9	44/58	M.Tahir	Noor Idayu	OS25-1	47/93
Li	Mingyue	OS4-4	44/56			OS25-2	48/94
Li	Na	OS24-4	21/93			OS25-3	48/94
Li	Zixin	OS24-3	20/92			OS25-4	48/94
Liang	Xin	OS13-4	26/71			OS25-5	48/95
Lim	Tiong Hoo	OS26-8	46/99			OS25-6	48/95
		OS26-9	46/99			OS25-7	48/95
Lim	Wei Hong	OS6-1	43/60	Ma	Dongpo	OS13-9	26/73
		OS6-3	43/61			OS13-10	27/73
		OS26-2	45/97	Ma	Shuangshuang	OS2-1	25/52
		OS26-3	45/97	Mabu	Shingo	OS12-1	34/70
		OS26-4	45/98	Machida	Kosei	GS4-1	23/107
		OS26-5	45/98	Magid	Evgeni	OS5-5	39/59
		OS26-6	45/98			OS5-6	39/60
		OS26-7	46/99			OS10-2	28/66
		OS26-8	46/99			OS10-4	28/67
		OS26-9	46/99			OS11-1	47/68
		OS26-10	46/100			OS11-4	47/69
		OS26-11	46/100			OS11-6	47/69
Lim	Wei Yee	GS7-6	49/113	Mahmoud E.A.	Zeiad	OS25-5	48/95
Liu	Chun-Liang	OS5-4	39/59	Marco	Rozilyn	OS14-2	36/73
Liu	Fangyv	OS2-3	25/53	Matoba	Osamu	OS17-2	32/77
		OS3-3	27/54			OS17-3	32/77
		OS3-4	27/54	Matsumoto	Sho	OS9-1	22/64
Liu	I-Hsien	OS1-1	21/51	Mazher	Moona	OS7-1	31/62
		OS1-2	21/51			OS7-2	31/62
		OS1-3	21/51			OS7-3	31/62
		OS1-4	21/51			OS7-4	31/63
		OS1-5	21/52	Mei	Yuping	OS3-5	27/54
Liu	Mengda	OS4-7	44/57			OS3-6	27/55
Liu	Yi-Ting	OS5-2	38/58			OS3-7	27/55
Liu	Yufei	OS20-3	29/82	Meng	Tianbin	OS24-1	20/92
Lu	Yuhao	OS26-11	46/100	Minato	Gaku	OS20-2	29/82
Lv	Lei	OS13-4	26/71	Mirzoian	Viktoriiia	OS10-4	28/67
				Mitsuyama	Fuga	GS1-1	34/103
[M]				Mizoe	Eiji	OS20-10	30/84
						OS20-11	30/85

Mizutani	Akinobu	OS15-2	22/74	Nakamura	Akira	OS14-1	36/73
		OS15-4	23/75	Nakamura	Jun	OS27-2	33/101
Mizumoto	Yoshitaka	GS4-4	24/108			OS27-3	33/101
Mo	Lipo	OS8-4	36/64			OS27-4	33/101
Mohamed	Rizon	GS4-6	24/108	Nakashima	Riku	GS1-6	35/104
Mohammad	Ilyas	OS26-3	45/97	Narayanan	Ganesh	OS18-4	40/79
Arif				Niederer	Steven	OS7-1	31/62
		OS26-4	45/98			OS7-2	31/62
		OS26-5	45/98			OS7-3	31/62
		OS26-6	45/98			OS7-4	31/63
Mokayef	Mastaneh	OS6-1	43/60	Nishida	Naoya	OS20-11	30/85
		OS6-2	43/60	Nishida	Yuya	OS20-13	31/85
		OS6-3	43/61	Noor	Rayan	OS26-8	46/99
		OS6-4	43/61	Mohammed	Mohammed		
		OS6-5	43/61	Bakhit			
		OS7-1	31/62	Nur	Afifi	OS25-6	48/95
		OS7-2	31/62	Muhammad			
		OS7-3	31/62				
		OS7-4	31/63	[O]			
		OS26-2	45/97	Ogata	Takashi	OS27-1	33/100
		OS26-3	45/97	Ogawa	Shintaro	OS16-2	39/76
		OS26-6	45/98			OS16-4	40/76
Mokhtar	Norrima	OS18-6	40/79	Ohno	Asako	OS17-5	32/78
		OS21-1	41/86	Ohara	Makoto	OS12-4	34/70
		OS21-3	42/87	Ohe	Kaoru	OS22-1	37/88
Moribe	Ichirou	GS3-2	25/106			OS22-5	37/89
Moshkin	Vladimir	OS5-6	39/60			OS22-6	38/89
Muhammad		GS5-2	36/109	Okawachi	Yuto	OS16-2	39/76
Risal						OS16-4	40/76
Muthusamy	Hariharan	OS21-2	41/87	Okazaki	Naonobu	OS9-2	22/65
Mustapha	Ain Atiqa	OS25-3	48/94			OS9-3	22/65
		OS25-4	48/94			OS9-4	22/65
		OS25-7	48/95	Okuda	Haruhisa	PS3	29/50
Mustafin	Maksim	OS10-4	28/67	Onaga	Haruki	OS9-2	22/65
				Ono	Jumpei	OS27-1	33/100
[N]				Ooba	Miki	GS2-3	23/105
Nagayoshi	Masato	OS12-2	34/70	Oshima	Tatsuya	OS22-1	37/88
Naito	Yuka	OS27-2	33/101	Ozaki	Tomoaki	PS1	20/50
Najirah Umar		GS5-2	36/109				

[P]				Rahman	Hameedur	OS26-9	46/99
Pak	Alexander	OS10-5	28/67			OS26-10	46/100
Pan	Li	OS26-8	46/99	Rajagopal	Heshalini	OS18-3	40/78
Paramasivam	Sivajothi	OS6-5	43/61			OS18-5	40/79
Park	Chan Gook	GS1-8	35/105			OS18-6	40/79
Patan	R.	OS23-4	24/91			OS18-8	41/80
Peng	Bo	OS26-2	45/97			OS18-9	41/80
Peng	Tzu-En	OS1-2	21/52			OS18-10	41/80
		OS1-4	21/51			OS18-11	41/81
Peng	Yizhun	OS13-1	26/71			OS18-12	41/81
		OS13-2	26/71			OS21-1	41/86
		OS13-3	26/71	Rajagopal	Renuka	OS18-3	40/78
		OS13-4	26/71	Rajapakse	R.P.C. Janaka	OS17-4	32/77
		OS13-5	26/72	Ramis	Kulmukhametov	OS11-6	47/69
		OS13-6	26/72	Rathinam	Manoj	OS18-3	40/78
		OS13-7	26/72	Razzak	Imran	OS7-1	31/62
		OS13-8	26/72			OS7-2	31/62
		OS13-9	26/73	Ren	Xiang	OS2-4	25/53
		OS13-10	27/73			OS2-5	25/53
Permyakov	Alexander	OS5-6	39/60	Riajuliislam	MD	OS22-7	38/89
Phan	Duc	GS6-3	42/111	Rizwan	Amar	OS25-1	47/93
Phiri	Gershom	OS6-1	43/60			OS25-3	48/94
Pramanta	Dinda	OS15-1	22/74				
Pujianti		GS5-2	36/109	[S]			
Wahyuningsih				S	Amutha	OS18-2	40/78
				S	Akshay	OS18-3	40/78
[Q]				Sadyiko c a	Karina	OS11-5	47/69
Qi	Pon Xiao	GS7-1	49/111	Safin	Ramil	OS10-2	28/66
Qin	Jianfeng	OS13-7	26/72			OS11-6	47/69
Qayyum	Abdul	OS6-1	43/60	Sakamoto	Makoto	OS22-2	37/88
		OS6-2	43/60			OS22-3	37/88
		OS6-3	43/61			OS22-4	37/89
		OS6-5	43/61			OS22-5	37/89
		OS7-1	31/62			OS22-6	38/89
		OS7-2	31/62			OS22-7	38/89
		OS7-3	31/62			OS22-8	38/90
		OS7-4	31/63	Salman	Riham	OS11-2	47/68
				Sendari	Siti	OS21-1	41/86
[R]				Saleh	Ghassan	OS18-6	40/79

Saruchi	Sarah Atifah	OS25-1	47/93	Sugimoto	Taiki	OS27-4	33/101
		OS25-2	48/94	Sulaiman	Shifa	OS10-1	28/66
		OS25-3	48/93			OS11-2	47/68
Saw	D. Wen	OS23-4	24/91	Summakieh	MHD Amen	OS6-1	43/60
Seino	Satoko	OS16-2	39/76			OS6-2	43/60
		OS16-4	40/76			OS6-3	43/61
Seki	Hiroaki	OS14-3	36/74			OS6-5	43/61
Saleh	Ghassan	OS18-12	41/81	Sumoto	Yuta	GS1-5	35/104
		GS7-5	49/113	Sun	Haozhe	OS3-2	27/54
Sethaput	Thunyaseth	GS6-4	42/111	Sun	Xun	OS26-1	45/97
Shang	Xueqiang	OS24-2	20/92	Sun	Yizhe	OS13-8	26/72
Sharma	Abhishek	OS26-7	46/99	Sun	Yucheng	OS24-4	21/93
		OS26-8	46/99	Sun	Zhongheng	OS26-1	45/97
Shen	Chua Huang	OS6-2	43/60	Suwatri Jura		GS5-2	36/109
Shi	Puwei	OS20-5	29/83	Suzuki	Katsuaki	OS20-13	31/85
Shiba	Tomoya	OS15-3	22/74	Suzuki	Yasuhiro	OS19-1	37/81
		OS15-5	23/75			OS19-2	37/81
Shibghatullah	Abdul	GS3-1	25/106			OS19-3	37/82
		GS7-1	49/111	Syulistyo	Arie Rachmad	OS15-1	22/74
		GS7-2	49/112			OS15-2	22/74
		GS7-3	49/112				
Shibanoki	Taro	GS4-4	24/108	[T]			
Shirley	Glaret	OS18-8	41/80	T.	Y. Hui	OS25-7	48/95
Sinnappan				Tabuchi	Ryosuke	OS22-1	37/88
		OS18-9	41/80	Takagi	Tomohiko	OS9-1	22/64
Simatrang	Sorn	GS6-4	42/111	Takahashi	Hirokazu	OS12-1	34/70
Stephen John	Reuben	OS18-2	40/78	Takakura	Shota	OS9-3	22/65
Soesilo	Taufik	GS1-4	35/104	Takano	Youta	OS20-7	30/83
Spektor	Ilya	OS10-2	28/66			OS20-8	30/84
Su	Ying	OS3-5	27/54	Takei	Amane	OS22-2	37/88
		OS3-6	27/55			OS22-3	37/88
		OS3-7	27/55			OS22-5	37/89
Subaramaniam	Kasthuri	GS7-1	49/111			OS22-6	38/89
		GS7-3	49/112			OS22-7	38/89
		GS7-4	49/112			OS22-8	38/90
		GS7-5	49/113	Takemura	Kakeru	OS22-5	37/89
		GS7-6	49/113			OS22-6	38/89
Sugikawa	Satoshi	OS12-3	34/70	Takemura	Yasunori	OS20-10	30/84
Sugimoto	Kazuhide	OS22-6	38/89			OS20-11	30/85

Takeoka	Kenta	OS12-3	34/70			GS3-2	25/106
Tamaki	Hisashi	OS12-2	34/70			GS3-3	25/107
Tamukoh	Hakaru	OS15-1	22/74	Terasawa	Takashi	GS5-1	36/109
		OS15-2	22/74	Tew	Hwa Hui	OS25-2	48/94
		OS15-3	22/74	Thamadharan	Kavitha	OS18-1	40/78
		OS15-4	23/75	Thota	Tejaswini	OS18-2	40/78
		OS15-5	23/75	Tian	Shaokai	OS13-5	26/72
Tamura	Hiroki	GS1-2	34/103	Tiang	Sew Sun	GS4-6	24/108
		GS1-3	34/103			OS6-1	43/60
		GS1-4	35/104			OS6-3	43/61
		GS1-5	35/104			OS26-2	45/97
		GS1-6	35/104			OS26-3	45/97
		GS4-2	23/107			OS26-4	45/98
		GS5-4	37/110			OS26-5	45/98
Tan	Chi Jie	GS6-1	42/110			OS26-6	45/98
		OS16-2	39/76			OS26-7	46/99
		OS16-4	40/76			OS26-8	46/99
Tan	Jia Wei	OS26-3	45/97			OS26-9	46/99
		OS26-4	45/98			OS26-10	46/100
		OS26-5	45/98	Ting	Tin Chang	OS26-9	46/99
		OS26-6	45/98			OS26-10	46/100
Tan	Rodney	OS25-1	47/93	Titan	Janthori	OS16-2	39/76
		OS25-10	49/96			OS16-4	40/76
Tanaka	Takeshi	OS17-5	32/78	Tominaga	Ayumu	OS16-2	39/76
Tanaka	Toshiki	OS17-1	32/77			OS16-4	40/76
		OS17-2	32/77			OS20-12	30/85
		OS17-3	32/77	Tominaga	Moeko	OS20-10	30/84
Tanaka	Yuichiro	OS15-2	22/74			OS20-11	30/85
		OS15-4	23/75			OS20-14	31/86
Tanev	Ivan	OS17-1	32/77	Tomioka	Toyoaki	OS22-4	37/89
Taniguchi	Rie	OS19-3	37/82	Too	Kok Sem	OS25-9	48/96
Tanveer	M. H.	OS23-3	24/91	Tsoy	Tatyana	OS5-5	39/59
		OS23-4	24/91			OS10-1	28/66
		OS23-5	24/91			OS10-3	28/66
Taniguchi	Yasutaka	OS20-1	29/82			OS10-5	28/67
		OS20-2	29/82			OS11-1	47/68
Tanjo	Yui	GS2-3	23/105			OS11-2	47/68
		GS2-4	23/106			OS11-6	47/69
		GS2-5	23/106	Tsuji	Tokuo	OS14-3	36/74

				Wang	Xiaolong	OS24-4	21/93
[U]				Wang	Xuran	OS4-3	44/56
Umeno	Ren	GS1-1	34/103	Wang	Zipei	OS2-4	25/53
ul Husnain	Anees	OS21-1	41/86			OS2-5	25/53
Urano	Shingen	OS20-1	29/82	Watanabe	Keisuke	OS20-1	29/82
						OS20-2	29/82
				Watanabe	Konosuke	OS20-1	29/82
[W]						OS20-2	29/82
Wadi harun	Sulaiman	OS21-3	42/87	Wen	Zongyan	OS26-11	46/100
Wagatsuma	Hiroaki	GS4-3	24/108	Wong	Chin Hong	OS6-2	43/60
		GS6-2	42/110			OS26-2	45/97
		GS6-3	42/111			OS26-7	46/99
Wan	Weiwei	OS14-2	36/73			OS26-8	46/99
Wan Ahmad	Wan	OS21-2	41/87			OS26-9	46/99
	Khairunizam					OS26-11	46/100
Wang	Chun-Chieh	OS5-3	39/59	Wu	Qihua	OS24-4	21/93
Wang	Depeng	OS4-10	45/58	Wu	Tai-Hsuan	OS5-4	39/59
Wang	Haiquan	OS3-5	27/54	Wu	YingCheng	OS1-3	21/51
Wang	Jiashuai	OS2-1	25/52				
Wang	Jiaxin	OS2-3	25/53	[X]			
		OS3-3	27/54	Xia	Yuntian	OS13-2	26/71
		OS3-4	27/54			OS13-6	26/72
Wang	Jiqiang	OS8-2	35/63	Xiang	Yande	OS4-10	45/58
Wang	Jiwu	OS24-1	20/92	Xiao	Ziyue	OS3-9	28/55
		OS24-2	20/92			OS4-8	44/57
		OS24-3	20/92			OS4-9	44/58
		OS24-4	21/93			OS4-10	45/58
		OS24-5	21/93	Xie	Jiahao	OS3-8	27/55
Wang	Limei	OS13-1	26/71			OS3-9	28/55
Wang	Ningfei	OS26-2	45/97	Xie	Shengke	OS18-12	41/81
Wang	Peng	OS4-5	44/57	Xie	Yanzhe	OS26-11	46/100
		OS4-6	44/57				
		OS4-7	44/57	[Y]			
Wang	Qikun	OS4-6	44/57	Yabuki	Tomohide	GS1-1	34/103
		OS4-7	44/57	Yamaba	Hisaaki	OS9-2	22/65
Wang	Shengfeng	OS4-6	44/57			OS9-3	22/65
Wang	Shuai	GS3-1	25/106			OS9-4	22/65
Wang	Shuxin	OS13-8	26/72	Yamada	Shintaro	GS3-3	25/107
Wang	Siyi	OS13-6	26/72	Yamaguchi	Hiromasa	OS15-2	22/74

Yamaguchi	Naoki	OS15-3	22/74			OS11-4	47/69
Yamao	Kosei	OS15-4	23/75	Zakariya	Azman	OS25-8	48/96
Yan	Lixia	OS8-1	35/63	Zhai	Hongshuo	OS4-2	44/56
Yang	Hang	OS24-2	20/92	Zhang	Bin	OS8-3	35/63
Yang	Tongqing	OS8-4	36/64	Zhang	Junsheng	OS13-9	26/73
Yang	Xue	OS3-5	27/54			OS13-10	27/73
		OS3-6	27/55	Zhang	Lijiang	OS2-1	25/52
		OS3-7	27/55	Zhang	Saijie	OS2-2	25/52
Yang	Yahui	OS24-5	21/93	Zhang	Weicun	OS8-2	35/63
Yankova	Anastasia	OS10-3	28/66	Zhang	Xinyi	OS14-2	36/73
Yeoh	Zhi Ying	OS26-3	45/97	Zhang	Yuhao	OS2-1	25/52
		OS26-4	45/98			OS4-3	44/56
		OS26-5	45/98			OS4-4	44/56
		OS26-6	45/98	Zhang	Yuqi	OS8-3	35/63
Yin	Xiaoyu	OS8-2	35/63	Zhao	Huailin	OS2-2	25/52
Yonehara	Shun	OS15-6	23/75	Zhao	Hongpi	OS13-4	26/71
Yoon	Jang-Sok	GS6-2	42/110			OS13-7	26/72
Yoshikawa	Akimasa	GS5-3	37/109	Zhao	Zhihan	OS13-4	26/71
Yoshimoto	Yuma	OS15-6	23/75	Zhdanova	Julia	OS5-6	39/60
Yuan	Tong	OS8-5	36/64	Zhidenko	Ivan	OS5-6	39/60
Yuldashev	Niez	OS10-6	28/67	Zhou	Wenxuan	OS26-1	45/97
Yusoff	Badli Shah	OS6-4	43/61	Zhou	Yue	OS26-1	45/97
				Zhu	Yingfan	OS4-10	45/58
	[Z]					OS13-4	26/71
Zagirov	Aidar	OS10-2	28/66	Zhukova	Valeriya	OS11-5	47/69