ICAROB 2021

PROCEEDINGS OF THE 2021 INTERNATIONAL CONFERENCE ON ARTIFICIAL LIFE AND ROBOTICS

January 21 to 24, 2021
On line
26th AROB International Meeting Series

Editor-in-Chief
Masanori Sugisaka
Editors: Yingmin Jia, Takao Ito, Ju-Jang Lee
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HISTORY

The International Conference on Artificial Life and Robotics (ICAROB) resulted from the AROB-symposium (International Symposium on Artificial Life and Robotics) whose first edition was held in 1996 and the eighteenth and last edition in 2013. The AROB symposium was annually organized by Oita University, Nippon Bunri University (NBU), and ALife Robotics Corporation Ltd., under the sponsorship of the Science and Technology Policy Bureau, the Ministry of Education, Science, Sports, and Culture (Monbusho), presently, the Ministry of Education, Culture, Sports, Science, and Technology (Monkasho), Japanese Government, Japan Society for the Promotion of Science (JSPS), the Commemorative Organization for the Japan World Exposition ('70), Air Force Office of Scientific

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

AIMS AND SCOPE

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

Foundation of computation and its application
Fuzzy control
Genetic algorithms
Human-welfare robotics
Image processing
Insect-like aero vehicles
Intelligence in biological systems
Intelligent control
Management of technology
Medical surgical robot
Micro-machines
Multi-agent systems
Nano-biology
Nano-robotics
Networking
Neural circuits
Neuro-computer
Neuromorphic Systems
Neuroscience
Pattern recognition
Quantum computing
Reinforcement learning system & genetic programing
Robotics
Software development support method
System cybernetics
Unmanned underwater vehicles
Unmanned Aerial Systems Technologies
Unmanned Aerial Systems designing, controls and navigation
Unmanned Aero vehicles
Virtual reality
Visualization
Hardware-oriented submissions are particularly welcome. This conference will discuss new results in the field of artificial life and robotics

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ICAROB Office
ALife Robotics Corporation Ltd.
4-Go, 8-Ban, Higshi 2Cyome, Handadai, Oita 870-1108, JAPAN
TEL/FAX : +81-97-597-7760
E-MAIL :
icarob@alife-robotics.co.jp
Home Page : https://alife-robotics.co.jp/

MESSAGES

Masanori Sugisaka
General Chair
(President, ALife Robotics Co., Ltd., Japan)
(Visiting Professor, The Open University, UK)

Masanori Sugisaka

Masanori Sugisaka

General Chair of ICAROB

It is my great honor to invite you all to The 2021 International Conference on Artificial Life and Robotics (ICAROB 2021). 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 in **SCOPUS** and **CPCI-Web of Science** now. From now on, ALife Robotics Corporation Ltd. is in charge of management. This year we have The 2021 International Conference on Artificial Life and Robotics (ICAROB2020) (26th AROB Anniversary). The future of The ICAROB is brilliant from a point of view of yielding new technologies to human society in 21st century. I hope that fruitful discussions and exchange of ideas between researchers during Conference (ICAROB2021) will yield new merged technologies for happiness of human beings and, hence, will facilitate the establishment of an international joint research institute on Artificial Life and Robotics in future.

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

Yingmin Jia

Co-General Chair of ICAROB

It is my great pleasure to invite you to The 2021 International Conference on Artificial Life and Robotics (ICAROB 2021), in Higashi Hiroshima Arts & Culture Hall Kurara, Hiroshima, Japan from January 21-24, 2021.

ICAROB develops from the AROB that was created in 1996 by Prof. Masanori Sugisaka and will celebrate her 26th birthday in 2021. So far many important results have been presented at the past meetings and have a profound impact on artificial life and robotics. Doubtless, it is really one of the most famous international conferences in the field of artificial intelligence and attract wide interests among scientist, researchers, and engineers around the world.

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

Looking forward to meeting you at ICAROB in on line and wishing you enjoy your stay in on line.

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

Takao Ito

Co General Chair of ICAROB

It is my great honor to invite you all to the 2021 International Conference on Artificial Life and Robotics (ICAROB 2021), to the wonderful city of Higashi-Hiroshima, Hiroshima Prefecture, Honshu Island, Japan.

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

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

The conference is on line. I eagerly look forward to personally meeting you in on line, during the ICAROB 2021 and to sharing a most pleasant, interesting and fruitful conference with you. Do come and make this conference a fruitful, productive as well as enjoyable event.

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

Ju-Jang Lee

Co-General Chair of ICAROB

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

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

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

It is a great honor for me as a Co-General Chair of the 8th ICAROB 2021 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 8th ICAROB.

I'm looking forward to meeting you at the 8th ICAROB in on line and wishing you all the best.

GENERAL SESSION TOPICS

GS1 Chaos & Application (4)	GS2 Image & Signal Processing 1 (4)
GS3 Image & Signal Processing 2 (3)	GS4 Image & Signal Processing 3 (3)
GS5 Genetic Algorithms & Robotics 1 (3)	GS6 Robotics 1 (4)
GS7 Robotics 2 (4)	GS8 Medical Data Processing (6)

ORGANIZED SESSION TOPICS

OS1 Human-Machine Interface Application (4)	OS2 Media Information Processing, Music Recommendation and Artificial Intelligence (4)
OS3 Robot Control (9)	OS4 Intelligent UAV and Systems (3)
OS5 Advanced Information Processing Applications (6)	OS6 Intelligent Control (6)
OS7 Information Applications and Security (5)	OS8 Intelligent Systems and Control (5)
OS9 Intelligent Systems and Life (7)	OS10 Advanced Control Systems and Signal Processing (7)
OS11 Robotic Manipulation (3)	OS12 System and Control (18)
OS13 Intelligent Systems and Robotics (14)	OS14 Image Processing (4)
OS15 Bridging the Gap Between AI, Cognitive Science, and Narratology (7)	OS16 Software Development Support Method (5)
OS17 Robotics and machine vision (3)	OS18 Natural Computing (3)
OS19 Artificial Intelligence for Embedded Systems and Robotics (4)	OS20 Virtual Reality and Intelligence Interactions (3)
OS21 Educational Application of Control Technology (4)	OS22 Robot Competitions and Education (5)
OS23 Advances in Field Robotics and Their Applications (6)	OS24 Mathematical Informatics (5)

1/21(Thu.)	Group meeting for the conference (ZOOM ID: 984 9796 8944)
1/22(Fri.) – 1/24(Sun.)	ICAROB Secretariat
1/24(Sun)	Group meeting for the next conference (ZOOM ID: 914 3254 0230)

TIME TABLE (1/22)

1/22(Fri.)	**Meeting Room 1** (ZOOM ID: 993 2436 1751)	**Meeting Room 2** (ZOOM ID: 986 1953 6512)	**Meeting Room 3** (ZOOM ID: 984 4367 9770)	**Meeting Room 4** (ZOOM ID: 971 5454 5491)
8:40-	Registration			
9:00-10:00	OS19 Artificial Intelligence for Embedded Systems and Robotics (4) Chair: Hakaru Tamukoh	OS21 Educational Application of Control Technology (4) Chair: Kazuo Kawada	GS2 Image & Signal Processing 1 (4) Chair: Tohru Kamiya	GS5 Genetic Algorithms & Robotics 1 (3) Chair: Hideyuki Tanaka
10:00-10:20	Coffee break			
10:20-10:50	Opening Ceremony (ZOOM ID: 925 6396 7074)			
11:00-12:00	Chair: Takao Ito Plenary Speech PS1 (ZOOM ID: 966 3705 6919) Kazuo Ishii			
12:00-13:00	Lunch			
13:00-14:15	OS2 Media Information Processing, Music Recommendation and Artificial Intelligence (4) Chair: Chair: Yasunari Yoshitomi	OS8 Intelligent Systems and Control (5) Chair Chung-Wen Hung	OS24 Mathematical Informatics (5) Chair: Takao Ito	GS3 Image & Signal Processing 2 (3) Chair: Keiko Sakurai
14:15-15:15	Coffee break			
15:15-17:00	OS9 Intelligent Systems and Life (7) Chair: Kuo-Hsien Hsia	OS10 Advanced Control Systems and Signal Processing (7) Chair: Takuya Kinoshita	OS15 Bridging the Gap Between AI, Cognitive Science, and Narratology (7) Chair: Jumpei Ono	OS23 Advances in Field Robotics and Their Applications (6) Chair: Keisuke Watanabe

TIME TEBLE (1/23)

1/23(Sat.)	Meeting Room 1 (ZOOM ID: 993 2436 1751)	Meeting Room 2 (ZOOM ID: 986 1953 6512)	Meeting Room 3 (ZOOM ID: 984 4367 9770)	Meeting Room 4 (ZOOM ID: 971 5454 5491)
8:40-	Registration			
9:00-10:15	OS14 Image Processing (4) Chair: Joo Kooi Tan	OS16 Software Development Support Method (5) Chair: Tetsuro Katayama	OS22 Robot Competitions and Education (5) Chair: Yasunori Takemura	GS6 Robotics 1 (4) Chair: Noritaka Sato
10:15-11:00	Coffee break			
11:00-12:00	Chair: Masayoshi Tabuse Plenary Speech PS2 (ZOOM ID: 912 8494 3957) Yasunari Yoshitomi			
12:00-13:00	Lunch			
13:00-14:30	OS5 Advanced Information Processing Applications (6) Chair: Toru Hiraoka	OS6 Intelligent Control (6) Chair: Yingmin Jia	OS7 Information Applications and Security (5) Chair: Kuo-Hsien Hsia	GS1 Chaos & Application (4) Chair: Masato Nagayoshi
14:30-15:30	Coffee break			
15:30-16:45	OS11 Robotic Manipulation (3) Chair: Kensuke Harada	OS17 Robotics and machine vision (3) Chair: Jiwu Wang	OS18 Natural Computing (3) Chair: Marion Oswald	GS8 Medical Data Processing (6) Chair: Shingo Mabu

TIME TABLE (1/24)

1/24(Sun.)	Meeting Room 1 (ZOOM ID: 993 2436 1751)	Meeting Room 2 (ZOOM ID: 986 1953 6512)	Meeting Room 3 (ZOOM ID: 984 4367 9770)	Meeting Room 4 (ZOOM ID: 971 5454 5491)
8:40-	Registration			
9:00-9:45	OS4 Intelligent UAV and Systems (3) Chair: Young Im Cho	GS4 Image & Signal Processing 3 (3) Chair: Taro Shibanoki		
9:45-11:00	Coffee break			
11:00-12:00	OS3 Robot Control (9) Chair: Yizhun Peng	OS13 Intelligent Systems and Robotics (14) Chair: Fengzhi Dai	OS20 Virtual Reality and Intelligence Interactions (3) Chair: R.P.C. Janaka Rajapakse	GS7 Robotics 2 (4) Chair: Wisanu Jitviriya
12:00-13:00	Lunch			
13:00-14:15	OS3 Robot Control (9) Chair: Yizhun Peng	OS12 System and Control (18) Chair: Huailin Zhao (18)	OS1 Human-Machine Interface Application (4) Chair: Norrima Mokhtar	
Group meeting for the next conference (15:00-15:30) (ZOOM ID: 914 3254 0230)				

The 2021 International Conference on ARTIFICIAL LIFE AND ROBOTICS (ICAROB2021)

January 21 (Thursday)

17:30-19:30 Group meeting for the conference (ZOOM ID: 984 9796 8944)

January 22 (Friday)

10:20-10:50

Opening Ceremony (ZOOM ID: 925 6396 7074)

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

Welcome Addresses

1. General Chairman of ICAROB	Masanori Sugisaka (ALife Robotics Co., Ltd., Japan)
2. Co-General Chairman of ICAROB	Yingmin Jia (Beihang University, China)
3. Co-General Chairman of ICAROB	TaKao Ito (Hiroshima University, Japan)
4. Co-General Chairman of ICAROB	Ju-Jang Lee (KAIST, Korea)

January 23 (Saturday)

Banquet: on line (ZOOM ID: 971 4311 0144)

18:30-20:30

Chair: Takao Ito (Hiroshima University, Japan)

Welcome Addresses

Prof. Yingmin Jia (Beihang University, China)
Prof. Ju-Jang Lee (KAIST, Korea)
Prof. Jangmyung Lee (Pusan National University, Korea)

TECHNICAL PAPER INDEX

January 22 (Friday)

8:40-Registration

Conference Room:
10:20-10:50 Opening Ceremony (ZOOM ID: 925 6396 7074)
Chair: Tetsuro Katayama (The University of Miyazaki, Japan)

11:00-12:00 (ZOOM ID: 966 3705 6919)
Plenary Speech PS1,
Chair: Takao Ito (Hiroshima University, Japan)

PS1 *Tomato-harvesting-robot competition towards smart agriculture*
Kazuo Ishii (Kyushu Institute of Technology, Japan)

Meeting Room 1 (ZOOM ID: 993 2436 1751)
9:00-10:00 OS19 Artificial Intelligence for Embedded Systems and Robotics (4)
Chair: Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

OS19-1 *Convolutional Network with Sub-Networks*
Ninnart Fuengfusin, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

OS19-2 *Influence of FPGA implementation methods in High-Level Synthesis*
[1]Yusuke Watanabe, [2]Hakaru Tamukoh
([1]RAFT WORK Co., Ltd, Japan, [2]Kyushu Institute of Technology, Japan)

OS19-3 *A Hardware-Oriented Random Number Generation Method and A Verification System for FPGA*
Sansei Hori, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

OS19-4 *Synthesis of realistic food dataset using generative adversarial network (GAN) based on RGB and depth images*
Obada Al Aama, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

13:00-14:00 OS2 Media Information Processing, Music Recommendation and Artificial Intelligence (4)
Chair: Yasunari Yoshitomi (Kyoto Prefectural University, Japan)
Co-Chair：Masayoshi Tabuse (Kyoto Prefectural University, Japan)

OS2-1 *Comparison of Data Augmentation Methods in Pointer-Generator Model Using Various Sentence Ranking Methods*
Tomohito Ouchi, Masayoshi Tabuse (Kyoto Prefectural University, Japan)

OS2-2 *Music Recommendation System Driven by Variations in Fingertip Skin Temperature*
Mayuka Wada[1], Taro Asada[2], Yasunari Yoshitomi[2], Masayoshi Tabuse[2]
([1]Shimadzu System Development Corp., Japan, [2]Kyoto Prefectural University, Japan)

OS2-3 *Music Recommendation System Driven by Interaction between User and Personified Agent Using Speech Recognition, Synthesized Voice and Facial Expression*
Ayumi Matsui[1], Miki Sakurai[2], Taro Asada[3], Yasunari Yoshitomi[3], Masayoshi Tabuse[3]
([1]Sumitomo Mitsui Card Co., Ltd., Japan, [2]TIS Inc., Japan, [3]Kyoto Prefectural University, Japan)

OS2-4 *Wallet Operation Evaluation System Using Deep Learning*
Junichiro Yamawaki[1], Yasunari Yoshitomi[2], Masayoshi Tabuse[2], Taro Asada[2]
([1]SKY Co., Ltd., Japan, [2]Kyoto Prefectural University, Japan)

15:15-17:00 OS9 Intelligent Systems and Life (7)
Chair: Kuo-Hsien Hsia (National Yunlin University of Science and Technology, Taiwan)
Co-Chair: Evgeni Magid (Kazan Federal University, Russia)

OS9-1 *Architecture of a student training computer program for preparing professional outpatient consulting skills within an electronic medical records system during COVID-19 alertness situation*
Sergey Bulatov[1], Evgeni Magid[2], Enzhe Kharisova[1], Roman Lavrenov[2], Vitaly Dudin[1], Artur Khazetdinov[2] ([1]Kazan State Medical University, Russia), ([2]Kazan Federal University, Russia)

OS9-2 *Satisfaction Assessment on the Counseling Service System for Full-Time Teacher-Counselor in Tainan Elementary School*
Hsiu-Hao Liu (Chang Jung Christian University, Taiwan)
Yun-Syuan Jhang (National University of Tainan, Taiwan)

OS9-3 *Assess The Critical Factors for the Counseling Service System Usage Intention*
Hsiu-Hao Liu (Chang Jung Christian University, Taiwan)

OS9-4 *Design and Implementation of EMI Suppression Filter for Electronic Commutation Fans*
Ching-Chun Chuang, Chih-Chiang Hua, Chung-Wen Hung, Chun-Jen Yao
(National Formosa University, Taiwan)

OS9-5 *Application of IOT to Forest Management Taking Fushan Botanical Garden as an Example*
Shuo-Tsung Chen, Chih-Chiang Hua, Ching-Chun Chuang
(National Formosa University, Taiwan)

OS9-6 *Development of the IoT Module using MQTT Protocol and AES*
Jr-Hung Guo, Tzu-Yuan Lin, Kuo-Hsien Hsia
(National Yunlin University of Science and Technology, Taiwan)

OS9-7 *Exploring the Intention to Continuance of Learning Programming at Elementary School of Rural Area by the mBot Robot*
Yung-Hsin Cheng, Jia-Ming Hsiao
(National Yunlin University of Science and Technology, Taiwan)

Meeting Room 2 (ZOOM ID: 986 1953 6512)
9:00-10:00 OS21 Educational Application of Control Technology (4)
Chair: Kazuo Kawada (Hiroshima University, Japan)
Co-Chair: Yoshihiro Ohnishi (Ehime University, Japan)

OS21-1 *Development of Shock Sensitive Tiny Dummy Robot for Junior High School Rescue Robot Challenge*
Kazuo Kawada, Keisuke Iuchi, Keita Murai, Hiroyuki Y. Suzuki
(Hiroshima University, Japan)

OS21-2 *Basic Research on Parameter Tuning Skills Evaluation Based on Sensor Car Behavior Data in Technology Education*
Teruyuki Tamai (Hiroshima University / Ehime University),
Yoshihiro Ohnishi (Ehime University), Kazuo Kawada(Hiroshima University)

OS21-3 *Mini Windmill Generator Kit for homework for Hiroshima Univ. Monozukuri Junior Doctor Special Educational Program*
Hiroyuki Y. Suzuki, Kazuo Kawada, Masayasu Nagamatsu
(Hiroshima University, Japan)

OS21-4 *Development of Teaching Materials to Learn the Efficient Use of Energy*
Yoshihiro Ohnishi[1], Teruyuki Tamai[1], Shinnosuke Mori[1] Kawada Kazuo[2]
([1]Ehime University, [2]Hiroshima University, Japan)

13:00-14:15 OS8 Intelligent Systems and Control (5)
Chair: Chung-Wen Hung (National Yunlin University of Science and Technology, Taiwan)
Co-Chair: Kuo-Hsien Hsia (National Yunlin University of Science and Technology, Taiwan)

OS8-1 *Networking Integration Application of an Intelligent Production Line for Aerospace Precision Manufacturing*
Chau-Chung Song, Chun-Chi Wang, Chen-Pang Chen, Chung-Wen Hung
(National Yunlin University of Science and Technology, Taiwan)

OS8-2 *Low-Cost Indoor Localization Using Sound Spectrum of Light Fingerprints*
Chung-Wen Hung, Hiroyuki Kobayashi, Jun-Rong Wu, Chau-Chung Song
(National Yunlin University of Science and Technology, Taiwan)

OS8-3 *Air Valve Fuzzy Control Combined with Sheet Music Recognition Techniques Applied to Autoplaying Soprano Recorder Machines*
Chun-Chieh Wang, Guang-Ming Jhang (Chienkuo Technology University, Taiwan)

OS8-4 *Image Inpainting Techniques Combined with Isolated Pixel Filtering Applied to Multifunctional Drawing Robots*
Chun-Chieh Wang, Zhan-Xian Ye (Chienkuo Technology University, Taiwan)

OS8-5 *Mobile Robot with Image Recognition -- Using LabVIEW and KNRm*
Kuo-Hsien Hsia, Bo-Jung Yang, Jr-Hung Guo, Chang-Sheng Xiao
(National Yunlin University of Science and Technology, Taiwan)

15:15-17:00 OS10 Advanced Control Systems and Signal Processing (7)
Chair: Takuya Kinoshita (Hiroshima University, Japan)
Co-Chair: Shinichi Imai (Tokyo Gakugei University, Japan)

OS10-1 *Nonlinear Internal Model Controller based on Local Linear Models, and its Application*
Shinichi Imai (Tokyo Gakugei University, Japan)

OS10-2 *Design of a data-driven control system for reference model design using predicted signals*
Yuki Nakatani, Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

OS10-3 *Design of a Data-driven GMV Controller Using the Nelder-Mead Method*
LiYing Shi, Zhe Guan, Toru Yamamoto (Hiroshima University, Japan)

OS10-4 *Design of a Databased-Driven GPC for Nonlinear Systems*
Zhe Guan, Toru Yamamoto (Hiroshima University, Japan)

OS10-5 *Design of a Data-Driven Controller using Open-Loop Data*
Y. Nishiya, Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

OS10-6 *Improved Estimation of Sway-Angle for Overhead Crane based on Phase Difference of Acoustic Signals in Frequency Domain*
Hanako Ogawa, Takeshi Yamada, Masayoshi Nakamoto
(Hiroshima University, Japan)

OS10-7 *Study on an Optimal Design Method for Control Systems based on Bayesian Optimization*
Koichi Hirota, Shin Wakitani, Toru Yamamoto (Hiroshima University, Japan)

Meeting Room 3 (ZOOM ID: 984 4367 9770)
9:00-10:00 GS2 Image & Signal Processing 1 (4)
Chair: Tohru Kamiya (Kyushu Institute of Technology, Japan)

GS2-1 *Unconstrained Measurement of Heart Rate Considering Harmonics of a Respiratory Signal by Tactile Sensor*
Kazuya Matsuo (Kyushu Institute of Technology, Japan), Toshiharu Mukai (Meijo University, Japan), Shijie Guo (Hebei University of Technology, China)

GS2-2 *Image Registration Method for Chest MDCT Images Based on 2-D Finite Element Method*
Takuji Ogimoto, Tohru Kamiya (Kyushu Institute of Technology, Japan)
Takatoshi Aoki (University of Occupational and Environmental Health, Japan)

GS2-3 *Detection of Abnormal Shadows in Low-dose CT Images Using CNN*
Hiromu Ikeda, Tohru Kamiya (Kyushu Institute of Technology, Japan)

GS2-4 *EEG signal extraction method based on HHT and CSP*
Lei Gong (Tianjin University of Science and Technology, China)

13:00-14:15 OS24 Mathematical Informatics (5)
Chair: Takao Ito (Hiroshima University, Japan)
Co-Chair: Makoto Sakamoto (University of Miyazaki, Japan)

OS24-1 *Verification of CG character operation by brain wave discrimination*
Kenji Sakoma[1], Kodai Miyamoto[1], Taketo Kamasaka[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan)
([2]National Institute of Technology, Ube College, Japan)
([3]Hiroshima University, Japan)

OS24-2 *Approach to tourism support by aerial video using CG*
Kenji Sakoma[1], Noritake Seto[1], Kodai Miyamoto[1], Taketo Kamasaka[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan)
([2]National Institute of Technology, Ube College, Japan)
([3]Hiroshima University, Japan)

OS24-3 *Method for detecting eye misalignment based on movement near the center of the pupil*
Uchida Noriyuki[1,2], Kayoko Takatuka[2], Hisaaki Yamaba[2], Masayuki Mukunoki[2], Naonobu Okazaki[2]
([1]Kyushu University of Health and Welfare, Japan), ([2]University of Miyazaki, Japan)

OS24-4 *Basic research on video production for educational support by virtual technology*
Kodai Miyamoto[1], Taketo Kamasaka[1], Kenji Sakoma[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan) ([2]National Institute of Technology, Ube College, Japan) ([3]Hiroshima University, Japan)

OS24-5 *There is a movement towards the development of hula costume CAD*
Taketo Kamasaka[1], Kenji Sakoma[1], Kodai Miyamoto[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan), ([2]National Institute of Technology, Ube College, Japan) ([3]Hiroshima University, Japan)

15:15-17:00 OS15 Bridging the Gap Between AI, Cognitive Science, and Narratology (7)
Chair: Jumpei Ono (Aomori University, Japan)
Co-Chair: Hiroki Fukushima (Kyushu Womens' University, Japan)
Co-Chair: Takashi Ogata (Iwate Prefectural University, Japan)

OS15-1 *Analysis and Construction of Elements of the Stage Performance Structure in a Kabuki-dance*
Miku Kawai (Iwate Prefectural University, Japan), Jumpei Ono (Aomori University, Japan), Takashi Ogata (Iwate Prefectural University, Japan)

OS15-2 *Unchiku Generation with Moving Illustration Using Kabuki Knowledge*
Jumpei Ono (Aomori University, Japan), Miku Kawai (Iwate Prefectural University, Japan), Takashi Ogata (Iwate Prefectural University, Japan)

OS15-3 *Implementing Story Units of Japanese Folktales with Conceptual Dictionaries*
Takuya Ito (Iwate Prefectural University, Japan), Jumpei Ono (Aomori University, Tokyo) Takashi Ogata (Iwate Prefectural University, Japan)

OS15-4 *The Story Generation Process and Cognitive Biases*
Jun Nakamura (Chuo University, Japan)

OS15-5 *Time in an Aesthetic Experience of a cup of Sake*
Hiroki Fukushima (Kyushu Womens' University, Japan)

OS15-6 *Extension of Clinical/Psychological Approach Using Post-Narratology: Possibility of application on Artificial Intelligence and Robot*
Kai Seino (National Rehabilitation Center for Persons with Disabilities, Japan)

OS15-7 *A relationship between narratology and marketing*
Akinori Abe (Chiba university, Japan)

Meeting Room 4 (ZOOM ID: 971 5454 5491)
9:00-9:45 GS5 Genetic Algorithms & Robotics 1 (3)
Chair: Hideyuki Tanaka

GS5-1 *Layout decision system for multiple production lines using work-flow-line and GA*
Masato Noda[1], Hidehiko Yamamoto[1] (Gifu University, Japan),
Hirohumi Tsuji[2], Yasuhisa Terawa[2], Yoshinori Nakamura[2], Masayuki Tsuchida[2] (Infofarm Corporation, Japan),
Katsuaki Yamada[3], Yukiyasu Kuriyama[3] (Kai Industries Corporation, Japan)

GS5-2 *Autonomous decentralized FMS's AGVs moving control by mind change with deep learning*
Ryunosuke Yamane, Hidehiko Yamamoto (Gifu University)

GS5-3 *Secondary School Robotics Education in Camarin High School: Developments and Challenges for Improvement*
Jeffrey Rivera Galino (Camarin High School, Philippines and Hiroshima University, Japan), Hideyuki Tanaka (Hiroshima University, Japan)

13:00-13:45 GS3 Image & Signal Processing 2 (3)
Chair: Keiko Sakurai (University of Miyazaki, Japan)

GS3-1 *Deep-Learning Based Segmentation Algorithm for Defect Detection in Magnetic Particle Testing*
Akira Ueda, Huimin Lu, Tohru Kamiya (Kyushu Institute of Technology, Japan)

GS3-2 *A Method for Improving Recognition of Lying Postures Using a Measured Signal Intensity of Respiration and Heartbeat by Flexible Tactile Sensor Sheet*
Kazuya Matsuo (Kyushu Institute of Technology, Japan)
Toshiharu Mukai (Meijo University, Japan),
Shijie Guo (Hebei University of Technology, China)

GS3-3 *Basic research for the realization of online MEG using SSD*
Kazuhiro Yagi, Yuta Shibahara, Lindsey Tate, Keiko Sakurai, Hiroki Tamura
(University of Miyazaki, Japan)

15:15-17:00 OS23 Advances in Field Robotics and Their Applications (7)

Chair: Keisuke Watanabe (Tokai University)

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

OS23-1 *Three-dimensional Measurement Using Laser Pattern And Its Application to Underwater Scanner*
Yuya Nishida, Tomoya Shinnoki, Shinsuke Yasukawa, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

OS23-2 *Motion control of a cable-restricted underwater vehicle for long-term spot observation*
Yoshiki Tanaka, Yuya Nishida, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS23-3 *Development of current sensors for digitizing expert knowledge in fish feeding Towards sustainable aquaculture*
Dominic B. Solpico, Yuya Nishida, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS23-4 *Underwater image reconstruction using convolutional auto-encoder*
Shinsuke Yasukawa, Sreeraman Srinivasa Raghura, Yuya Nishida, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

OS23-5 *Spherical Robot Transfer Problem with Minimal Total Kinetic Energy*
Kenji Kimura[1], Kazuo Ishii[2]
([1]Fukuoka Daiichi High School, Japan, [2]Kyushu Institute of Technology, Japan)

OS23-6 *Acoustic Impedance Measurement through the Modelling of Ultrasonic Wave Transmission*
Ryuugo Mochizuki, Yuya Nishida, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS23-7 *Installation Method of In-situ Drilling Platform(withdraw)*
Keisuke Watanabe (Tokai University, Japan)

January 23 (Saturday)

8:40-Registration

Conference Room (ZOOM ID: 912 8494 3957)

11:00-12:00

Plenary Speech PS2

Chair: Masayoshi Tabuse (Kyoto Prefectural University, Japan)

PS2 *Human-computer Communication Using Facial Expression*

Yasunari Yoshitomi (Kyoto Prefectural University, Japan)

Meeting Room 1 (ZOOM ID: 993 2436 1751)

9:00-10:15 OS14 Image Processing (4)

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

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

OS14-1 *Detection of a Fallen Person and Estimation of Their Head Position from UAV Images*
Haruka Egawa, Seiji Ishikawa, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

OS14-2 *Development of a Pedestrian Crossing Navigation System for Visually Impaired People Using MY VISION*
Kohei Kitagawa, Seiji Ishikawa, JooKooi Tan (Kyushu Institute of Technology, Japan)

OS14-3 *Abnormal Human Action Detection Based on GAN*
Tomoya Sano, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

OS14-4 *3-D Position Measurement of a Cargo Using Epipolar Geometry for Logistics Automation (withdraw)*
Kazuki Fukuda, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

OS14-5 *Bus Line Number Detection Employing MY VISION*
Ye Zhou, Yosiki Hamasaki, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

13:00-14:30 OS5 Advanced Information Processing Applications (6)

Chair: Toru Hiraoka (University of Nagasaki, Japan)

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

OS5-1 *A Method for Patterns of Cell-Like Images Based on Distance Transformation*
Toru Hiraoka, Kohei Maeda (University of Nagasaki, Japan)

OS5-2 *Generating Striped Animations by Inverse Line Convergence Index Filter*
Toru Hiraoka, Ryosuke Takaki (University of Nagasaki, Japan)

OS5-3 *A Method for Estimating Home Location of Foreigners in Japan Using Photograph Location*
Masaharu Hirota, Tetsuya Oda (Okayama University of Science, Japan)

OS5-4 *A Proposal of Online Map-matching Based Trajectory Compression Algorithm Using Road Networks*
Shota Iiyama, Tetsuya Oda, Masaharu Hirota (Okayama University of Science, Japan)

OS5-5 *Case Study and Direction of Share Cycle System in Japanese Cities*
Minoru Kumano (University of Miyazaki, Japan)
Toru Hiraoka (University of Nagasaki, Japan)

OS5-6 *The IoT Solution to Play English Word Learning Tool*
Shogo Aizawa, Motohide Yoshimura (University of Nagasaki, Japan)

15:30-16:15 OS11 Robotic Manipulation (3)
Chair: Kensuke Harada (Osaka University, Japan)
Co-Chair: Tokuo Tsuji (Kanazawa University, Japan)
Co-Chair: Akira Nakamura (AIST, Japan)

OS11-1 *Using Various Evaluation Standards to Determine an Error Recovery Process in an Automation Plant*
Akira Nakamura*[1], Natsuki Yamanobe*[1], Ixchel Ramirez Alpizar*[1],
Kensuke Harada*[2], Yukiyasu Domae*[1]
(*[1] National Institute of Advanced Industrial Science and Technology (AIST), Japan
*[2] Osaka University, Japan)

OS11-2 *Robotic Picking for Piled Sushi Topping*
Kenta Matsuura*[1*2], Keisuke Koyama*[1], Weiwei Wan*[1], Kensuke Harada*[1]
(*[1] Osaka University, Japan, *[2] Currently with Yaskawa Electric Co. Ltd., Japan)

OS11-3 *Motion Generation by Learning Relationship between Object Shapes and Human Motions*
Tokuo Tsuji[1]*, Sho Tajima*[1], Yosuke Suzuki*[1], Tetsuyou Watanabe*[1],
Shoko Miyauchi*[2], Ken'ichi Morooka*[2], Kensuke Harada*[3], and Hiroaki Seki*[1]
(*[1] Kanazawa University, Japan, *[2] Kyushu University, Japan, *[3] Osaka University, Japan)

Meeting Room 2 (ZOOM ID: 986 1953 6512)
9:00-10:15 OS16 Software Development Support Method (5)
Chair: Tetsuro Katayama (University of Miyazaki, Japan)
Co-Chair: Tomohiko Takagi (Kagawa University, Japan)

OS16-1 *Simulation and Regression Testing for Behavior of Software Models Based on Extended Place/Transition Net with Attributed Tokens*
Tomohiko Takagi, Ryo Kurozumi (Kagawa University, Japan)

OS16-2 *Development of an Early Prototype Tool for Learning Software Modeling Using Extended Place/Transition Net*
Tomohiko Takagi, Akio Usuda (Kagawa University, Japan)

OS16-3 *Test Suite Reusability Measurement Based on Frequency and Coverage of Reused Test Cases*
Mochamad Chandra Saputra*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, Japan) (†University of Nagasaki, Japan)

OS16-4 *The Seven Information Features of Class for Blob and Feature Envy Smell Detection in a Class Diagram*
Bayu Priyambadha*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, Japan) (†University of Nagasaki, Japan)

OS16-5 *Improvement of RETUSS to Ensure Traceability between Sequence Diagram in UML and Java Source Code in Real Time*
Kaoru Arima*, Tetsuro Katayama*, Yoshihiro Kita†, Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, Japan) (†University of Nagasaki, Japan)

13:00-14:30 OS6 Intelligent Control (6)
Chair: Yingmin Jia (Beihang University, China)
Co-Chair: Weicun Zhang (University of Science and Technology Beijing, China)

OS6-1 *Faster R-CNN Based Defect Detection of Micro-precision Glass Insulated Terminals*
Qunpo Liu[1], Mengke Wang[1], Zonghui Liu[1], Naohiko Hanajima[2], Bo Su[1]
([1]Henan Polytechnic University, P.R.China) ([2]Muroran Institute of Technology, Japan)

OS6-2 *Adaptive Sliding Mode Control for a Constant Tension Suspension System*
Yuxin Jia, Yingmin Jia, Kai Gong (Beihang University, China)

OS6-3 *Weighted Multiple Model ADRC for Uncertain Linear System*
Weicun Zhang, Jing Ge (University of Science and Technology Beijing, China)

OS6-4 *Trajectory Tracking Control of Differential Wheeled Mobile Robot Based on Rhombic Input Constraints*
Kai Gong, Yingmin Jia, Yuxin Jia (Beihang University, China)

OS6-5 *Maneuvering target tracking based on improved interacting multiple model algorithm*
Weicun Zhang, Meiyu Zhu (University of Science and Technology Beijing, China)

OS6-6 *Encapsualted Agents of Hybrid Order Discrete Dyanmics*
Yunzhong Song (Henan Polytechnic University, P.R.China)

15:30-16:15 OS17 Robotics and machine vision (3)
Chair: Jiwu Wang (Beijing Jiaotong University, China)
Co-Chair: Junxiang Xu (Beijing Jiaotong University, China)

OS17-1 *Kinematic modeling and Simulation of humanoid dual-arm robot*
Jiwu Wang, Junxiang Xu (Beijing Jiaotong University, China)

OS17-2 *Kinematics analysis and simulation of 6R Robot Based on MATLAB/Simulink*
Jiwu Wang, Shuo Han (Beijing Jiaotong University, China)

OS17-3 *Research on planar ranging system based on binocular stereo vision*
Jiwu Wang, Xin Pei (Beijing Jiaotong University, China)

Meeting Room 3 (ZOOM ID: 984 4367 9770)

9:00-10:15 OS22 Robot Competitions and Education (5)
Chair: Yasunori Takemura (Nishinippon Institute of Technology, Japan)
Co-Chair: Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS22-1 *Robustness Verification Against Noise of Self-localization Method Using Omni-directional Camera for Soccer Robot*
Yuehang Ma, Kaori Watanabe, Hidekazu Suzuki
(Tokyo Polytechnic University, Japan)

OS22-2 *Tomato-Harvesting Robot Competition: Aims and Developed Robot of 6th Competitions*
Takayuki Matsuo[1], Yasunori Takemura[2], Takashi Sonoda[2], Shinsuke Yasukawa[3], Yuya Nishida[3], Kazuo Ishii[3] ([1]National Institute of Technology, Kitakyushu College, Japan, [2]Nishinippon Institute of Technology, Japan, [3]Kyushu Institute of Technology, Japan)

OS22-3 *Smart Agriculture IoT Education Course in enPiT-everi (Education Network for Practical Information Technologies - Evolving and Empowering Regional Industries)*
Yasunori Takemura[1, 2], Keiji Kamei[1, 2], Atsushi Sanada[1, 2], Kazuo Ishii[1]
([1]Kyushu Institute of Technology, Japan, [2]Nishinippon Institute of Technology, Japan)

OS22-4 *Development of a Handy Autonomous Underwater Vehicle "Kyubic"*
Toshimune Matsumura, Yuuichiro Uemura, Kentaro Yanagise, Yoshiki Tanaka, Yuya Nishida, Kazuo Ishii (Kyushu Institute of Technology, Japan)

OS22-5 *A Greenhouse Project toward Smart Agriculture*
Kazuo Ishii[1], Yuya Nishida[1], Shinsuke Yasukawa[1], Kanako Shirahashi[1], Yasunori Takemura[2], Takayuki Matsuo[3]
([1]Kyushu Institute of Technology, Japan, [2]Nishinippon Institute of Technology, Japan, [3]National Institute of Technology, Kitakyushu College, Japan,)

13:00-14:15 OS7 Information Applications and Security (5)
Chair: Kuo-Hsien Hsia (National Yunlin University of Science and Technology, Taiwan)
Co-Chair: I-Hsien Liu (National Cheng Kung University, Taiwan)

OS7-1 *The Security Challenges with the Widespread Use of IT Infrastructure in ICS*
Kuan-Ming Su, I-Hsien Liu, Jung-Shian Li
(National Cheng Kung University, Taiwan)

OS7-2 *A Communication System with Equipment's Characteristics*
Chia-Chun Lai[1], I-Hsien Liu[1], Chi-Che Wu[1], Chuan-Gang Liu[2], Jung-Shian Li[1]
([1]National Cheng Kung University, Taiwan)
([2]Chia Nan University of Pharmacy and Science, Taiwan)

OS7-3 *Application of the Self-Organizing Map (SOM) to Analyze the Multiple Perspectives on Cross-National Culture*
Li-Ming Chuang, Yu-Po Lee, Shu-Tsung Chao
(Chang Jung Christian University, Taiwan)

OS7-4 Threats Hidden in Employee Workstation through Office Files
Tung-Lin Lee, I-Hsien Liu, Jung-Shian Li (National Cheng Kung University, Taiwan)

OS7-5 *Microsatellite Attitude Control Approach: Combined with Generation Adversarial Networks Fault-Detection and Cerebellar Model Articulation Controller Fault-Tolerant Control*
Ho-Nien Shou (Air Force Institute of Technology, Taiwan)

15:30-16:15 OS18 Natural Computing (3)
Chair: Marion Oswald (Vienna University of Technology, Austria)
Co-Chair: Yasuhiro Suzuki (Nagoya University., Japan)

OS18-1 *Contribution to the Theory of Periodic Reaction of Three Bodies Systems*
Yasuhiro Suzuki (Nagoya University Japan)

OS18-2 *Deep Micro Vibrotactile, DMV and its Applications*
Yasuhiro Suzuki (Nagoya Universit, Japan)

OS18-3 *Inter-Induce computation and its Philosophical Foundation*
Yasuhiro Suzuki (Nagoya University, Japan)

Meeting Room 4 (ZOOM ID: 971 5454 5491
9:00-10:00 GS6 Robotics 1 (4)
Chair: Noritaka Sato (Nagoya Institute of Technology, Japan)

GS6-1 *Digital Testing Device for Active Range of Motion of Finger Joints Utilizing Artificial Neural Network*
Huu-Hieu Quang, Yoshifumi Morita (Nagoya Institute of Technology, Japan),
Makoto Takekawa (everfine, Japan)

GS6-2 *Position and Force Teaching Method for 6 DoF Manipulator Using Contact Teaching Tool and Teaching Data Editor*
Duy-Do Bui, Hiroki Tanaka, Quang-Trung Chu, Hideki Inuzuka, Yoshifumi Morita
(Nagoya Institute of Technology, Japan) Masao Sakai (Aichi Prefecture, Japan)

GS6-3 *Haptic Device that Presents Sensation Corresponding to Palm on Back of Hand for Teleoperation of Robot Hand Report2: Consideration on Decided Specification*
Kyosuke Ushimaru,Noritaka Sato,Yoshifumi Morita
(Nagoya Institute of Technology, Japan)

GS6-4 *Robot Assisting Water Serving to Disabilities by Voice Control*
Yang Chunxin, Sakmongkon Chumkamon, Eiji Hayashi
(Kyushu Institute of Technology, Japan)

13:00-14:15 GS1 Chaos & Application (4)
Chair: Masato Nagayoshi (Niigata College of Nursing, Japan)

GS1-1 A Method of Role Differentiation Using a State Space Filter with a Waveform Changing Parameter in Multi-agent Reinforcement Learning
Masato Nagayoshi, Simon Elderton (Niigata College of Nursing, Japan)
Hisashi Tamaki (Kobe University, Japan)

GS1-2 *The research about editing system of performance information for player piano. - Make inferences about both handed musical composition by using DP matching system -*
Ryo Kinoshita, Eiji Hayashi (Kyushu Institute of Technology, Japan)

GS1-3 *Development of a LiDAR based Navigation System for Tree Harvester*
Ayumu Tominaga, Ryusuke Fujisawa, Eiji Hayashi (Kyushu Institute of Technology, Japan), Abbe Mowshowitz (The City College of New York, US)

GS1-4 *Numerical study on a class of chaotic financial chaotic systems(withdraw)*
Lei Gong, Minghan Song (Tianjin University of Science and Technology, China)

GS1-5 *Dynamic characteristics analysis of a multi-scroll conservative chaotic system with sinusoidal nonlinearity*
Zhonggao Chen (Tianjin University of Science and Technology, China)

15:30-16:45 GS8 Medical Data Processing (5)
Chair: Shingo Mabu (Yamaguchi University, Japan)

GS8-1 *Development of in-Home Wireless Continuous Temperature Data Logging and Alarming System for Fever Monitoring in Pediatrics*
Ali S. AlMejrad(University of Hail, Kingdom of Saudi Arabia)

GS8-2 *Design and Development of in-home Wireless Crucial Events Logging and Alarming System for Elderly and Disabled People Care*
Ali S. AlMejrad(University of Hail, Kingdom of Saudi Arabia)

GS8-3 *Virtual bird's-eye view for remote operation of unmanned construction machinery*
Noritaka Sato, Akihiro Fukuda (Nagoya Institute of Technology, Japan)

GS8-4 *Domain Transformation of Chest CT Images Using Semi-Supervised Cycle GAN for Opacity Classification of Diffuse Lung Diseases*
Masashi Miyake[1], Shingo Mabu[1] , Shoji Kido[2], Takashi Kuremoto[1]
([1]Yamaguchi University, Japan, [2]Osaka University, Japan)

GS8-5 *Anomaly Detection of Lung Sounds Using DAGMM*
Ryosuke Wakamoto[1], Shingo Mabu[1], Shoji Kido[2], Takashi Kuremoto[1]
([1]Yamaguchi University, Japan, [2]Osaka University, Japan)

GS8-6 *A ground reaction force analysis in walking and running gaits in horse leg model on viscoelastic hoof-ground contact*
Dondogjamts Batbaatar, Hiroaki Wagatsuma (Kyushu Institute of Technology, Japan)

January 24 (Sunday)

8:40-Registration

Meeting Room 1 (ZOOM ID: 993 2436 1751)

9:00-9:45 OS4 Intelligent UAV and Systems (3)
Chair: Young Im Cho (Gachon University, Republic of Korea)
Co-Chair: Jang-Myung Lee (Pusan National University, Republic of Korea)

OS4-1 *Satellite Image-based UAV Localization using Siamese Neural Network*
Seong-Ha Ahn, Ho-Sun Kang, Jang-Myung Lee
(Pusan National University, Republic of Korea)

OS4-2 *Analysis Based on CNN for Automated Vehicle Parking Occupancy*
Muksimova Shakhnoza, Young Im Cho (Gachon University, Republic of Korea)

OS4-3 *On the boundary layer part of the asymptotics of the solution of a singularly perturbed boundary value problem*
Assiya Zhumanazarova, Young Im Cho (Gachon University, Republic of Korea)

11:00-12:00 OS3-1 Robot Control (4)
Chair: Yizhun Peng (Tianjin University of Science and Technology, China)
Co-Chair: Huailin Zhao (Shanghai Institute of Technology, China)

OS3-1 *A Design and Implementation Intelligent Flowerpot*
Songyun Shi, Yizhun Peng (Tianjin University of Science and Technology, China)

OS3-2 *Research of Attention-LSTM Model for Baby Cry Detection Robot*
Tianye Jian, Yizhun Peng, Wanlong Peng, Zhou Yang
(Tianjin University of Science and Technology, China)

OS3-3 *A Design and Implement of an Automatic Intelligent Car*
Chengzhi Liu, Yizhun Peng, Jikai Zhao, Dezhi Yang
(Tianjin University of Science and Technology, China)

OS3-4 *A Target Detection in Remote Sensing Image based on Deep Learning*
Lianchen Zhao, Yizhun Peng, Di Li, Yuheng Zhang
(Tianjin University of Science and Technology, China)

13:00-14:15 OS3-2 Robot Control (5)
Chair: Yizhun Peng (Tianjin University of Science and Technology, China)
Co-Chair: Huailin Zhao (Shanghai Institute of Technology, China)

OS3-5 *A Design of Home Smart Nursing Robot based on Raspberry Pi 4*
Yuqi Zhao, Yizhun Peng, Jie Liu, Xiaowei Wu, Jikai Zhao
(Tianjin University of Science and Technology, China)

OS3-6 *Design and Simulation of Indoor Tour Guide Robot Based on ROS*
Yuheng Zhang, Yizhun Peng, Lianchen Zhao
(Tianjin University of Science and Technology, China

OS3-7 *Research on Path Planning of Manipulator*
Nana Wang, Yizhun Peng, Zhou Yang, Yuheng Zhang
(Tianjin University of Science and Technology, China)

OS3-8 *Research on White-Line-tracking Walking Technique of NAO Robot*
Wanlong peng, Yizhun peng, Yuheng zhang,Tianye jian
(Tianjin University of Science and Technology, China)

OS3-9 *A Design and Implement of Portable Epidemic Detection Device based on STM32*
Yuqi Zhao, Yizhun Peng, Xiaowei Wu, Yusong Zhou
(Tianjin University of Science and Technology, China)

Meeting Room 2 (ZOOM ID: 986 1953 6512)
9:00-9:45 GS4 Image & Signal Processing 3 (3)
Chair: Taro Shibanoki (Ibaraki University, Japan)

GS4-1 *Landslide Area Detection from Synthetic Aperture Radar Images Using Convolutional Adversarial Autoencoder and One-class SVM*
Shingo Mabu, Soichiro Hirata, Takashi Kuremoto (Yamaguchi University, Japan)

GS4-2 *Anomaly Detection in Time Series Data Using Support Vector Machines*
Umaporn Yokkampon[1], Sakmongkon Chumkamon[1], Abbe Mowshowitz[2],
Eiji Hayashi[1] and Ryusuke Fujisawa[1] ([1]Kyushu Institute of Technology, Japan)
([2]The City College of New York, USA)

GS4-3 *Relationship Between Tactile Stimuli and Human Body Sway*
Masaya Tadokoro, Taro Shibanoki (Ibaraki University, Japan)

11:00-12:00 OS13 Intelligent Systems and Robotics (14)
Chair: Fengzhi Dai (Tianjin University of Science and Technology, China)
Co-Chair: Yunzhong Song (Henan Polytechnic University, China)

OS13-1 *Analysis of the Consensus Protocol of Heterogeneous Agents with Time-Delays*
Jichao Zhao[1], Fengzhi Dai[1,3], Yunzhong Song[2]
([1]College of ElTianjin University of Science and Technology, China, [2]Henan Polytechnic University, China, [3]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

OS13-2 *Burrows-Wheeler Transform Acceleration based on CUDA*
Chang Sheng, Fengzhi Dai (Tianjin University of Science and Technology, China)

OS13-3 *Design of Automatic Water Supply Upper Computer System*
Peng Lu, Fengzhi Dai, Tianyi Zhang
(Tianjin University of Science and Technology, China)

OS13-4 *Analysis of Boiler Water Level System based on the Fuzzy Control*
Tianyi Zhang, Fengzhi Dai, Peng Lu
(Tianjin University of Science and Technology, China)

OS13-5 *Development of the Circuit System for Greenhouse Environment Regulation*
Yuhui Cheng, Fengzhi Dai, Chengxu Ji, Peng Lu
(Tianjin University of Science and Technology, China)

OS13-6 *Design of an Intelligent Car based on MSP430*
Ruming Kang, Fengzhi Dai (Tianjin University of Science and Technology, China)

OS13-7 *Design of a WIFI Video Car*
Qianqian Zhang[1], Fengzhi Dai[1,2], Jichao Zhao[1], Haokang Wen[1], Hongbo Hao[1]
([1]Tianjin University of Science and Technology, China)
([2]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

OS13-8 *Design of WebGIS Transportation and Distribution System based on the Genetic Algorithm*
Hongbo Hao, Fengzhi Dai (Tianjin University of Science and Technology, China)

OS13-9 *A Study of YOLO Algorithm for Target Detection*
Haokang Wen, Fengzhi Dai, Yasheng Yuan
(Tianjin University of Science and Technology, China)

OS13-10 *Research on Recognition and Application of EEG Signal based on SSVEP-BCI*
Di Yin[1], Fengzhi Dai[1,3], Mengqi Yin[2], Yasheng Yuan[1], Yuxuan Zhu[1]
([1]Tianjin University of Science and Technology, China)
([2]Hebei University of Chinese Medicine, China)
([3]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

OS13-11 *Research on Bad Driving Detection based on Behavior Recognition*
Yasheng Yuan, Fengzhi Dai, Di Yin, Yuxuan Zhu
(Tianjin University of Science and Technology, China)

OS13-12 *Research on Crop Image Recognition Technology - Take Daylily as an Example*
Jichao Zhao, Fengzhi Dai (Tianjin University of Science and Technology, China)

OS13-13 *Design of Daylily Agricultural Picking Robot*
Jichao Zhao, Fengzhi Dai (Tianjin University of Science and Technology, China)

OS13-14 *Development of Intelligent Public Trash Can based on Machine Vision and Learning*
Longyu Gao, Fengzhi Dai, Zhiqing Xiao, Jiangyu Wu, Zilong Liu
(Tianjin University of Science and Technology, China)

13:00-14:15 OS12 System and Control (18)
Chair: Huailin Zhao (Shanghai Institute of Technology, China)
Co-Chair: Jichao Zhao (Tianjin University of Science and Technology, China)

OS12-1 *The Optimized Intelligent Algorithms on Face Recognition and Tracking for ROS-based Robots*
Yue Chen, Shuhao Tian, Huailin Zhao, Shengyang Lu
(Shanghai Institute of Technology)

OS12-2 *Control of a Novel 5D Hyperchaotic System*
Qiang Wei[1], Hong Niu[2]
([1]Army Military Transportation University, China)
([2]Tianjin University of Science & echnology, China)

OS12-3 *Design of Multifunctional Vehicle Interior Environment Monitoring System Based on Wireless Communication*
Yuqi Yan, Jialin Yang, Zhongxu Qin (Wuhan University of Technology, China)

OS12-4 *Robot Structure and Motion control Design Based on UG and Product*
Yuhang Sheng (Tianjin University of Science and Technology, China)

OS12-5 *Design of Brushed Motor Position Loop Control System Based on Incremental PID*
Tianyi Zhang, Peng Lu (Tianjin University of Science and Technology, China)

OS12-6 *Design of a Fire alarm system*
Yuhui Cheng, Tianyi Zhang (Tianjin University of Science and Technology, China)

OS12-7 *Design of intelligent curtain control circuit based on single chip Microcomputer*
Qianqian Zhang, Jichao Zhao, Haokang Wen, Hongbo Hao
(Tianjin University of Science and Technology, China)

OS12-8 *Research on the algorithm of flue gas desulfurization system*
Hongbo Hao (Tianjin University of Science and Technology, China)

OS12-9 *A Survey of Low Visibility Image Enhancement Based on MSRCR Algorithm*
Haokang Wen, Hongbo Hao (Tianjin University of Science and Technology, China)

OS12-10 *Design of a Taxi Meter Based on Single Chip Computer*
Haokang Wen, Min Wang (Tianjin University of Science and Technology, China)

OS12-11 *Design of a High Precision Digital Clock Based on Single Chip Microcomputer*
Haokang Wen, Qiang Zheng (Tianjin University of Science and Technology, China)

OS12-12 *Design of Manchu Image Acquisition System Based on STM32*
Hongbo Hao[1], Fulin Zheng[2]
([1]Tianjin University of Science and Technology, China)
([2] Dalian Minzu University, China)

OS12-13 *Design of timing socket based on single chip microcomputer*
Hongbo Hao[1], Shuailin Chen[2]
([1]Tianjin University of Science and Technology, China)
([2]Qingdao University of Science and Technology, China)

OS12-14 *Study on the effect of physical fitness training on children's cognitive ability*
Jianhua Deng, Lei Ning (Yanshan University, China)

OS12-15 *Effects of high heels on plantar stress in women*
Jianhua Deng, Lei Ning (Yanshan University, China)

OS12-16 *A research on Intelligent Classification of Urban Trash Bins based on Machine Learning*
Longyu Gao, Zilong Liu, Luqi Shen, Songyun Shi, Yongzheng Lv
(Tianjin University of Science and Technology, China)

OS12-17 *A Design on Intelligent Public Trash Can based on Machine Vision and Auxiliary Sensors*
Longyu Gao, Leixin Han, Jiangyu Wu, Mingfei Liu, Ruming Kang
(Tianjin University of Science and Technology, China)

OS12-18 *A research on Front-end Garbage Classification based on Machine Vision*
Longyu Gao, Zhiqing Xiao, Junlong Hao, Luqi Shen, Manqian Hu
(Tianjin University of Science and Technology, Tianjin, China)

Meeting Room 3 (ZOOM ID: 984 4367 9770)
11:00-12:00 OS20 Virtual Reality and Intelligent Interactions (3)
Chair: R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Co-Chair: Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

OS20-1 *NeuroPhyllotaxis: An Interactive Application for Generative Art Based on EEG Data*
Chien-Tung Lin, R.P.C. Janaka Rajapakse
(Tainan National University of the Arts, Taiwan) Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

OS20-2 *VRMAZU: VR Visualization of Mazu Temple for Passive Interaction with Generated Sound from the ML Technique(withdraw)*
Yi-Li Liang. R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Jen-Tun Lee (Japan Advanced Institute of Science and Technology, Japan)
Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

OS20-3 *ThoughtMix: Interactive Water Color Generation and Mixing Based on EEG Data*
R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

OS20-4 *HaptWarp: Soft Printable and Motion Sensible Game Controller*
Jen-Tun Lee, Kazunori Miyata
(Japan Advanced Institute of Science and Technology, Japan)
R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

13:00-14:00 OS1 Human-Machine Interface Application (4)
Chair: Norrima Mokhtar (University of Malaya, Malaysia)
Co-Chair: Heshalini Rajagopal (Manipal International University, Malaysia)

OS1-1 *Gray Level Co-Occurrence Matrix (GLCM) and Gabor Features Based No-Reference Image Quality Assessment for Wood Images*
Heshalini Rajagopal[1], Norrima Mokhtar[1], Anis Salwa Mohd Khairuddin[1], Wan Khairunizam[2], Zuwairie Ibrahim[3], Asrul Bin Adam[3], Wan Amirul Bin Wan Mohd Mahiyidin[1]
([1]University of Malaya, Malaysia) ([2]University of Malaysia Perlis, Malaysia) ([3]University of Malaysia Pahang, Malaysia)

OS1-2 *Design and Development of Automated Seeding and Irrigation System*
Anirban Kumar, Heshalini Rajagopal (Manipal International University, Malaysia)

OS1-3 *Investigation of A Real-Time Driver Eye-Closeness for the Application of Drowsiness Detection*
Muhammad Zubir bin Kamazlan[1], Wan Khairunizam[1], Abdul Hafiz Halin[1], M. Rudzuan M. Nor[1], Azian Azamimi Abdullah[1], Norrima Mokhtar[2]
([1]University Malaysia Perlis, Malaysia) ([2]University of Malaya, Malaysia)

OS1-4 *Towards Establishing Path Planning Strategies For Autonomous UAVs; A Brief Survey-Summary on Recent Technique*
Anees ul Husnain, Norrima Binti Mokhtar, Noraisyah Binti Mohamed Shah, Mahidzal Bin Dahari
(University of Malaya, Malaysia)

Meeting Room 4 (ZOOM ID: 971 5454 5491)
11:00-12:00 GS7 Robotics 2 (4)
Chair: Wisanu Jitviriya

GS7-1 *Development of Interactive Robot – Emotion Estimation System Using Speech by 1dCNN -*
Yugo Kawachi, Eiji Hayashi (Kyushu Institute of Technology, Japan)

GS7-2 *Deep Learning Methods for Semantic Segmentation of Dense 3D SLAM Maps*
Pei Yingjian, Sakmongkon Chumkamon, Eiji Hayashi
(Kyushu Institute of Technology, Japan)

GS7-3 *Robot Motion Generation by Hand Demonstration*
Sakmongkon Chumkamon, Umaporn Yokkampon, Eiji Hayashi, Ryusuke Fujisawa
(Kyushu Institute of Technology, Japan)

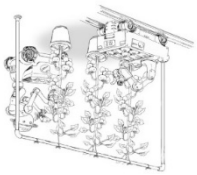
GS7-4 *Medical Telerobotics: IRAPs SHaRE-aGIVeR*
Noppadol Pudchuen, Jiraphan Inthiam, Wisanu Jitviriya, Amornphun Phunopas, Chirdpong Deelertpaiboon
(King Mongkut's University of Technology North Bangkok, Thailand)
Aran Blattler (Kyushu Institute of Technology, Japan)

Group Meeting

Abstracts
PS abstracts

PS1 Tomato-harvesting-robot competition towards smart agriculture

Kazuo Ishii (Kyushu Institute of Technology, Japan)



In agriculture, the aging and depopulation of farmers cause the shortages of farmers and manpower. Most of commercialized robots are industrial robots for factory automation, and most of robots for the first industry, agriculture, forestry and fisheries are still under developing. The reasons are cost-efficiency of the robotization, safety of the works using robots, difficulty of outdoor operations, and knowledge transfer problem from farmers to computer, etc. As one of solutions for the problems, robot technology into the agriculture is expected to contribute to the laborsaving, improvement of production, production line automation, and also the management toward smart-agriculture. We organize the Tomato-harvesting-robot competition to offer the research field and welcome researchers into agricultural robotics.

PS2 Human-computer Communication Using Facial Expression

Yasunari Yoshitomi (Kyoto Prefectural University, Japan)

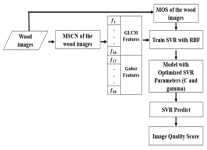
To develop a computer system, such as a robot, that can communicate smoothly with human, it is necessary to equip the system with a function of understanding human emotion. Moreover, it is also necessary to equip the system with a function of expressing emotional signal to human. From both points of view, facial expression is a promising target as a research field. With co-researchers, I have been researching both aspects on facial expressions. For developing a method for recognizing facial expression, we have used infrared-ray images in addition to visible-ray images. For expressing emotional signal to human, we have developed a personified agent. Our challenges for human-computer communication using facial expression will be introduced in my presentation.

OS abstracts
OS1 Human-Machine Interface Application (4)
Chair: Norrima Mokhtar (University of Malaya, Malaysia)
Co-Chair: Heshalini Rajagopal (Manipal International University, Malaysia)

OS1-1 Gray Level Co-Occurrence Matrix (GLCM) and Gabor Features Based No-Reference Image Quality Assessment for Wood Images

Heshalini Rajagopal[1], Norrima Mokhtar[1], Anis Salwa Mohd Khairuddin[1], Wan Khairunizam[2], Zuwairie Ibrahim[3], Asrul Bin Adam[3], Wan Amirul Bin Wan Mohd Mahiyidin[1]
([1]University of Malaya, Malaysia) ([2]University of Malaysia Perlis, Malaysia)
([3]University of Malaysia Pahang, Malaysia)

Image Quality Assessment (IQA) is an imperative element in improving the effectiveness of an automatic wood recognition system. There is a need to develop a No-Reference-IQA (NR-IQA) system as a distortion free wood images are impossible to be acquired in the dusty environment in timber factories. Therefore, a Gray Level Co-Occurrence Matrix (GLCM) and Gabor features-based NR-IQA, GGNR-IQA algorithm is proposed to evaluate the quality of wood images. The proposed GGNR-IQA algorithm is compared with a well-known NR-IQA, Blind/Referenceless Image Spatial Quality Evaluator (BRISQUE) and Full-Reference-IQA (FR-IQA) algorithms, Structural Similarity Index (SSIM), Multiscale SSIM (MS-SSIM), Feature SIMilarity (FSIM), Information Weighted SSIM (IW-SSIM) and Gradient Magnitude Similarity Deviation (GMSD). Results shows that the GGNR-IQA algorithm outperforms the NR-IQA and FR-IQAs. The GGNR-IQA algorithm is beneficial in wood industry as a distortion free reference image is not required to pre-process wood images.



OS1-2 Design and Development of Automated Seeding and Irrigation System

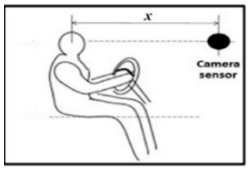
Anirban Kumar, Heshalini Rajagopal (Manipal International University, Malaysia)

Malaysia, has a very conducive environment for agriculture. Six percent of the population are employed to some of the agriculture activities making agriculture the most curtail industry in Malaysia. Hence, there is a need to develop the agricultural facilities by incorporating latest technological advancements. Conventional seeding process is time consuming and requires additional labor cost. In this project, an automated system is proposed for seeding as well as irrigation process in agriculture which reduces the labor cost. This system aims to increase the efficiency of the seeding process without affecting the nature of soil. The proposed system is equipped with Arduino MEGA and Arduino UNO which acts as the main control unit while ultrasonic and soil moisture sensors are used to detect the obstacles and soil moisture level, respectively. The robot consists of a funnel like arrangement to perform the seeding procedure. The field is equipped with moisture sensors placed at different areas that monitors the moisture level of the soil on a regular interval for irrigation purposes. The proposed system will be of great benefit to the future endeavor of agricultural business as well as it will be able to optimize the seeding and irrigation.

OS1-3 Investigation of A Real-Time Driver Eye-Closeness for the Application of Drowsiness Detection

Muhammad Zubir bin Kamazlan[1], Wan Khairunizam[1], Abdul Hafiz Halin[1], M. Rudzuan M. Nor[1], Azian Azamimi Abdullah[1], Norrima Mokhtar[2]
([1]University Malaysia Perlis, Malaysia) ([2]University of Malaya, Malaysia)

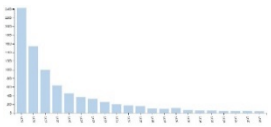
The increase in accident and death rates due to drowsiness while driving raises concerns to the community. An efficient solution is vital to ensure the safety of all drivers on the road. Most previous studies have analyzed drowsiness using head tilt, yawning, and eye condition. Face detection applied in drowsiness detection from previous research not included distances between subject and camera. The features used for eye detection required large storage and long-term process which are not applicable in a real-time system. This study uses Haar algorithm and analysis is performed based on the size of the region of interest for face detection. Eye monitoring uses facial landmark features and the evaluation is dependent on the width of the eye. The percentage of eye closure is used to describe the eyes as closed. This study only takes into account the normal rate of blinking eyes while driving because of the long-time constraints required for a person to be in a drowsy state. In this research, the Raspberry Pi 3B+ and Pi cameras are used as processing and vision devices. The highest accuracy of face detection achieved based on the ROI area at a distance of 80 cm is 98.33%. The lowest difference between eye width and the intercanthal distance is 0.36%. The overall normal eye blink rate while driving is in the range of the normal eye blink rate which does not exceed 20 blinks/min as reported by the previous researcher.



OS1-4 Towards Establishing Path Planning Strategies For Autonomous UAVs; A Brief Survey-Summary on Recent Technique

Anees ul Husnain, Norrima Binti Mokhtar, Noraisyah Binti Mohamed Shah, Mahidzal Bin Dahari
(University of Malaya, Malaysia)

The extent of autonomy in path planning for a UAV primarily depends upon the capabilities of its algorithm. The diversity in UAV applications and an abundance of choices in autonomous path planning algorithms are swelling every day, so the selection of most appropriate algorithm gets baffling. The past two decades of research on UAVs revealed that seventy percent of it had been published in the previous three and a half years. Hence, a comprehensive survey study was proposed and conducted to obtain an overview of the recent developments in autonomous path planning applications and their respective algorithms. This article presents a summary of the survey and suggests most suitable path planning algorithms for a UAV application.



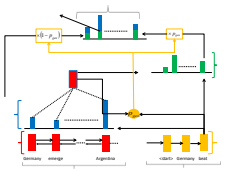
OS2 Media Information Processing, Music Recommendation and Artificial Intelligence (4)

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

OS2-1 Comparison of Data Augmentation Methods in Pointer-Generator Model Using Various Sentence Ranking Methods

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

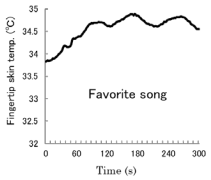
In the existing research, we proposed a data augmentation method using topic model for Pointer-Generator model. In this study, we add to the sentence ranking method in the data augmentation method. Specifically, we add two ranking method using LexRank and Luhn. LexRank is based on Google's search method and Luhn defines sentence features and ranks sentences. We compare three data augmentation method. We considered which method is suitable for data augmentation. Nowadays, it is very difficult to extract information due to the flood of information on the Internet. Therefore, we propose Pointer-Generator model using a data augmentation method using various ranking methods.



OS2-2 Music Recommendation System Driven by Variations in Fingertip Skin Temperature

Mayuka Wada[1], Taro Asada[2], Yasunari Yoshitomi[2], Masayoshi Tabuse[2]
([1]Shimadzu System Development Corp., Japan, [2]Kyoto Prefectural University, Japan)

In recent years, music therapy has been performed to recover cognitive function of elderly people. In the previously reported system, it is necessary to input the user's subjective evaluation to determine the next recommended song. In this study, variations in fingertip skin temperature were used as input instead of subjective evaluation, focusing on evaluation of emotion expressed as physiological response through variations in fingertip skin temperature. Our system can be used with no support for users, such as severe dementia patients or bedridden patients, who cannot respond actively.



OS2-3 Music Recommendation System Driven by Interaction between User and Personified Agent Using Speech Recognition, Synthesized Voice and Facial Expression

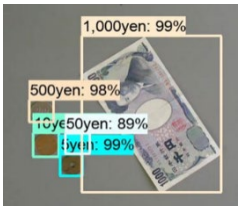
Ayumi Matsui[1], Miki Sakurai[2], Taro Asada[3], Yasunari Yoshitomi[3], Masayoshi Tabuse[3]
([1]Sumitomo Mitsui Card Co., Ltd., Japan, [2]TIS Inc., Japan, [3]Kyoto Prefectural University, Japan)

We propose a system for music recommendation through an interaction between a user and a personified agent using speech recognition, synthesized voice and facial expression. The speech is recognized using a speech recognition system called as Julius, followed by facial expression synthesis of the agent using preset parameters depending on the vowel each. We used MikuMikuDanceAgent (MMDAgent) to create an agent. To produce the agent's voice, we use the speech synthesis function setting built into MMD Agent. We add the agent a new function of changing its facial expression according to user's response to music recommended by our system. The effectiveness of the proposed system is verified.

OS2-4 Wallet Operation Evaluation System Using Deep Learning

Junichiro Yamawaki[1], Yasunari Yoshitomi[2], Masayoshi Tabuse[2], Taro Asada[2]
([1]SKY Co., Ltd., Japan, [2]Kyoto Prefectural University, Japan)

In Japan, the average age of the population has been increasing, and this trend is expected to continue. Because of this trend, the number of older people with dementia is increasing very rapidly. It is necessary to find out persons at the early stage, so called MCI (Mild Cognitive Impairment), of dementia, for taking care of them while suppressing their dementia progression. For investigating MCI, wallet operation test has been receiving considerable attentions. In the present study, we propose a system for wallet operation evaluation using deep learning. By the system, a wallet, bills, and coins are automatically recognized and the ability of correctly picking up bills and coins in the wallet within the reasonable time is estimated.



OS3 Robot Control (9)

Chair: Yizhun Peng (Tianjin University of Science and Technology, China)
Co-Chair: Huailin Zhao (Shanghai Institute of Technology, China)

OS3-1 A Design and Implementation Intelligent Flowerpot

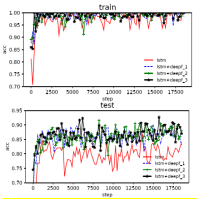
Songyun Shi, Yizhun Peng (Tianjin University of Science and Technology, China)

Aiming at the characteristics that people often neglect the care of potted plants at home, this article designs a smart flowerpot, which can make the potted plants survive and grow better without supervision. This is a smart home product based on the Internet of Things technology. The flowerpot collects data from temperature sensors, humidity sensors, soil humidity sensors, harmful gas sensors, and photosensitive modules through STM32 single-chip microcomputers, and cooperates with smart tracking systems and automatic irrigation systems. To achieve the purpose of unmanned cultivation of potted plants, beautify and improve the living environment.

OS3-2 Research of Attention-LSTM Model for Baby Cry Detection Robot

Tianye Jian, Yizhun Peng, Wanlong Peng, Zhou Yang
(Tianjin University of Science and Technology, China)

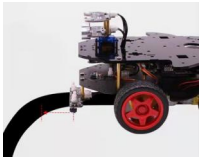
In order to achieve the effective acquisition of frame-level speech features under different emotional needs of baby, a speech emotion recognition model for baby based on improved long-term and short-term memory (LSTM) network is established. The frame-level speech features are used instead of the traditional statistical features to preserve the temporal relationships in the original speech, and the traditional forgetting and input gates are transformed into attention gates by introducing an attention mechanism, in order to improve the performance of speech emotion recognition, the depth attention gate is calculated according to the self-defined depth strategy. The results show that, in Fau Aibo Children's emotional data corpus and baby crying emotional needs database, compared with the traditional LSTM based model, the recall rate and F1 score of this model are 3.14%, 5.50%, 1.84% and 5.49% higher, respectively, compared with the traditional model based on Lstm and GRU, the training time is shorter and the speech emotion recognition rate of baby is higher.



OS3-3 A Design and Implement of an Automatic Intelligent Car

Chengzhi Liu, Yizhun Peng, Jikai Zhao, Dezhi Yang (Tianjin University of Science and Technology, China)

In order to study the situation that some unmanned vehicles need to drive repeatedly on fixed lines, this article introduces an autonomous smart car based on the STM32 platform. Infrared detectors are used to determine whether the vehicle is driving on a prescribed route. Ultrasonic detectors can prevent the vehicle from colliding with other people or vehicles. Inexpensive trolleys can help express companies to transport packages and letters to reduce labor costs. Large vehicles can be used to carry large cargo such as containers in docks and other places.



OS3-4 A Target Detection in Remote Sensing Image based on Deep Learning

Lianchen Zhao, Yizhun Peng, Di Li, Yuheng Zhang (Tianjin University of Science and Technology, China)

For high-resolution optical remote sensing images, there are still many challenges in target detection. In this paper, deep learning algorithm is used to detect the target in remote sensing image. Improve and optimize the deep learning target detection algorithm. When the selected data set is used for target detection, the AP value is improved, which leads to the concept of multi-scale feature fusion feature pyramid and residual network. By improving the selected Yolov3 network model, the detection effect of the two targets of aircraft and ships in remote sensing images has been significantly improved.

OS3-5 A Design of Home Smart Nursing Robot based on Raspberry Pi 4

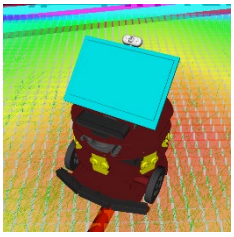
Yuqi Zhao, Yizhun Peng, Jie Liu, Xiaowei Wu, Jikai Zhao
(Tianjin University of Science and Technology, China)

This product is based on Bluetooth, WIFI and other wireless technologies, with the Raspberry Pi 4 as the core, to meet the health, safety and entertainment needs of the serviced users, mainly the elderly, while assisting the leisure and entertainment of users when traveling outdoors. A multi-functional escort robot designed for safety and other issues. It has many methods such as temperature and humidity monitoring, harmful gas monitoring, and noise monitoring to ensure the safety of users. At the same time, it also has TV projection, audio-visual entertainment touch screen interaction, mobile phone projection and other entertainment functions.

OS3-6 Design and Simulation of Indoor Tour Guide Robot Based on ROS

Yuheng Zhang, Yizhun Peng, Lianchen Zhao (Tianjin University of Science and Technology, China

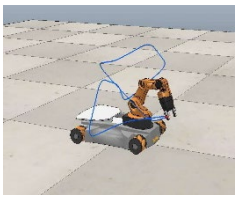
Aiming at the problems of the small number of lecturers in museums and other venues and the large demand for audience consultation, a ros-based indoor guide robot was designed. The robot consists of a mechanical system, a motion control system, and a sensor system. In order to improve the efficiency of development and debugging, and reduce the cost of experiments, it is necessary to test related algorithms in a virtual simulation environment before the robot enters the actual working state. Experiments have proved that the robot can autonomously guide guests to the destination and explain according to a preset path; the robot has multiple sensors to sense obstacles, and can autonomously avoid obstacles during the explanation and continue to move; the robot can accurately and efficiently recognize faces and provide accurate services Fast.



OS3-7 Research on Path Planning of Manipulator

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

In order to further realize the flexibility, intelligence and human-machine friendliness, the robot must have the ability of flexible motion planning. This paper mainly introduces the general steps of manipulator path planning and common path planning algorithms. First, the path planning of the manipulator is reviewed from three aspects: environment modeling, path search, and path smoothing. In addition, compared various manipulator path planning algorithms, such as RRT algorithm, ant colony algorithm, genetic algorithm, etc. Finally, the development trend of path planning technology is summarized and analyzed.



OS3-8 Research on White-Line-tracking Walking Technique of NAO Robot

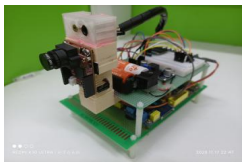
Wanlong peng, Yizhun peng, Yuheng zhang,Tianye jian
(Tianjin University of Science and Technology, China)

Liner-tracking walking technique is an essential part of intelligent robot technology. This paper selected NAO robot as the research platform to study the line-tracking walking problem. Firstly, NAO white shell increased the difficulty of white line recognition, this is different from other robot. A method based on image preprocessing is presented, sorting white edge with cut-point which is non-differential or derivative is zero, then designed the controller based on the improved digital incremental PID(proportion integration differentiation)algorithm and determined the controller parameters through the concise test method on Simulink. Finally, it was realized by programming in Python language.

OS3-9 A Design and Implement of Portable Epidemic Detection Device based on STM32

Yuqi Zhao, Yizhun Peng, Xiaowei Wu,Yusong Zhou (Tianjin University of Science and Technology, China)

The equipment is mainly designed for epidemic detection. It is an intelligent detection box device. It collects and analyzes data through cameras and sensors. It uses LBP algorithm and LAB color model to enable the detection box to identify the temperature and mask of the entered personnel. Wearing conditions, preliminary comparison of epidemic prevention standards for passers-by, whether to wear masks, whether the body temperature exceeds the standard, and at the same time enter the identity of new personnel and store them in the database, and detect the incoming personnel through face recognition to find out in time Those who are not entered shall take corresponding measures in time to improve the efficiency of epidemic prevention and control. The device does not need to be held in hand, can be fixed anywhere, can effectively avoid cross-infection, and supports self-set temperature alarm thresholds, support voice broadcast reminders, fast and accurate non-contact temperature measurement.



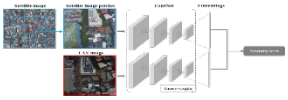
OS4 Intelligent UAV and Systems (3)

Chair: Young Im Cho (Gachon University, Republic of Korea)
Co-Chair: Jang-Myung Lee ((Pusan National University, Republic of Korea))

OS4-1 Satellite Image-based UAV Localization using Siamese Neural Network

Seong-Ha Ahn, Ho-Sun Kang, Jang-Myung Lee (Pusan National University, Republic of Korea)

We present a method for UAV localization using pre-existing satellite images. The use of Unmanned Aerial Vehicles (UAVs) has rapidly increased in several applications such as surveillance, search, and defense. When in GPS-denied situations, however, the onboard GPS signal may be noisy or inaccurate. The proposed method is based on a Siamese Neural Network that contains two instances of the same neural architecture and weights. Siamese Neural Network learns the similarity metric so that can recognize the same place from two raw images. Convolutional Neural Network is used as a backbone in Siamese Neural Network to overcome variation due to differences such as perspective, shadow angle, and presence of vehicles. We describe UAV localization pipeline and a dataset for training and testing our networks. Finally, the performance of the proposed method was shown in accuracy.



OS4-2 Analysis Based on CNN for Automated Vehicle Parking Occupancy

Muksimova Shakhnoza, Young Im Cho (Gachon University, Republic of Korea)

The noteworthy growth of the automotive trade besides an absence of urban development has caused issues like traffic congestion, air contamination, and driving difficulties. To facilitate consumers, most car manufacturers provide a pre-installed or aftermarket navigation system in vehicles. This enables drivers to easily navigate to their destination. However, navigation systems provide a rough estimate of the remaining distance to the destination. With the recent technological advancements in sensing and intelligent technologies, companies are interested to find out whether these advancements can assist in reducing the time spent to search for vacant parking spaces. Locating an unoccupied parking space is a major predicament that drivers face since searching for it is a tedious process. We investigations showed that, in comparison with previous approaches, for the task of classifying given parking spaces as vacant or occupied, the proposed approach is more robust, stable, and well-generalized for unseen images captured from completely different camera viewpoints, which has strong indications that it would generalize effectively to other parking lots.

	Accuracy	Accuracy
Our Method	97.92%	97.87%
AlexNet[6]	96.99%	97.91%
ResNet[55]	96.51%	97.80%

Table 1. Comparison of training and validation scores for AlexNet, ResNet and Our method on UFPR04.

OS4-3 On the boundary layer part of the asymptotics of the solution of a singularly perturbed boundary value problem

Assiya Zhumanazarova, Young Im Cho (Gachon University, Republic of Korea)

In this paper, we study the boundary layer part of the asymptotics of a singularly perturbed integro-differential boundary value problem with an initial jump. A part of the boundary layer is defined as an expansion in powers of a small parameter, and the coefficients of this expansion are solutions of a third-order differential problem. The purpose of this work is to describe in detail the properties of the boundary layer part of the asymptotics and to prove estimates of their coefficients.

OS5 Advanced Information Processing Applications (6)

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

OS5-1 A Method for Patterns of Cell-Like Images Based on Distance Transformation

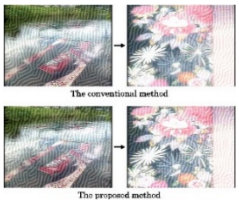
Toru Hiraoka, Kohei Maeda (University of Nagasaki, Japan)

A non-photorealistic rendering method has been proposed to generate cell-like images that cell-like patterns are represented in photographic images. The cell-like patterns are automatically generated according to changes with edges and shades of the photographic images. However, the cell-like patterns are irregularly arranged. In this study, we propose a method to arrange the cell-like patterns along the edges of the photographic images. Our method improves on the conventional method by using Euclidean distance from the edges. We show that the cell-like images with the cell-like patterns arranged along the edges can be generated by our method through experiments using various photographic images.

OS5-2 Generating Striped Animations by Inverse Line Convergence Index Filter

Toru Hiraoka, Ryosuke Takaki (University of Nagasaki, Japan)

A non-photorealistic rendering method has been proposed for generating a striped image which is overlaid striped patterns in a photograph. The conventional method generates the striped image by an iterative process using an inverse line convergence index filter. When a striped animation is generated by converting each frame of a movie by the conventional method, flickering occurs in the generated striped animation. In this letter, we propose a method for generating a striped animation that has characteristic with less flicker from the movie. The effectiveness of the proposed method is investigated experimentally. As a result of the experiments, the proposed striped animation had less flicker than the conventional striped animation.



OS5-3 A Method for Estimating Home Location of Foreigners in Japan Using Photograph Location

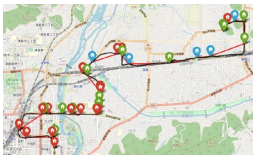
Masaharu Hirota, Tetsuya Oda (Okayama University of Science, Japan)

The attributes of travelers such as home location and age could be useful for many applications such as information recommendation and targeted advertisement. However, this information is not accessible in most Web services because users do not reveal them. We propose a method to estimate a foreign tourist's home location based on each country's tendency, in which tourists from certain regions tend to visit certain places when traveling abroad. The feature for the estimation uses the frequency of photograph location in a geohash. In this paper, we use foreigners in Japan as a case study. We evaluate the performance of our proposed method by using photographs obtained from their user accounts on Flickr.

OS5-4 A Proposal of Online Map-matching Based Trajectory Compression Algorithm Using Road Networks

Shota Iiyama, Tetsuya Oda, Masaharu Hirota (Okayama University of Science, Japan)

As the data size of GPS logs increases, the amount of data transferred from mobile devices to the server, and the computational cost of analysis of GPS logs increase. One of the solutions to these problems is to compress the GPS logs. However, it is difficult to compress a sparse GPS log while preserving the feature points in the GPS log, such as the user's movement speed, the shape of the GPS log trajectory, and the direction of movement of the GPS log. In this study, we propose an online compression algorithm for GPS logs that improves the compression ratio while preserving GPS logs' feature points. Our proposed method compresses GPS logs by using information from the road network to identify users' roads. We evaluate the performance of this method using the GPS data of the bus.



OS5-5 Case Study and Direction of Share Cycle System in Japanese Cities

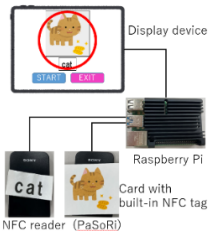
Minoru Kumano (University of Miyazaki, Japan), Toru Hiraoka (University of Nagasaki, Japan)

In the share cycle, people can share a bicycle with others, use and return it using multiple cycle ports, and register and borrow it with just an IC card or smartphone. The share cycle system is still new in Japan, and there are few papers even if you search the National Institute of Informatics. There is no case study. Therefore, in this paper, we selected 16 advanced cases nationwide and conducted a questionnaire survey in 2019. The purpose was to clarify the business purpose, issues, effects, features, numerical values such as the number of ports and the number of bicycles, and the direction. As a result, it was clarified that the purpose is to improve the ease of migration and to supplement public transportation, and to improve the profitability and the number of users are many issues, which contributes to tourism.

OS5-6 The IoT Solution to Play English Word Learning Tool

Shogo Aizawa, Motohide Yoshimura (University of Nagasaki, Japan)

We innovate an IoT solution to play the English word learning tool. It uses a Raspberry Pi and two NFC readers. You can learn English words in three steps by using our tool. First, prepare NFC tags corresponding to English words and illustrations. Next, select a pair of the English word and illustration. Finally, hold them over the NFC reader, then the correct answers are displayed. Our solution has two aspects. The one is an educational tool for children and the other is an IoT toy playing with children. As to the former, the children can learn English words by intuitive operation such as operating the touch panel and holding the NFC tags. As to the latter, you can experience a part of an IoT technology such as NFC. In this paper, we report findings through the construction of the English word learning tool.



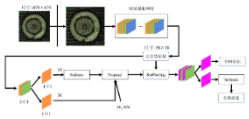
OS6 Intelligent Control (6)

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

OS6-1 Faster R-CNN Based Defect Detection of Micro-precision Glass Insulated Terminals

Qunpo Liu[1], Mengke Wang [1], Zonghui Liu[1], Naohiko Hanajima[2], Bo Su[1]
([1]Henan Polytechnic University, P.R.China) ([2]Muroran Institute of Technology, Japan)

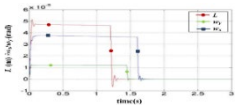
Micro-precision glass-encapsulated electrical connectors are the core components used in precision electronic equipment. As an electrical connector, its quality has a huge impact on the performance of precision electronic equipment. Due to limitations in materials and production processes, some of the micro-precision glass connectors produced have defects such as missing blocks, bubbles, and cracks. At present, it is difficult to ensure product quality and production efficiency with manual inspection methods. However, the defect characteristics of micro-precision glass connectors are quite different, and it is difficult for traditional defect detection technology to design an ideal feature extractor for detection. Therefore, this paper proposes to use deep learning technology to detect missing blocks. Firstly, the sample pictures of missing defects of electrical connectors are preprocessed, and then be used to train the deep learning network of Faster RCNN. According to the test results, the algorithm has an accuracy of over 80% in detecting missing defects in glass connectors.



OS6-2 Adaptive Sliding Mode Control for a Constant Tension Suspension System

Yuxin Jia, Yingmin Jia, Kai Gong (Beihang University, China)

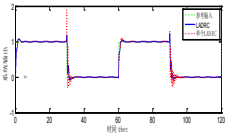
The constant tension suspension system can be used to counteract the gravity of the test object, and is widely used in the ground test of spacecraft control schemes. In this paper, the dynamic model of a constant tension suspension system is established, and a new adaptive sliding mode controller is designed. The simulation results show that the transient time and steady-state error of the control system designed in this paper are small, which satisfies the requirements of microgravity simulation.



OS6-3 Weighted Multiple Model ADRC for Uncertain Linear System

Weicun Zhang, Jing Ge (University of Science and Technology Beijing, China)

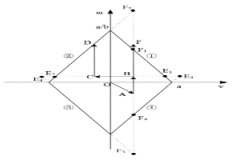
For uncertain linear systems such as parameter jumping, this paper establishes a fixed model set to cover the uncertainties of the real plant to be controlled, and for each local model with minor uncertainties, the corresponding local controller is designed based on Active Disturbance Rejection Controller (ADRC) approach. As a result, a weighted multiple model ADRC adaptive control framework is proposed. Some simulations have been conducted based on MATLAB to verify the effectiveness of the proposed weighted multiple model ADRC adaptive control algorithm.



OS6-4 Trajectory Tracking Control of Differential Wheeled Mobile Robot Based on Rhombic Input Constraints

Kai Gong, Yingmin Jia, Yuxin Jia (Beihang University, China)

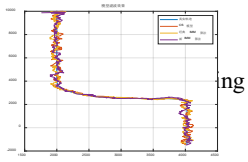
This paper focuses on the trajectory tracking control algorithm for the differential wheeled mobile robot (DWMR) based on rhombic input constraints. The kinematics and dynamics model of the DWMR are Established, and vector analysis method is used to design the time-varying parameters of the controller when the linear velocity and angular velocity of the DWMR were not independent of each other. Through the trajectory tracking simulation of the 8-shaped curve, a good control performance is obtained.



OS6-5 Maneuvering target tracking based on improved interacting multiple model algorithm

Weicun Zhang, Meiyu Zhu (University of Science and Technology Beijing, China)

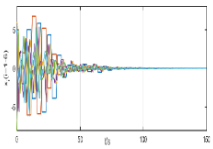
In recent decades, with the rapid development of artificial intelligence, target tracking technology has become a major aspect of scientific and technological research. Mobile target tracking technology is widely used in military and civilian fields. For example, in air defense and air traffic control, reliable and accurate tracking of targets is always the main purpose of target tracking system design. This paper presents a new interacting multiple model (IMM) algorithm for maneuvering target tracking. Some simulation based on MATLAB have been conducted to verify the effectiveness of the proposed algorithm.



OS6-6 Encapsualted Agents of Hybrid Order Discrete Dyanmics

Yunzhong Song (Henan Polytechnic University, P.R. China)

This paper is targeting to investigate the encapsulated cell realization of the hybrid order agents in discrete time, where it is composed by two different dynamic order agents, one is the first order and the another one is the second order, the work is the continued case of its continuous counter part of the encapsulated agents. To be specific, the exploration of the sampling speed is made distinguished from each other, where the fist order section is assigned at low speed, and the second order section is selected at comparatively high speed. To compensate the distinct sampling speed, the lifting technology is taken to analyze the encapsulated system. Theoretical analysis and simulation results are made available for the further reference.



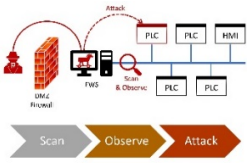
OS7 Information Applications and Security (5)

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

OS7-1 The Security Challenges with the Widespread Use of IT Infrastructure in ICS

Kuan-Ming Su, I-Hsien Liu, Jung-Shian Li (National Cheng Kung University, Taiwan)

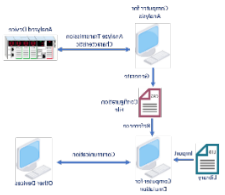
The communication established by Ethernet is becoming more and more common in the industrial control systems (ICS), and it brings not only pros but also cons like vulnerabilities. To hijack or get access to industrial devices, the attacker must know the information about the devices first, but most of the devices, equipment, and systems in ICS are not public, which is like a black box to the attacker. Therefore, we generalized a standard procedure to attack ICS with Ethernet-enabled, which is able to get the information and access of the devices in an unknown ICS like identifying the manufacturer of programmable logic controllers (PLC) and overwriting the configuration of PLCs. Also, we will implement the procedure to demonstrate the feasibility of this procedure with the system obtained from the real industrial control field whose devices' manufacturer is Schneider and protocol is Modbus TCP.



OS7-2 A Communication System with Equipment's Characteristics

Chia-Chun Lai[1], I-Hsien Liu[1], Chi-Che Wu[1], Chuan-Gang Liu[2], Jung-Shian Li[1]
([1]National Cheng Kung University, Taiwan) ([2]Chia Nan University of Pharmacy and Science, Taiwan)

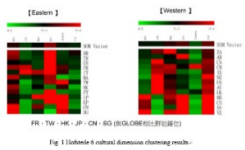
Over the past few years, the application on internet has grown rapidly and the devices that can connect to internet also have an explosive increase. In the past, some information such as IP address, MAC address and communication port are commonly used to identify a specific device on the internet. However, using this kind of information is not enough for the purpose to identify precisely because the information can simply be imitated by any other devices. In our research, we focus on the communicational characteristics of device. And we also provide a mechanism that can analyze these characteristics and generate configuration references which other devices can utilize. With the customized communication module and the references mentioned above, we can make other device imitate the behavior of analyzed device and provide a better effect on device emulation.



OS7-3 Application of the Self-Organizing Map (SOM) to Analyze the Multiple Perspectives on Cross-National Culture

Li-Ming Chuang, Yu-Po Lee, Shu-Tsung Chao (Chang Jung Christian University, Taiwan)

This study integrates the previous cross-cultural literature and aims to construct an analysis model of cross-national culture with multiple dimensions from three important cultural dimension theoretical models commonly used in cross-cultural studies: Hofstede, Global Leadership and Organizational Effectiveness (GLOBE) and World Values Survey (WVS). This study uses a self-organizing map (SOM) as an analysis method to integrate 17 cultural variables from this multicultural dimension for cluster analysis and explains the cultural types in 26 countries based on the results. This study explores the differences and similarities of different countries in different cultural dimension analyses and provides a comparative model of multicultural analysis. This study takes samples from three cross-cultural analysis databases as data sources and employs the self-organizing map for analysis based on a neural network algorithm. The results identify the cross-cultural groups of 26 countries and reveal their key cultural similarities and differences. We also elaborate upon the findings of these cultural characteristics and multi-cultural dimensions.



OS7-4 Threats Hidden in Employee Workstation through Office Files

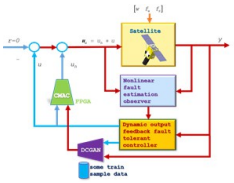
Tung-Lin Lee, I-Hsien Liu, Jung-Shian Li (National Cheng Kung University, Taiwan)

Due to the single sign-on implementation of windows operating systems, users could save a lot of time without having to enter their account and password again and again. However, this setting also allows hackers to Use some dedicated constructed malicious files to steal the user's identity verification information (NTLM hash), and then launch attacks like pass the hash, and then log in to the user's computer remotely, which becomes a way to gain access to the organization's intranet. Although there are many ways to cause an NTLM hash leak, fortunately, most of them cannot be exploited by hackers. For example, this paper will meet various common NTLM hash leak methods, and focus on the most commonly used method of hacking: Office files, and discuss them The possibility of extended application and under what circumstances will the existing protection mechanism be bypassed.

OS7-5 Microsatellite Attitude Control Approach: Combined with Generation Adversarial Networks Fault-Detection and Cerebellar Model Articulation Controller Fault-Tolerant Control

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

A new attitude control architecture for microsatellite is proposed. Based on the deep learning fault-detection method, the Cerebellar Model Articulation Controller(CMAC) is used as the fault-tolerant control. With the function of Generation Adversarial Networks(GAN) to recognize images, the microsatellite attitude fault wavelet spectrum is used as a guide for the training of generators and discriminators, and for system real-time fault diagnosis and classification. When the system fault diagnosis determines that the fault occurs, the cerebellar neural network is involved in fault-tolerant control. The GAN learning ability of the generative confrontation network is used to solve the problem of insufficient sample data and sample labeling respectively. The CMAC is used as a local learning network, which has generalization ability, strong convergence speed, and easy software and hardware implementation. The simulation results show that compared with other methods, the GAN method of fault-detection combined with CMAC can achieve higher accuracy and robustness.



OS8 Intelligent Systems and Control (5)

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

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

OS8-1 Networking Integration Application of an Intelligent Production Line for Aerospace Precision Manufacturing

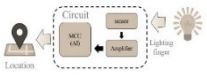
Chau-Chung Song, Chun-Chi Wang, Chen-Pang Chen, Chung-Wen Hung
(National Yunlin University of Science and Technology, Taiwan)

In this paper, the networking integration application of an intelligent production line is studied and developed for aerospace precision manufacturing. The technical development of the performance equalization and control for EDM machine is also introduced with the related technologies of the machine network and EtherCAT network. In addition, the development of intelligent production lines is integrated to improve the system stability and production efficiency of production line systems for aerospace component manufacturing. The key technologies of Cyber-Physical System (CPS) and intelligent networking is also integrated to constructs the real-time intelligent system monitoring system (SCADA) for data record and management. The key technologies of through-hole process are developed for intelligent diagnosis and through-hole inspection of related production processes. The integrated robot arm is responsible for the loading and unloading of the material, and the entire production line is connected by EtherCAT network. The automatic optical inspection (AOI) is introduced at the rear end of the production line to realize the quality judgment of the finished product. Furthermore, the virtual cloud network and intelligent factory is achieved with the information collection and intelligent monitoring system.

OS8-2 Low-Cost Indoor Localization Using Sound Spectrum of Light Fingerprints

Chung-Wen Hung, Hiroyuki Kobayashi, Jun-Rong Wu, Chau-Chung Song
(National Yunlin University of Science and Technology, Taiwan)

A low-cost indoor localization system using sound spectrum of light fingerprint is proposed in this paper, an artificial intelligence, AI, algorithm will be implemented in a low-cost micro-control unit, MCU, to perform the localization. The unit, complex and tiny differences of the light fingerprints are caused by the different characteristics of the discrete components used in lighting devices. To reduce the memory size for low-cost MCU, only sound spectrum of light fingerprint is used to identification the lighting device. Moreover, the grid search also is used to optimize the hyperparameters to compact the AI model. The system architecture and algorithm development are discussed in this paper, and the experimental results will be present to show the proposed system workable.



OS8-3 Air Valve Fuzzy Control Combined with Sheet Music Recognition Techniques Applied to Autoplaying Soprano Recorder Machines

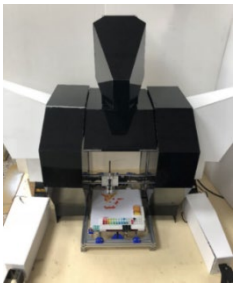
Chun-Chieh Wang, Guang-Ming Jhang (Chienkuo Technology University, Taiwan)

In the past research, there are many disadvantages to score recognition and flute performance. Therefore, this paper would improve on these two points. For the part of music score recognition, we use the y-axis projection method to detect the staff position and remove it to replace the erosion and expansion in morphology. After research and observation, it was found that the notes have a specific writing style on the staff. Therefore, we use this feature to distinguish notes. Detect note stem by x-axis projection to distinguish them in the first stage, then remove the stems to distinguish them in the second stage. After the notes are distinguished, the pixel clustering method is used to identify the scales. The center point of the rune head is compared with the staff position. The scale codes are arranged in order from bass to treble. Moreover, the performance is arranged according to basic music theory. The soprano recorder performance part, using the motors to control the finger to press the blow hole will not keep up the tempo. So we changed the motor to a solenoid valve to control the pneumatic cylinder to press the blow hole. In addition, the recorder will have different pressures depending on the pitch. So we increased the part of the control from one air valve to three air valves. Not only that, we have divided the range of the recorder into three different ranges of bass, midrange and treble, which greatly improves the situation that the original sound is generated when playing. Finally, we use fuzzy control theory to control the air valve. Experiments prove that the air valve fuzzy control combined with sheet music recognition techniques can fully realize the functions of autoplaying soprano recorder machines.

OS8-4 Image Inpainting Techniques Combined with Isolated Pixel Filtering Applied to Multifunctional Drawing Robots

Chun-Chieh Wang, Zhan-Xian Ye (Chienkuo Technology University, Taiwan)

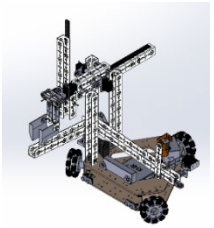
The purpose of this thesis is to assist street painters to improve their work efficiency. That is, the simpler part of the drawing is drawn by the robot. Once the initial picture is completed, the artist will take over the painting. In this paper, HSI color space is used to improve the effect of color simplification such that the recognition of image processing results is enhanced. Moreover, the isolated pixel filtering is used to replace the less-affected isolated point color with the surrounding color. Furthermore, Image Inpainting Techniques are utilized to reduce the distortion caused by the isolated pixel filtering. Besides, we adjusted the path planning as well as reduced isolated points to dramatically reduce drawing time. At the same time, LabVIEW can issue commands directly to control the robot by adding the communication function. In addition, in order to achieve the multifunctional drawing robotic mode, this system adds the sketch function. Through the image resolution adjustment as well as the shortening of the spacing of the drawing lines, the robot can draw more detailed pictures in the same size of drawing space. Simultaneously, we reserved some space in the organization to provide the use of subsequent development of other functions. The measured results confirm that the application of the technology in this paper can shorten the drawing time by about 55% on the multifunctional drawing robot system.



OS8-5 Mobile Robot with Image Recognition -- Using LabVIEW and KNRm

Kuo-Hsien Hsia, Bo-Jung Yang, Jr-Hung Guo, Chang-Sheng Xiao
(National Yunlin University of Science and Technology, Taiwan)

The main purpose of this paper is to use the image recognition of LabVIEW software to construct mobile robots with various functions, and make the robots applicable to the industry and have web monitoring applications. The core of the robot is mainly the KNRm controller. This controller is suitable for beginners, and can be connected to DC servo motor, RC servo motor, infrared, ultrasonic and camera to achieve various functions of the robot. The structure of the robot uses metal parts sold by Studica company, which can be in accordance with the desired function to assemble the robot. Since the company is a designated equipment sponsor company for World Skills competitions, it can also be in line with international standards. Finally, PID control and sensors are added to make the robot movement and position more accurately.



OS9 Intelligent Systems and Life (7)

Chair: Kuo-Hsien Hsia (National Yunlin University of Science and Technology, Taiwan)
Co-Chair: Evgeni Magid (Kazan Federal University, Russia)

OS9-1 Architecture of a student training computer program for preparing professional outpatient consulting skills within an electronic medical records system during COVID-19 alertness situation

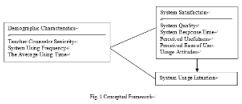
Sergey Bulatov[1], Evgeni Magid[2], Enzhe Kharisova[1], Roman Lavrenov[2], Vitaly Dudin[1], Artur Khazetdinov[2] ([1]Kazan State Medical University, Russia), ([2]Kazan Federal University, Russia)

One of the important goals of a medical education in the context of the COVID-19 pandemic is a broad introduction of simulated-based teaching methods, which might include elements of robotics and artificial intelligence. We analyzed computer programs that are currently used for maintaining medical records of patients by various polyclinics of Kazan. Based on these results, we summarized requirements for a training computer program that could provide students with medical records maintaining skills and developed program's preliminary architecture. Our main attention focused on modeling situations that are associated with pre-hospital stage processing of medical records for patients with suspected or confirmed COVID-19.

OS9-2 Satisfaction Assessment on the Counseling Service System for Full-Time Teacher-Counselor in Tainan Elementary School

Hsiu-Hao Liu (Chang Jung Christian University, Taiwan)
Yun-Syuan Jhang (National University of Tainan, Taiwan)

As the most important case management system in the school counseling works, the counseling service system must meet the needs and expectations of the school teacher-counselor (the main users). This investigation conducted a questionnaire among teacher-counselor to survey their satisfaction when using the counseling service system in Tainan City. The results of satisfaction items are as follows: "The items are provided abundant and complete by the system" was the highest of all items. "The items are provided to meet the needs to be collected in the counseling works by the system" was secondly. The least satisfactory item was "Using the system can help me communicate and interact with others in the counseling works". Additionally, system usage intention was effectively explained by perceived ease of use and usage attitudes. The conclusion was to discuss the implications of this research and suggest several future research issues.



OS9-3 Assess The Critical Factors for the Counseling Service System Usage Intention

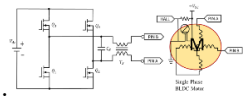
Hsiu-Hao Liu (Chang Jung Christian University, Taiwan)

As the most important case management system in the school counseling works, the counseling service system must meet the needs and expectations of the school teacher-counselor (the main users). Semi-structured interviews were used to interview teacher-counselor who have experience in using systems in Tainan. The data are recorded and semantic analyzed after interviewing, summarize the critical factors that affect the usage intention of the teacher-counselor. The conclusion was to discuss the implications of this research and suggest several future research issues.

OS9-4 Design and Implementation of EMI Suppression Filter for Electronic Commutation Fans

Ching-Chun Chuang, Chih-Chiang Hua, Chung-Wen Hung, Chun-Jen Yao
(National Formosa University, Taiwan)

This paper presents an electronically commutated fan has a complex digital control compared to conventional alternating current fans. Since serious electromagnetic interferences occur in the electronic commutation fan, a filter is required and its mechanical design is very important. A digital control for an electronically commutated fan is used to reduce the components of the EMI filter, and the suppression of conducted and radiated electromagnetic interference is discussed. Moreover, the fan system is integrated with proper mechanical design to reduce the radiated electromagnetic interference. Fig.1 shows a single-phase BLDC motor driver for the proposed fan. The electromagnetic interference produced by the electronically commutated fan is analyzed and the suppression strategy is provided. The experimental verification for the electronically commutated fan will be made available to the public.



OS9-5 Application of IOT to Forest Management Taking Fushan Botanical Garden as an Example

Shuo-Tsung Chen, Chih-Chiang Hua, Ching-Chun Chuang
(National Formosa University, Taiwan)

In recent years, the Internet of Things (IoT) technology has developed rapidly and has been successfully applied in different fields, and has begun to expand the application context of the Internet of Things. This work aims to study how to apply the IoT technology to forestry management, including: 1. Forestry management using wireless network communication technology of Low Power Wide Area Network (LPWAN) such as LoRa and NB-IoT; 2. Apply different sensing technologies to survey resource of forest and monitor the microclimate changes in forest. In order to actually verify the proposed feasible communication technology and sensor arrangement, we chose the Fushan Botanical Garden with the most diverse and complex terrain in Taiwan as the experimental site. Fig. 1 shown that the evaluation of a situation and setting for Forest Resources Survey. We actually built LoRa and NB-IoT communication equipment (including relay equipment) and various sensors to test the influence of terrain, climate, and trees on signal transmission efficiency and equipment installation. The returned data also verifies the successful operation of various communication devices and sensors.

OS9-6 Development of the IoT Module using MQTT Protocol and AES

Jr-Hung Guo*, Tzu-Yuan Lin, Kuo-Hsien Hsia
(National Yunlin University of Science and Technology, Taiwan)

The efficiency and safety of the Internet of Things have always been the focus of the development of IoT devices. Because the chips used in IoT devices generally have poor computing power, they cannot transmit data quickly and in large amounts, and use more complex security algorithms. Therefore, this thesis is to develop an IoT module with STM32 chip as the main controller. This module uses MQTT Protocol and AES encryption technology, and this IoT module can be operated directly with a browser. MQTT is a communication protocol for the Internet of Things, which was developed by IBM and Eurotech, and officially became an OASIS international standard in 2014. The purpose of development is to send and receive processing messages under narrow bandwidth and low energy consumption conditions. To ensure the security of IoT communications, we use AES encryption technology. Through this design, the communication of the entire IoT module is more efficient and safe. Finally, we applied this IoT module to the security system, and the overall efficiency and safety have been verified. In the future, we will continue to improve related software and hardware so that this IoT module can be used in different fields.

OS9-7 Exploring the Intention to Continuance of Learning Programming at Elementary School of Rural Area by the mBot Robot

Yung-Hsin Cheng, Jia-Ming Hsiao (National Yunlin University of Science and Technology, Taiwan)

Since Curriculum Guidelines of 12-Year Basic Education implemented by the Ministry of Education in 2018, the program learning courses have been added to junior high school education. However, there are no programming course in the elementary school. This study is proposed to explore the continuity and intentions of the rural area students in the programming course with mBot robot and mBlock programming tool through the Post-Acceptance Model of IS Continuance. It is indicated that enlightenment education of computational thinking should be implemented during the elementary school by means of graphical programming software and robot practice. Through the graphical software and teaching robots, we can cultivate problem solving skills for students' logic, creative thinking and communication, as well as through the task-guided way to train the students' concentration and perseverance.

OS10 Advanced Control Systems and Signal Processing (7)

Chair: Takuya Kinoshita (Hiroshima University, Japan)
Co-Chair: Shinichi Imai (Tokyo Gakugei University, Japan)

OS10-1 Nonlinear Internal Model Controller based on Local Linear Models, and its Application

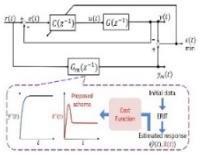
Shinichi Imai (Tokyo Gakugei University, Japan)

In this paper, nonlinear internal model controller based on local linear models, and its Application. The internal model control has a simple structure and has a high robustness for system uncertainties. However, there are few studies of internal model control schemes for nonlinear systems. On the other hand, many controlled systems have the nonlinearity. The effectiveness of the newly proposed control scheme is numerically evaluated on experiment examples in comparison with the conventional control methods for nonlinear systems.

OS10-2 Design of a data-driven control system for reference model design using predicted signals

Yuki Nakatani, Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

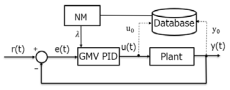
In recent years, data-driven control schemes that do not require system identification have been actively studied. Generally, it is easy to give a reference model focusing only on the output response. In contrast, it is difficult to give a reference trajectory considering the input signals based on the controlled system's characteristics. Furthermore, it is necessary to consider the output signal and the input signal since there is a limit of the actuator performance in the control design of the actual machine. This paper proposes a data-driven control system that can predict the input/output response of an unknown system in offline using operation data. The effectiveness of the proposed scheme is numerically verified.



OS10-3 Design of a Data-driven GMV Controller Using the Nelder-Mead Method

LiYing Shi, Zhe Guan, Toru Yamamoto (Hiroshima University, Japan)

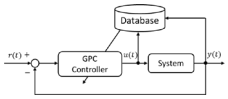
This paper presents a design scheme that can obtain the optimized generalized minimum variance (GMV) control parameters by applying the Nelder-Mead (NM) method based on proportional-integral-derivative (PID) controller for linear systems. The NM method is used to find the most suitable parameter λ of GMV controller, then the PID parameters can be obtained. In the previous GMV controller, the PID parameters are calculated by simply changing λ manually. Therefore, it is hard to get desirable control performance. The application of NM method can optimize the calculation of the most suitable λ and get better PID parameters. Furthermore, the estimation of closed-loop response uses data-driven approach. The effectiveness of the proposed scheme is verified by using a simulation example.



OS10-4 Design of a Databased-Driven GPC for Nonlinear Systems

Zhe Guan, Toru Yamamoto (Hiroshima University, Japan)

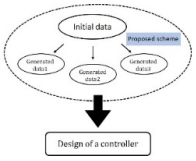
This paper presents a Generalized Predictive Control (GPC) design scheme considering databased-driven approach for nonlinear systems. In several conventional design methods, model parameters are required to calculate control parameters. However, it is time- and cost-consuming to identify the model in real practical systems, especially for chemical or thermal industries with unknown delay time and strong nonlinearity. Recently the database-driven approach has been attracted considerable attention to tackle the model identification issue. It is widely applied in nonlinear systems. On the other hand, GPC is considered in the cases with unknown delay time. As a result, the controller is designed based on GPC by using databased driven approach. The proposed scheme is verified by a numerical simulation which demonstrates the effectiveness.



OS10-5 Design of a Data-Driven Controller using Open-Loop Data

Y. Nishiya, Takuya Kinoshita, Toru Yamamoto (Hiroshima University, Japan)

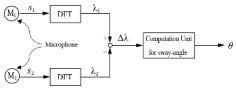
In recent years, data-driven control has been proposed as a control system design that does not require system modeling. Furthermore, it is extended to a nonlinear system using a database. It is necessary to collect several data to obtain good control performance. However, collecting sufficient data incurs both time and human costs. This paper proposes an offline scheme for generating several data from a set of open-loop data is proposed. Additionally, the controller is designed considering the input signal to prevent a heavy burden on the actuator. In this paper, the numerical examples verify the effectiveness of the proposed scheme.



OS10-6 Improved Estimation of Sway-Angle for Overhead Crane based on Phase Difference of Acoustic Signals in Frequency Domain

Hanako Ogawa, Takeshi Yamada, Masayoshi Nakamoto (Hiroshima University, Japan)

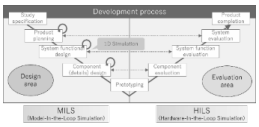
When operating crane, sway of the payload is an issue that should be controlled. For the anti-sway control, it is essential to detect the sway-angle θ. However, it is difficult to measure the sway-angle directly. In this paper, we propose a method to obtain the phase difference (λ1 - λ2) of the acoustic signals s1 and s2 in the frequency domain by using the discrete Fourier transform (DFT). Based on the phase difference, we compute the arrival time difference and convert that to the sway-angle of deflection. To improve the accuracy, we discuss a method for generating the frequencies of the sound sources and the signal processing with filters. In the experiments, the sway-angle measured by the camera are compared with the proposed method.



OS10-7 Study on an Optimal Design Method for Control Systems based on Bayesian Optimization

Koichi Hirota, Shin Wakitani, and Toru Yamamoto (Hiroshima University, Japan)

Most product systems consist of a combination of multiple subsystems. Appropriate setting and design of operating goals (functional goals) of these subsystems are important to achieve and maintain the target performance of the system. In recent years, model-based development (MBD) has been attracting attention in the industrial world. In the MBD process, a user can evaluate the subsystem's performance and easily improve their design. In many situations of control system design, plant design is completed in advance. In subsystem design, a plant and a controller are required to be optimized at the same time for the functional goals determined upstream design process. Based on the background, this study considers the simultaneous optimum design of the controller and the plant.



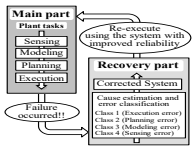
OS11 Robotic Manipulation (3)

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

OS11-1 Using Various Evaluation Standards to Determine an Error Recovery Process in an Automation Plant

Akira Nakamura[*1], Natsuki Yamanobe[*1], Ixchel Ramirez Alpizar[*1], Kensuke Harada[*2], Yukiyasu Domae[*1]
([*1] National Institute of Advanced Industrial Science and Technology (AIST), Japan
[*2] Osaka University, Japan)

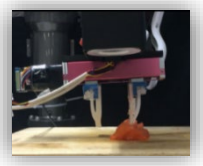
In an automation plant, not only simple repetition tasks but also complicated tasks are carried out. An error is more likely to occur in such difficult work, so the improvement of the technique to perform recovery of an error is needed. The task often is re-executed after returning to previous step, in the case of a big error. Therefore, it becomes the important problem to decide both the past step that it should return to and the recovery planning after returning. In this paper, error recovery planning taking these two factors is proposed by using various evaluation standards.



OS11-2 Robotic Picking for Piled Sushi Topping

Kenta Matsuura[*1*2], Keisuke Koyama[*1], Weiwei Wan[*1], Kensuke Harada[*1]
([*1] Osaka University, Japan, [*2] Currently with Yaskawa Electric Co. Ltd., Japan)

This paper proposes a method for picking piled sushi topping. By observing a human motion picking a sushi topping, we propose two picking strategies where one is to insert a finger into the separation among two toppings with shaking the finger, and the other is to insert a finger into the separation between a topping and a table. Along with two segmentation method, i.e., plane segmentation and LCCP segmentation methods, we experimentally verify the effectiveness of the proposed approach.



OS11-3 Motion Generation by Learning Relationship between Object Shapes and Human Motions

Tokuo Tsuji[1*], Sho Tajima[*1], Yosuke Suzuki[*1], Tetsuyou Watanabe[*1], Shoko Miyauchi[*2], Ken'ichi Morooka[*2], Kensuke Harada[*3], and Hiroaki Seki[*1]
([*1] Kanazawa University, Japan, [*2] Kyushu University, Japan, [*3] Osaka University, Japan)

(This paper presents a method for planning a robot motion of daily tasks by learning the relationship between object shapes and human motions. Robots are required to be able to deal with multifarious objects in various categories. However, it is difficult for robots to plan motions automatically for performing a task because objects even in the same category have different shapes. In our method, the motions are estimated by learning the relationship between object shapes and human motions using linear regression analysis. We evaluate the estimated motions and the experimental results of tasks which are performed by a robot to verify the effectiveness of our proposed method.

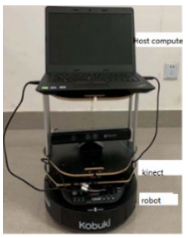
OS12 System and Control (18)

Chair: Huailin Zhao (Shanghai Institute of Technology, China)
Co-Chair: Jichao Zhao (Tianjin University of Science and Technology, China)

OS12-1 The Optimized Intelligent Algorithms on Face Recognition and Tracking for ROS-based Robots

Yue Chen, Shuhao Tian, Huailin Zhao, Shengyang Lu (Shanghai Institute of Technology)

With the development of artificial intelligence, face recognition and tracking technology have been widely used in many fields such as target positioning, automatic driving, and human-computer interaction. Recently, a large number of face detection, recognition and tracking algorithms have emerged, but there are still many shortcomings in practical applications, such as slow face detection, low detection accuracy, and face recognition and tracking for ROS robots Algorithms are rare. This paper improves the traditional Haar-like algorithm and LK optical flow tracking algorithm, and designs a ROS robot platform based on the improved algorithm. By comparing the accuracy and timeliness of face detection and tracking between the improved algorithm and the traditional algorithm, the superiority of this design algorithm is obtained.



OS12-2 Control of a Novel 5D Hyperchaotic System

Qiang Wei[1], Hong Niu[2]
([1]Army Military Transportation University, China)
([2]Tianjin University of Science & echnology, China)

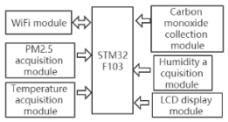
In this paper, a novel five-dimensional (5D) autonomous hyperchaotic system is presented, and the characteristics of the 5D system are given in brief. For control of the 5D hyperchaotic system, a linear feedback controller is designed via the Lyapunov stability theory, so that the 5D system is no longer hyperchaotic but globally asymptotically converges to the equilibrium point at the origin. The numerical simulation results are given to illustrate the feasibility and effectiveness of the method.

$$\dot{\tilde{x}} = a(\tilde{y} - \tilde{x}) + u_{c1}$$
$$\dot{\tilde{y}} = (c - a)\tilde{x} + c\tilde{y} + \tilde{w} - \tilde{x}\tilde{z} + u_{c2}$$
$$\dot{\tilde{z}} = -b\tilde{z} + \tilde{x}\tilde{y} + u_{c3}$$
$$\dot{\tilde{v}} = m\tilde{w} + u_{c4}$$
$$\dot{\tilde{w}} = -\tilde{y} - h\tilde{v} + u_{c5}$$

OS12-3 Design of Multifunctional Vehicle Interior Environment Monitoring System Based on Wireless Communication

Yuqi Yan, Jialin Yang, Zhongxu Qin (Wuhan University of Technology, China)

The interior environment of the car affects the driver's mental state to a certain extent, so it is necessary to design a multi-functional interior environment monitoring system. In this paper, STM32103 single chip microcomputer is used as the core controller, which integrates multiple sensors to collect various environmental information in the vehicle, and transmits the data to the monitoring platform through WiFi wireless communication. When the detected data exceeds the preset threshold, the monitoring system will generate an alarm to remind the user to carry out relevant operations. The system has the advantages of low cost, convenient use and high precision, and has certain commercial value and market prospect.



OS12-4 Robot Structure and Motion control Design Based on UG and Product

Yuhang Sheng (Tianjin University of Science and Technology, China)

The paper is to design a six-degree-of-freedom biped robot by the research on the humanoid characteristics of the biped robot. Our biped robot chooses the steering gear ASMC-03B as its power unit, we restricts the model parameters by analyzing the function relationship between the steering gear torque and the volume, and regulates the size of every parts, and create a motion analysis model. In the hardware part, Arduino UNO, which is used as the main control chip, realize the communication between the main control chip and the servo drive module PAC9685 through the IIC bus protocol, which saves the main control chip resources and ensures the execution efficiency. In the simulation part, it is to simulate the steering angle of the steering gear, and output it in the form of a waveform.

OS12-5 Design of Brushed Motor Position Loop Control System Based on Incremental PID

Tianyi Zhang, Peng Lu (Tianjin University of Science and Technology, China)

Motors are an important part of the transmission and control system. With the development of technology, the focus of motors in practical applications has shifted to precise control of speed, position and torque. This paper focuses on the control system design of the brush motor position loops, using STM32 microcontroller and incremental PID to achieve accurate control of the motor stopping moment position. The software is designed in C programming. It is divided into four parts: System Clock Configuration Functions, Principal Functions, System Tick Timer Interrupt Callback Function, Position closed loop PID Control Design Function. The hardware part is based on the STM32F103VET6 core board.

OS12-6 Design of a Fire alarm system

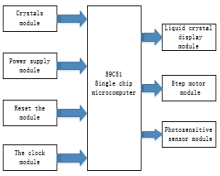
Yuhui Cheng, Tianyi Zhang (Tianjin University of Science and Technology, China)

This paper introduces the hardware and software design of the fire alarm system, and analyzes its working principle. This paper uses a distributed sensor network based on ZigBee to achieve fire alarm and real-time evacuation. Select infrared flame sensor and MQ2 smoke sensor as the information source. The core control board is the Arduino Mage2560 development board. Through the ESP8266 module and the GPRS module, the multi-channel information transmission function can be realized. The alarm can be classified according to the fire situation. System status monitoring software, written in C#, can view the status of each node in real time.

OS12-7 Design of intelligent curtain control circuit based on single chip Microcomputer

Qianqian Zhang, Jichao Zhao, Haokang Wen, Hongbo Hao
(Tianjin University of Science and Technology, China)

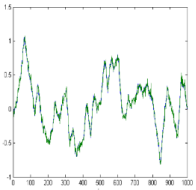
Since entering the 21st century, high technology has promoted the development of human beings and artificial intelligence has been popularized gradually. In this paper, the structure and principle of crystal oscillator circuit, reset circuit and photosensitive sensor circuit are introduced with 89C51 single chip microcomputer as the main control unit. The whole circuit system is analyzed in this paper. The circuit module of photosensitive sensor can be used to detect the external light intensity and automatically control the curtain. The user can set the temperature threshold with the remote control.



OS12-8 Research on the algorithm of flue gas desulfurization system

Hongbo Hao (Tianjin University of Science and Technology, China)

In this paper, the process of flue gas desulfurization and denitrification, which is a nonlinear, time-varying, large lag and strong coupling complex variable process, is analyzed and studied in depth. Based on the analysis of the coupling characteristics of the adsorption tower, the control model of the desulfurization and denitrification process of the adsorption tower is established, and the system identification adaptive PID Decoupling control algorithm is adopted. The Simulink toolbox corresponding to Matlab software is used to simulate and verify the effectiveness of the algorithm. The RBF neural network identifier is used to identify the plant model on-line to improve the adaptive ability of the controller.



OS12-9 A Survey of Low Visibility Image Enhancement Based on MSRCR Algorithm

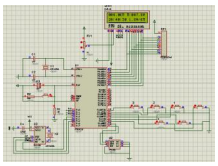
Haokang Wen, Hongbo Hao (Tianjin University of Science and Technology, China)

With the development of computer vision systems in the fields of traffic and safety monitoring, image enhancement has become an important research direction of computer vision. After development, the Retinex algorithm has a better enhancement effect, and the MSRCR algorithm has now developed into one of the important methods in image enhancement. This article introduces the development of the Retinex algorithm, and focuses on the main process and steps of the MSRCR algorithm, and uses the algorithm to enhance the low-visibility images of haze and night in multiple scenes. The actual results show that the MSRCR algorithm has a better enhancement effect and has a wide range of application values.

OS12-10 Design of a Taxi Meter Based on Single Chip Computer

Haokang Wen, Min Wang (Tianjin University of Science and Technology, China)

As a convenient means of transportation, taxis greatly facilitate people's daily travel. Based on such a background, this article designed a simple taxi meter based on STC89C52 microcontroller. This taximeter uses a single-chip microcomputer as the core, combines display module, clock module, storage module, key module, and combines software and hardware to build the required taxi meter model. The taxi meter introduced in this article has the functions of displaying time, starting price, and real-time display of the cost according to vehicle mileage. Theoretically, the meter has higher accuracy and has a wider practical value in daily life.



OS12-11 Design of a High Precision Digital Clock Based on Single Chip Microcomputer

Haokang Wen, Qiang Zheng (Tianjin University of Science and Technology, China)

Compared with traditional mechanical clocks, digital clocks have higher accuracy and durability and are widely used in people's daily lives. This paper designs a digital clock which uses AT89S52 single-chip microcomputer as the main control chip. It can count hours, minutes, and seconds, and can calibrate the time. It can switch between 24-hour and 12-hour systems. As a smart clock, while displaying the time, it also adds the function of temperature display. The intelligent digital clock designed in this paper has stable performance in theory and has certain practical value.

OS12-12 Design of Manchu Image Acquisition System Based on STM32

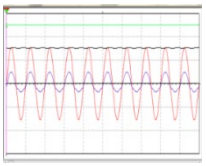
Hongbo Hao[1], Fulin Zheng[2]
([1]Tianjin University of Science and Technology, China)
([2] Dalian Minzu University, China)

This paper designs a Manchu image acquisition system based on STM32 to protect and utilize Manchu ancient books. The system uses stm32f407 as the core controller, with the help of image sensor, LCD screen, SD storage module to complete the function of image acquisition, storage and upload of Manchu ancient books. This paper describes in detail the hardware circuit design, software programming and overall function debugging of the image acquisition system. In order to achieve the purpose of digital protection of Manchu ancient books, we can collect, display, save and upload images in different situations.

OS12-13 Design of timing socket based on single chip microcomputer

Hongbo Hao[1], Shuailin Chen[2]
([1]Tianjin University of Science and Technology, China)
([2]Qingdao University of Science and Technology, China)

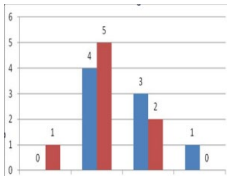
In this paper, the design of timing socket is mainly used for intelligent timing control of household appliances, and the working time of timing is set by pressing the key. In the working period, the external connection device and the power supply are in the conduction state. Outside the set time period, the external connector is disconnected from the power supply. This design uses STC89C52 as the driving chip. DS1302 clock module provides accurate timing. LCD1602 LCD module displays time and operation interface. The relay module controls the connection between the socket and the power supply. DC power supply module is converted to DC power supply module.



OS12-14 Study on the effect of physical fitness training on children's cognitive ability

Jianhua Deng, Lei Ning (Yanshan University, China)

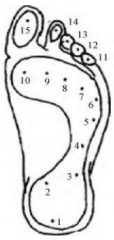
With the word physical fitness getting more and more attention in our country, physical fitness has been widely developed in our country. Therefore, in recent years, the students' physique has received attention from all aspects of society, and improving the students' physique has also become a new topic for physical education workers. I try to discuss the effect of physical fitness training on children's cognitive ability from the perspective of physical fitness training. To provide theoretical basis and reference for intervention of children's cognitive ability training methods. So as to promote the improvement of children's cognitive ability and provide guarantee. This paper studies the influence of physical fitness training on children's cognitive ability by using the methods of literature, observation and experiment. Finally, the conclusions are drawn.



OS12-15 Effects of high heels on plantar stress in women

Jianhua Deng, Lei Ning (Yanshan University, China)

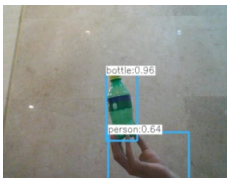
OBJECTIVE: to investigate the changes of Plantar pressure and gait in women wearing high-heeled shoes for different years. METHODS: from March 2019 to April 2019, a total of 30 female faculty members in Yanshan University were surveyed by questionnaires and plantar pressure was measured by static and dynamic tests. RESULT: 1. The peak value of plantar pressure of the arch of foot increased with the increase of wearing time (P & Lt; 0.05). 2. The plantar pressure and impulse of the second metatarsal and the fourth metatarsal increased with the increase of wearing time (P & Lt; 0.05). CONCLUSION: 1. Long-term wearing high-heeled shoes will cause foot discomfort, easy to cause flat foot and Hallux Valgus Lesions; 2. The distribution of plantar pressure and the change of arch shape and gait may be the main reasons for wearing high-heel shoes.



OS12-16 A research on Intelligent Classification of Urban Trash Bins based on Machine Learning

Longyu Gao, Zilong Liu, Luqi Shen, Songyun Shi, Yongzheng Lv
(Tianjin University of Science and Technology, China)

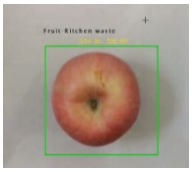
Aiming at the problems of inaccurate, insensitive and general performance of the current intelligent garbage sorting bins, an intelligent garbage sorting bin based on machine vision is proposed. The trash can is mainly divided into five parts: the main control module, machine vision module, classification module, overflow reminder module, and Wi-Fi Internet of Things module. The trash can uses convolutional neural networks to build an intelligent garbage classification model and classification algorithm to achieve rapid and accurate garbage classification. The experiment will be done based on the identification of waste bottles, analyze the recognition characteristics of machine vision, and then propose methods to improve the accuracy of recognition.



OS12-17 A Design on Intelligent Public Trash Can based on Machine Vision and Auxiliary Sensors

Longyu Gao, Leixin Han, Jiangyu Wu, Mingfei Liu, Ruming Kang
(Tianjin University of Science and Technology, China)

In order to improve the correct rate of front-end recognition in the garbage classification process, based on the machine vision technology, the automatic garbage classification system is designed and it has a significant improvement in recognition accuracy compared to traditional smart garbage cans. But in the case of identifying irregular garbage, the recognition accuracy is greatly reduced. In order to solve this kind of problem, four types of auxiliary sensors are added to the trash can, through the mutual cooperation between the sensors, combined with the results of machine vision recognition, comprehensive judgment, greatly improved the recognition accuracy of irregular garbage.



OS12-18 A research on Front-end Garbage Classification based on Machine Vision

Longyu Gao, Zhiqing Xiao, Junlong Hao, Luqi Shen, Manqian Hu
(Tianjin University of Science and Technology, Tianjin, China)

Adding a machine vision recognition module to the traditional smart trash can can effectively improve the efficiency of trash recognition. The intelligent garbage classification model constructed by the convolutional neural network can accurately identify the types of garbage, with an average accuracy rate of 0.87. Deploy the trained model on openMV and test it on the produced physical trash can. After the system is stable, the average time to complete a sorting and recovery is 2s. Experiments show that the system can effectively identify the types of garbage and complete garbage classification and recycling.

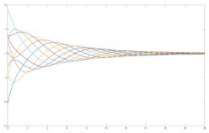
OS13 Intelligent Systems and Robotics (14)

Chair: Fengzhi Dai (Tianjin University of Science and Technology, China)
Co-Chair: Yunzhong Song (Henan Polytechnic University, China)

OS13-1 Analysis of the Consensus Protocol of Heterogeneous Agents with Time-Delays

Jichao Zhao[1], Fengzhi Dai[1,3], Yunzhong Song[2]
([1]College of ElTianjin University of Science and Technology, China, [2]Henan Polytechnic University, China, [3]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

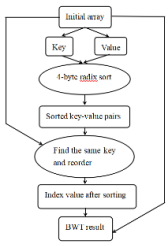
In practical engineering applications, the research on the consensus of heterogeneous multi-agents is of great significance. The consensus of multi-agents mainly includes average consensus, maximum consensus, and minimum consensus. The paper studies the average consensus of heterogeneous multi-agents, including continuous-time consensus protocol, discrete-time consensus protocol, consensus with time delay, and consensus of switching topology. The knowledge of graph theory is used to describe the system, and the results are simulated and analyzed for the consensus of time delay and switching topology to verify the correctness and effectiveness of the consensus protocol.



OS13-2 Burrows-Wheeler Transform Acceleration based on CUDA

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

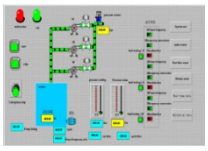
Burrows-Wheeler transform (BWT) is a commonly used transform in compression or text comparison. For example, in bzip2, BWT is used to preprocess the original data, then the same characters in the original data are close to each other, which improves the compression rate. Because the prefix tree of the original string can be easily obtained from the result of the BWT, BWT is also applied to the search and comparison of strings. For instance, the comparison of DNA sequences uses the BWT algorithm. However, BWT is not a fast algorithm, only Tens of megabytes per second on CPU. This article uses the GPU to sort the original string by the base of the 4-byte key size radix sort. After radix sort, the part with insufficient length is sorted again to complete the BWT algorithm.



OS13-3 Design of Automatic Water Supply Upper Computer System

Peng Lu, Fengzhi Dai, Tianyi Zhang (Tianjin University of Science and Technology, China)

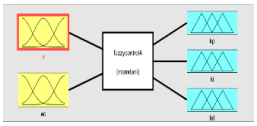
Aiming at the unstable water supply and fluctuating water pressure in the water supply system, an upper computer system of automatic water supply system based on Siemens PLC and KingView software was proposed. The pressure sensor in the water supply pipeline is used to detect the pressure in the pipeline, and the liquid level sensor monitors the liquid level in the tank. The sensor transmits the data to the PLC, and the PLC issues the control instruction after the computation processing. KingView software can realize real-time monitoring and fault alarm of the system. The system can effectively improve the stability of water supply, and can avoid human entering the dangerous environment to search for unknown faults.



OS13-4 Analysis of Boiler Water Level System based on the Fuzzy Control

Tianyi Zhang, Fengzhi Dai, Peng Lu (Tianjin University of Science and Technology, China)

Based on the three-stroke water supply system, this paper analyzes the performance characteristics of the boiler water level control system in reality, so as to reason out the appropriate fuzzy control rules, design fuzzy controller, and applied to the control system, so that the system for self-adjustment of PID parameters, constitute a fuzzy PID control system. On this basis, this paper analyzes the performance, advantages and characteristics of two control systems: the traditional PID control system and the fuzzy PID control system, and simulates the parameters of the input variables for comparison and analysis.



OS13-5 Development of the Circuit System for Greenhouse Environment Regulation

Yuhui Cheng, Fengzhi Dai, Chengxu Ji, Peng Lu
(Tianjin University of Science and Technology, China)

Aiming at the demand of agricultural modernization, this paper proposes a greenhouse environment regulation system based on single-chip microcomputer. For the greenhouse, due to the closed space and the requirements of the crops for the stability of the growth environment, the cheap single-chip control system can be used to complete this work well. The system can obtain the current environmental data in the greenhouse through the DHT11 temperature and humidity sensor and the light sensor. The system can keep the environment in the greenhouse in a proper state without people, and is suitable for large-scale greenhouse planting.

OS13-6 Design of an Intelligent Car based on MSP430

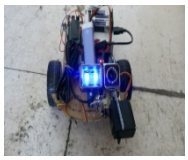
Ruming Kang, Fengzhi Dai (Tianjin University of Science and Technology, China)

The system takes the MSP430 single chip microcomputer as the control core, uses the reflective photoelectric sensor TCRT5000 module to track the line, and realizes the automatic tracking. In the experiment, the black-and-white line is used as the route. The system is driven by the L298N module and controlled by the PWM DC motor. This paper introduces the principle of the reflective photoelectric sensor and the circuit diagram of the tracking module. It also explains how to realize the automatic tracking based on the MSP430 single chip microcomputer. The technology can be used in warehouse, unmanned production line, intelligent service robot and other fields.

OS13-7 Design of a WIFI Video Car

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

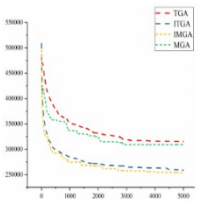
This subject is mainly composed of motor, frame, STC89C51 single-chip microcomputer and other auxiliary modules. Through the android client broadcast video car cameras, wireless video signal acquisition by the client to send commands to the car at the same time, wireless router transmission instruction by wireless router, single-chip microcomputer for processing, then driven by single chip microcomputer control motor, drive motor rotation, steering device, so as to realize the control of motor sports and video acquisition.



OS13-8 Design of WebGIS Transportation and Distribution System based on the Genetic Algorithm

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

With the concept of "smart logistics" put forward, the transformation of the logistics industry facing information technology is facing great challenges. At present, China's logistics industry is facing problems such as extensive resource allocation, low management level and high cost. Aiming at the transportation problem in logistics industry, this paper designs a solution method of balanced / unbalanced transportation problem based on Monte Carlo similarity and the genetic algorithm. Two coding methods, Prufer number and matrix are adopted. On this basis, dynamic mutation rate and random mutation strategy are designed, and Monte Carlo similarity receiving method is introduced. Finally, from the perspective of system requirements, the WebGIS transportation and distribution system based on the genetic algorithm is designed and developed.



OS13-9 A Study of YOLO Algorithm for Target Detection

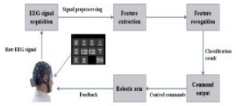
Haokang Wen, Fengzhi Dai, Yasheng Yuan
(Tianjin University of Science and Technology, China)

With the development of deep learning, target detection has become one of the research directions of many scholars. As one of the more mature algorithms, the YOLO series of algorithms have been widely used in real life. Combining the development history of the YOLO algorithm, this article focuses on the main framework and main content of the current latest YOLOv5 algorithm, and uses the YOLOv5 model to identify and detect footballs. This article evaluates its detection effect. The test results show that YOLOv5 has a wider application meaning in real life.

OS13-10 Research on Recognition and Application of EEG Signal based on SSVEP-BCI

Di Yin[1], Fengzhi Dai[1,3], Mengqi Yin[2], Yasheng Yuan[1], Yuxuan Zhu[1]
([1]Tianjin University of Science and Technology, China)
([2]Hebei University of Chinese Medicine, China)
([3]Tianjin Tianke Intelligent and Manufacture Technology CO., LTD, China)

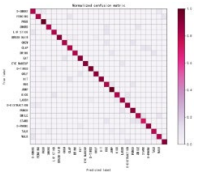
In recent years, brain-computer interface systems based on steady-state visual evoked potentials (SSVEP) have attracted attention due to their high information transfer rate (ITR) and more and more targets. The current mainstream algorithms for SSVEP recognition have greatly improved the accuracy and target detection time. This paper designs a robotic arm application system based on the eCCA-Y method for multi-target recognition. The phase characteristics of CCA's sine and cosine signals are added to the EEG signal. Compared with mainstream algorithms, research shows that this method can improve the SSVEP-based BCI performance. And choose a six-degree-of-freedom manipulator as the actuator of the brain-computer interface, and use a phase-encoded stimulation paradigm for multi-target recognition to conduct experiments on the application of the proposed method.



OS13-11 Research on Bad Driving Detection based on Behavior Recognition

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

Dangerous driving behavior is considered to be the direct or indirect reason of road accidents. Although artificial video surveillance is good to prevent bad driving, it wastes too much time and manpower. How to effectively identify behavior become the focus of the research. In recent years, deep learning showed the huge advantage in the field of computer vision. This paper adopt a number of deep learning network models, mining video integration of space and time features, introduction of analogy in human visual attention mechanism, improve the model deeply, using the LSTM to accurate and efficient video behavior analysis technology.



OS13-12 Research on Crop Image Recognition Technology - Take Daylily as an Example

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

Digital image recognition technology is the core technology of agricultural robots. The key research content is to judge the maturity of crops through image recognition. In this paper, the daylily is used as the crop to be identified, and the digital image processing technology is used to separate the image of daylily from the background, and then send the processed information to the picking actuator of the robot to assist the actuator in picking tasks. This method can be used not only in the recognition of daylily, but also in the recognition of tomatoes, cucumbers and other crops by adjusting the recognition pictures and recognition parameters. It has high scalability.

OS13-13 Design of Daylily Agricultural Picking Robot

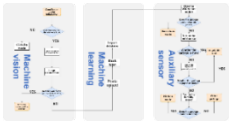
Jichao Zhao, Fengzhi Dai (Tianjin University of Science and Technology, China)

Agricultural picking activities occupy an important role in daily life, and the research and development of agricultural picking robots play a more crucial role and increasingly become an advantageous tool to improve agricultural productivity. Daylily, as a crop for daily consumption, can significantly reduce serum cholesterol and has extremely high nutritional value. However, the picking conditions of day lily are harsh, and long-term picking is likely to cause extremely high harm to the human body, especially the hands. This paper designs an agricultural picking robot that can pick daylily automatically, which can greatly free hands and improve labor productivity. Especially in health, it can significantly reduce the harm to the human body.

OS13-14 Development of Intelligent Public Trash Can based on Machine Vision and Learning

Longyu Gao, Fengzhi Dai, Zhiqing Xiao, Jiangyu Wu, Zilong Liu
(Tianjin University of Science and Technology, China)

At present, with the maturity of machine vision technology and the continuous expansion of application fields, there have been many intelligent trash cans based on machine vision, which can realize certain garbage identification and automatic classification. However, due to certain technical limitations of machine vision, it is impossible to identify all garbage. In this paper, a smart public trash can based on machine vision and auxiliary sensors is proposed. In addition to realizing machine vision to identify and automatically classify garbage, sensors will also be used to assist in identifying garbage to solve problems such as the same garbage classification of different shapes. At the same time, enhanced learning will be added to realize the self-learning of the trash can, so as to achieve the goal of continuously increasing identifiable types.



OS14 Image Processing (5)

Chair: Joo Kooi Tan (Kyushu Institute of Technology, Japan)
Co-Chair: Seiji Ishikawa (Kyushu Institute of Technology, Japan)

OS14-1 Detection of a Fallen Person and Estimation of Their Head Position from UAV Images

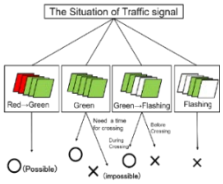
Haruka Egawa, Seiji Ishikawa, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

In recent years, aerial photography has often been used for finding victims in the event of a disaster. Searching from the sky enables quick rescue activities in places that are difficult for human to approach. In this paper, we propose a method of detecting a person fallen on the ground from the images taken by a camera mounted on a UAV(multicopter). Unlike pedestrians, the head orientation of a fallen person in an image is not identical. Therefore, in the proposes method, combination of Ri-HOG features and Ri-LBP features are employed for representing a fallen person, and the fallen person is detected by a classifier constructed using Random Forest. In addition, a head position of a fallen person is estimated by using the peak of the gradient direction histogram. The effectiveness of the proposed method was verified by experiments.

OS14-2 Development of a Pedestrian Crossing Navigation System for Visually Impaired People Using MY VISION

Kohei Kitagawa, Seiji Ishikawa, JooKooi Tan (Kyushu Institute of Technology, Japan)

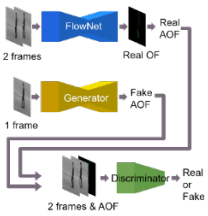
In this paper, we propose a system for a visually impaired person to cross a pedestrian crossing safely by the employment of the state of a traffic light and the remaining distance to the other side obtained from MY VISION images. The traffic light at a pedestrian crossing is detected by a discriminator using HOG (Histograms of Oriented Gradients) features and Random Forest. The possible actions for a visually impaired person at a pedestrian crossing are classified into six types of action patterns by analyzing the traffic lights and the distance information. The proposed system chooses one of the six patterns so that the visually impaired person may cross the pedestrian crossing safely. The effectiveness of the proposed method was verified by experiments.



OS14-3 Abnormal Human Action Detection Based on GAN

Tomoya Sano, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

Recently, surveillance systems using cameras have been widely used, according to frequent outbreak of crimes. One of the important roles of such a camera surveillance system is to detect abnormal human actions or events. In this paper, we propose a method of abnormal human actions/events detection using Generative Adversarial Nets (GAN). In anomaly action detection, the main problem is that the image data of abnormal human actions/events is more difficult to obtain than normal human actions/events. To solve this difficulty, we use only normal human action data in the employed training networks. The GAN architecture trains two deep networks which compete with each other; a generator that performs conversion of Pixel-to-Pixel and a discriminator that supports it. In the experiment, a single class classification using KTH dataset and anomaly detection using Avenue dataset were performed for detecting abnormal human actions and anomaly events, respectively. Our experimental results show the effectiveness of the proposed method in detecting abnormal human actions and events.



OS14-4 3-D Position Measurement of a Cargo Using Epipolar Geometry for Logistics Automation(withdraw)

Kazuki Fukuda, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

In recent years, with the expansion of the sales market such as online shopping, labor shortage has become a problem in logistics industries. Logistics is roughly composed of five tasks, in which transport vehicles such as forklifts are mainly used for cargo storage and cargo handling work. Since the operations of forklifts are still performed manually in many factories, automating the operations is strongly requested. This problem can be solved by the acquisition of the 3-D position information of the cargo. In this paper, we propose a method of estimating the 3-D position of a cargo from the images obtained from (i) two fixed cameras and (ii) a single camera mounted on a transport vehicle for measuring the relative distance between the transport vehicle and the cargo and for position control of the vehicle. The effectiveness of the proposed method is shown by experiments.

OS14-5 Bus Line Number Detection Employing MY VISION

Ye Zhou, Yosiki Hamasaki, Joo Kooi Tan (Kyushu Institute of Technology, Japan)

In response to the requests from visually impaired people that they wish higher QoL in their daily activities, and to the facts that they find difficulty in using public transportation, we propose we propose a bus boarding support system using MY VISION. For the support, we detect a bus approaching a bus stop from MY VISION images employing the characteristics of Haar-like filters, and extract the frontal upper area displaying bus line number by random forest. After having obtained the bus line number area, we use Contrast Limited Adaptive Histogram Equalization (CLAHE) to enhance the LED light of the area, and then recognize the line number using template matching. The effectiveness of the proposed method is shown by experiments.

OS15 Bridging the Gap Between AI, Cognitive Science, and Narratology (7)

Chair: Jumpei Ono (Aomori University, Japan)
Co-Chair: Hiroki Fukushima (Kyushu Womens' University, Japan)
Co-Chair: Takashi Ogata (Iwate Prefectural University, Japan)

OS15-1 Analysis and Construction of Elements of the Stage Performance Structure in a Kabuki-dance

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

We conducted a detailed analysis of the stage performance structure of Kyōganoko Musume Dōjōji and reproduced it on the animation tool KOSERUBE with the music, lyrics, and images aligned. In this paper, 11 scenes of Kyōganoko Musume Dōjōji are organized. The actual flow is compared with the movement on the system. The goal of this paper is to understand the entire stage structure of Kyōganoko Musume Dōjōji in detail. In addition, this research aims to use the stage performance structural system for an integrated narrative system that the authors are developing. We believe that this system will be the basis for the construction of the Kabuki stage. Further, we want to apply it not only to Kabuki but also to other genres, such as computer games and commercials.

OS15-2 Unchiku Generation with Moving Illustration Using Kabuki Knowledge

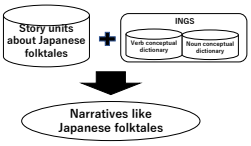
Jumpei Ono (Aomori University, Japan),
Miku Kawai (Iwate Prefectural University, Japan),
Takashi Ogata (Iwate Prefectural University, Japan)

In this study, we combined the unchiku generation system and an animation system, and added the animation system as a moving illustration. We have been studying the unchiku generation system and animation system for a long time. The first system is an unchiku generation system. Unchiku is the unchiku of deeply preserved knowledge. Unchiku in the story is one of the rhetorical techniques of the story. The second system is an animation system that expresses the stage performance structure. This system is based on the Kabuki-dance Kyōganoko Musume Dōjōji. In this study, we created a prototype and considered a new system that combines both the systems. The system provides an animated description for the generated story. Its purpose is to provide an explanation that deepens the understanding of the story.

OS15-3 Implementing Story Units of Japanese Folktales with Conceptual Dictionaries

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

This paper reports the development of story units that are knowledge representing story structure for story generation. A story structure in our narrative generation study is formed by a tree that consists of events connected based on the relationships, such as the causal and temporal relations of events. We have been implemented story units based on the "Type of Folktale" in the *Nihon Mukashi-banashi Taisei* (*The Concluded Compilation of Japanese Folktales*). The current main theme is to use our conceptual dictionaries, including verb and noun conceptual dictionaries, to combine the current version of story units to our "integrated narrative generation system," which is a general framework of our narrative generation study. In this paper, we explain the above mechanism.



OS15-4 The Story Generation Process and Cognitive Biases

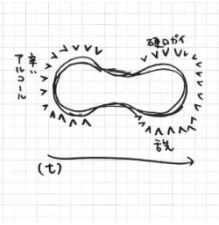
Jun Nakamura (Chuo University, Japan)

When it comes to designing a product, a service, or a new technology, whatever the case may be, author believes that in order to attract people, it is important to tell a story about the subject matter in a narrative style, that makes people impressed with the subject matter. In this paper, author asked several groups to create stories based on the same given data set. As expected, a variety of stories were created for each group. Cognitive biases were evident in the process of creating the stories. It is assumed that cognitive bias is a sort of driving force behind the creator's intentions, then it can be interpreted that the creator must have a certain strong intention to create a story.

OS15-5 Time in an Aesthetic Experience of a cup of Sake

Hiroki Fukushima (Kyushu Womens' University, Japan)

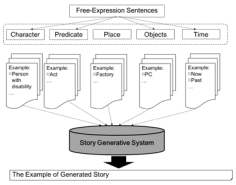
There are two broad genres of artworks depending on the nature of their appreciation: arts of space and arts of time. In the aesthetic appreciation of taste, which is the focus of the experience of a cup of Sake? Is there the dimension of time in the experience of taste, and if so, what is it? Because taste has never been considered a formal subject of aesthetics, there is little discussion of describing and appreciating the aesthetic experience. This study deals with the concept of time in the appreciation of Sake, with some reference to the concept in narrative studies. As with wine, the time associated with Sake is multifaceted, and each is intrinsic to the aesthetic experience. Consider some examples: Time from the Sake is brewed to the time it is opened on the table (so-called "vintage"; for some years). The time from opening the bottle to pour into the glass (for minutes to tens of minutes). The time between pouring into the glass and entering the mouth (for a few minutes). Time to swallow in the mouth (a few seconds). The flavor felt after swallowing ("after flavor"; tens of seconds). This study focuses on the period from the Sake is placed in the mouth to the time it is swallowed. The purpose of this study is to reveal how time is narrated (explicitly or metaphorically) in the tens of seconds of a sake tasting.



OS15-6 Extension of Clinical/Psychological Approach Using Post-Narratology: Possibility of application on Artificial Intelligence and Robot

Kai Seino (National Rehabilitation Center for Persons with Disabilities, Japan)

A purpose of this resarch is to examine the theories and methods of the psychological approach in treatment and research from a narrative viewpoint. In addition, we discuss the possibility of expanding collaboration with AI and Robot. This paper provides a literature review of the narrative psychological approaches in the fields of psychology and psychiatry. It addresses not only narrative therapy but also related therapeutic approaches that use the narrative framework. And Psychotherapy and Psychological, Practice and research of Self-help group, Open Dialogue, Tohjisha-Kenkyu (Self-directed studies), etc. are outlined, and the possibility of integration to A.I. Artificial Intelligence or application on Robots is proposed. In addition, the actual research which aimed at integration to A.I. Artificial Intelligence is reviewed. In discussions. First, literary narratology as basic theory is compared to psychological narratology as a practice or application theory. Second, the extension and possibility of a psychological narratology are considered.



OS15-7 A relationship between narratology and marketing

Akinori Abe (Chiba university, Japan)

We have been studying an expression of the taste of Japanese sake. Actually, the descriptions of the taste can be regarded as stories. Accoringly, we conducted an experiment, in which we asked participants to draw descriptions of the taste of the Japanese sakes and to design labels of them. From the results of the experiment, we will analyse the relationship between narratology and marketing of Japanese sake.

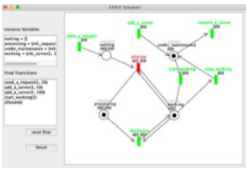
OS16 Software Development Support Method (5)

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

OS16-1 Simulation and Regression Testing for Behavior of Software Models Based on Extended Place/Transition Net with Attributed Tokens

Tomohiko Takagi, Ryo Kurozumi (Kagawa University, Japan)

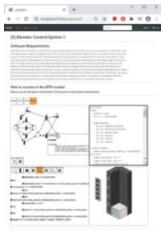
Extended Place/transition Net with Attributed Tokens (EPNAT) is a formal specification description language for modeling the expected behavior of state transition-based software that consists of multiple objects. Each attributed token corresponds to an object, and the values of its variables are updated while moving on the net. Engineers need to understand such complex aspects of EPNAT models when constructing, validating and refining them. In order to address this problem, we propose a simulation and regression testing technique for the behavior of software EPNAT models represent, and then show an early prototype tool to support it. In the tool, fireable transitions and values of variables are indicated for the simulation, and also the process of the simulation is recorded as test cases for the regression testing.



OS16-2 Development of an Early Prototype Tool for Learning Software Modeling Using Extended Place/Transition Net

Tomohiko Takagi, Akio Usuda (Kagawa University, Japan)

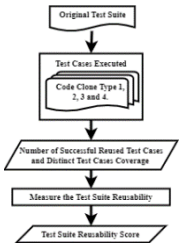
Extended Place/transition Net (EPN) is place/transition net that includes some additional elements written in VDM++ to enhance its representation power, and can be used to model the state transition-based behavior of software in development processes. The use of EPN is based on technical knowledge and skills, and therefore engineers will need to learn them. This paper shows an early prototype tool for learning software modeling using EPN, and then gives the discussion about its effectiveness and problems. A user of the tool, that is, an engineer tries to construct his/her EPN model based on given software requirements by selecting and putting the components of EPN. The behavior of the EPN model is partially visualized by using animated graphics, and finally its correctness is automatically checked.



OS16-3 Test Suite Reusability Measurement Based on Frequency and Coverage of Reused Test Cases

Mochamad Chandra Saputra*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, Japan) (†University of Nagasaki, Japan)

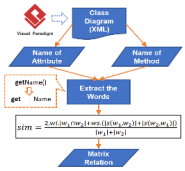
A test suite that consists of a set of test cases is an important element in software testing. The objectives of white-box testing process are to execute all the test cases in the test suite and also achieve 100% code coverage. One of the good criteria for test suite is possible to reuse it for testing another program. Reusability of a test suite is one of important factors to decrease the cost and time in testing the program. This research defines and measures the test suite reusability score expressed with the degree of reusability of the test suite. It is calculated by considering both frequency and code coverage of successful reused in the test suite. Test suite reusability measurement provides useful information to improve the efficiency of software testing, especially in regression testing and automated testing.



OS16-4 The Seven Information Features of Class for Blob and Feature Envy Smell Detection in a Class Diagram

Bayu Priyambadha*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, Japan) (†University of Nagasaki, Japan)

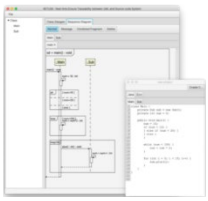
Measuring the quality of software design artifacts is difficult due to the limitation of information in the design phase. The class diagram is one of the design artifacts produced during the design phase. The syntactic and semantic information in the class is important to consider in the measurement process. The class information is used to detect the smell as an indicator of a lack of quality. All information related to the class is used by several classifiers to prove how informative it to be used to detect the smell. The smell types that are a concern in this research are Blob and Feature Envy. The experiment using three classifiers (j48, Multi-Layer Perceptron, and Naïve Bayes) confirms that the information can be used to detect the smell. The average of correctly detected by the classifiers is about 80.67%.



OS16-5 Improvement of RETUSS to Ensure Traceability between Sequence Diagram in UML and Java Source Code in Real Time

Kaoru Arima*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada*, Naonobu Okazaki*
(*University of Miyazaki, Japan) (†University of Nagasaki, Japan)

Ensuring traceability of software deliverables is one of the methods to ensure software quality. It has two problems: taking much labor and time, and causing mistakes by human handling. In order to solve them, our laboratory developed RETUSS (Real-time Ensure Traceability between UML and Source-code System). RETUSS ensures traceability between UML and source code by transforming them to each other in real time. However, RETUSS is not useful in ensuring traceability between sequence diagram and Java source code due to its limited scope of application. This paper improves the usefulness of RETUSS by extending the scope of application of sequence diagram and Java source code. The experimental results confirmed that the improved RETUSS also saves labor and time, and eliminates mistakes by human handling.



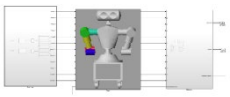
OS17 Robotics and machine vision (3)

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

OS17-1 Kinematic modeling and Simulation of humanoid dual-arm robot

Jiwu Wang, Junxiang Xu (Beijing Jiaotong University, China)

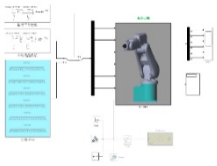
In recent years, dual-arm robots have attracted more and more attention due to their advantages such as strong cooperation ability and high flexibility. With the improvement of real-time requirement, the inverse kinematics solution of robot becomes a key problem to be solved urgently. In order to solve the time-consuming problem of inverse kinematics of robot arm, a closed inverse kinematics solution algorithm for humanoid dual-arm robot was proposed. The effectiveness of the algorithm was verified by simulation.



OS17-2 Kinematics analysis and simulation of 6R Robot Based on MATLAB/Simulink

Jiwu Wang, Shuo Han (Beijing Jiaotong University, China)

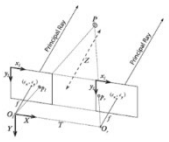
The intelligent robot has played an important role in improving working conditions and production efficiency with the development of intelligent robot technology. Here the robot kinematics was studied and simulated based on the MATLAB/Simulink. The forward and inverse kinematics equation were established based on the standard Denavit-Hartenberg method, and eight solutions regarding angle variables of robot joints were obtained. Then the motion trajectory of the robot was simulated in the joint space, and the smooth curves of angular displacement, angular velocity. Furthermore, the visualization of the robot kinematics model was realized based on the Simulink, and the kinematics simulation control system was established. The paper provides necessary theoretical basis and correct kinematics model for the research on kinetic analysis of 6R robots.



OS17-3 Distance measurement system based on binocular stereo vision

Jiwu Wang, Xin Pei (Beijing Jiaotong University, China)

In order to solve the problem of low precision and time consuming in traditional ranging, this paper studies key technologies such as binocular ranging principle, camera calibration, and stereo matching.On this basis, a planar ranging system based on parallel binocular vision is designed. Firstly, through the stereo camera calibration toolbox of MATLAB, the internal and external parameters are obtained. Then stereo correction is used to make the two images coplanar and aligned by line and performing stereo matching on the corrected image to obtain the parallax. Finally, it is able to select any two target points through the mouse to obtain their spatial coordinates and calculate the distance between the two points. Experimental results show that the method meets the precision requirements.



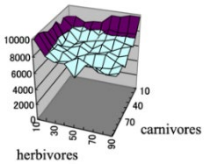
OS18 Natural Computing (3)

Chair: Marion Oswald (Vienna University of Technology, Austria)
Co-Chair: Yasuhiro Suzuki (Nagoya University., Japan)

OS18-1 Contribution to the Theory of Periodic Reaction of Three Bodies Systems

Yasuhiro Suzuki (Nagoya University Japan)

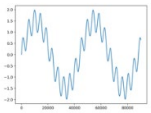
A chemical ecosystem is an ecosystem in which chemical substances mediate interactions. When herbivores feed, plants analyze herbivore saliva and produce volatile chemicals that attract herbivores' natural enemies. Natural enemies are attracted to volatile chemicals and eliminate herbivores. This system is a trytrophic system consisting of herbivores, carnivores and volatile chemicals. The basic equation of mathematical ecology is the Lotoka Volterra equation, which is a bitrophic system of herbivores and carnivores. This paper proposes the fundamental equations of chemical ecosystems and shows their mathematical features.



OS18-2 Deep Micro Vibrotactile, DMV and its Applications

Yasuhiro Suzuki (Nagoya University, Japan)

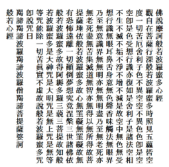
Deep Micro Vibrotactile, DMV is infrasound. DMVs produce sound effects when mixed with audio. Since the DMV has a transcendental low frequency, mixing it with sound such as music does not affect the frequency spectrum in the audible range. However, through demonstration experiments at concerts, it was confirmed that DMV changes the tactile qualities of the sound. This paper introduces the acoustic features and case studies of DMVs



OS18-3 Inter-Induce computation and its Philosophical Foundation

Yasuhiro Suzuki (Nagoya University, Japan)

Set theory is based on the distinguishability of elements. How to recognize and identify the world is the essence of set theory. If each element cannot be identified, all the elements are one set. So the set does not make sense. The Heart Sutra is highly rational and can be interpreted mathematically. The mathematical interpretation of the Heart Sutra shows the divergence of how to discriminate. Based on this world view of Heart Sutra, we propose Inter-Induce computation, IIC as a novel calculation paradigm that does not depend on set theory. This paper gives an overview and philosophical foundation of IIC.



OS19 Artificial Intelligence for Embedded Systems and Robotics (4)

Chair: Hakaru Tamukoh (Kyushu Institute of Technology, Japan)
Co-Chair: Sansei Hori (Kyushu Institute of Technology, Japan)

OS19-1 Convolutional Network with Sub-Networks

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

We propose a convolutional network with sub-networks (CNSN), a convolutional neural network (CNN) that can be detached in a depth-wise direction into sub-models. Due to a conventional design of CNN which feature map shapes are varied throughout the model, a hidden layer may not able to receive an input image without changing the last fully-connected layer. To deal with this problem, we attach a step-down convolutional layer as an additional layer to each sub-model. The step-down layer acts as an input layer of the sub-model which reduces input to the preferred representation to the sub-model. To train CNSN, we treat the base- and sub-models as separable models and by using multi-losses, a combination of losses from the base- and sub-model, we can update weights to able to be utilized to both base- and sub-model**s.**

OS19-2 Influence of FPGA implementation methods in High-Level Synthesis

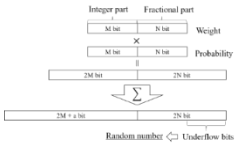
[1]Yusuke Watanabe, [2]Hakaru Tamukoh ([1]RAFT WORK Co., Ltd, Japan, [2]Kyushu Institute of Technology, Japan)

We explain about how the difference of implementation methods written in C++ in High-Level Synthsis(HLS) influences on time it takes for tiny You only look once(YOLO) v2, a real-time object detection system to infer on an FPGA. To utilize features of FPGA, we need to implement hardware-oriented algorithms such as the weight binalization. We primarily focus on convolution in tiny YOLO v2 network and we report execution results on the Xilinx SDSoC development environment to know whether methods are appropriate or not.

OS19-3 A Hardware-Oriented Random Number Generation Method and A Verification System for FPGA

Sansei Hori, Hakaru Tamukoh (Kyushu Institute of Technology, Japan)

We propose a new random number generation method for digital hardware such as an FPGA. A random number generator is one of the important components to implement neural networks (NNs) such as a generative model on FPGA. However, conventional methods of random number generators (RNGs) require huge hardware resources. The proposed method employs underflow bits obtained during calculations of NN on the FPGA instead of the random number from the conventional RNGs to reduce the hardware resources. In this paper, we employed the proposed method to a restricted Boltzmann machine to evaluate the method and trained MNIST dataset on a software environment. Furthermore, this paper proposes an FPGA infrastructure that can easily connect NNs to a host computer.



OS19-4 Synthesis of realistic food dataset using generative adversarial network (GAN) based on RGB and depth images

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

Constructing a large food dataset is time and effort consuming due to the need to cover the feature variations of food items. Hence, a huge data is needed for training neural networks for robot vision systems. Current study aims to advocate the Cycle-GAN to build up large food dataset based on large number of simulated images and relatively few real captured images thus obtaining more realistic images effortlessly compared with traditional capturing. Real RGB and depth images of variant food samples allocated over turntable were captured in three different angles using real-sense depth camera with different backgrounds. Furthermore, for simulated images, the Autodesk 3D_Maya software was employed using the same parameters of captured real images. Results showed that generally, realistic style transfer on simulated food objects was obtained as a result of employing Cycle-GAN. GAN proved to be an efficient tool that could minimize imaging efforts resulting in realistic images.

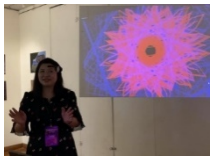
OS20 Virtual Reality and Intelligent Interactions (4)

Chair: R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Co-Chair: Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

OS20-1 NeuroPhyllotaxis: An Interactive Application for Generative Art Based on EEG Data

Chien-Tung Lin, R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

Generative art is produced by procedural techniques. It has obtained a lot of attention from the beginning of computer graphics. Many works of art are inspired by nature, among which phyllotaxis is more It is a combination of mathematics and the beauty of nature. Not only can it be seen everywhere in nature, but also often appear in man-made objects, becoming part of culture or religion. This paper presents the development of an interactive generative art application that is created from a phyllotaxis pattern by using the user's EEG data. When people are using it, it is easy to relax the mood and achieve the function of art therapy. We tried to use EEG data to make an interactive installation art which creates phyllotaxis patterns and project them on the wall. Everyone has a different state, the generated patterns are also different from person to person, which creates interesting interactive contents. In addition, sound can also be changed by EEG to become dynamic and real-time contents.



OS20-2 VRMAZU: VR Visualization of Mazu Temple for Passive Interaction with Generated Sound from the ML Technique(withdraw)

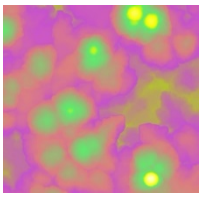
Yi-Li Liang. R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Jen-Tun Lee (Japan Advanced Institute of Science and Technology, Japan)
Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

Passive interaction based on virtual reality applications has the potential to identify personalized user activities. Through personalized interaction methods to access the virtual scene, the user gets a better sense of immersion. This paper introduces a VR visualization of Taiwan traditional Mazu Temple for passive Interaction with generated sound from the machine learning (ML) technique. In this VR application, user can control their own situation through the feedback information of the generated sound based on the user's location in the VR scene, so that their physical condition can reach a good state. This development that personalized interaction in VR applications is very important to get different experiences in each time of the user's temple activities, so an ML approach to design sound ambiance is needed. This paper also concerns the different perspectives on understanding Taiwan traditional temple activity knowledge and user interaction.

OS20-3 ThoughtMix: Interactive Water Color Generation and Mixing Based on EEG Data

R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)
Yoshimasa Tokuyama (Tokyo Polytechnic University, Japan)

In modern art, new types of installations and artworks use sensor-based inputs as an interactive method from which to create a new form of media art. Most of those installation artworks have static and pre-captured contents; they tend to be played as dynamic, and by some concerned as interactive creations. However, most of the installations were not be able to capture the visitor's rich feedback which could trigger the contents. In order to identify the relation between the cybernetic-aesthetics and visitor's brain wave activities, we propose an electroencephalogram (EEG) data-driven approach to generated watercolor effects and mixing application which visualizes the changes in brain wave activities in real-time. Our proposed application transforms the brain waves into real-time watercolor effects that are wrapped around by generating the data about emotion, attention, meditation, and neural mechanisms with EEG data. "ThoughtMix" creates watercolor effects as an immersive experience to influence creativity and art therapy by actually visualizing the colors user's mind creates.



OS20-4 HaptWarp: Soft Printable and Motion Sensible Game Controller

Jen-Tun Lee, Kazunori Miyata (Japan Advanced Institute of Science and Technology, Japan)
R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

Many interaction techniques have been introduced for controlling virtual reality contents and navigation. Traditional controllers need to map between two-dimensional inputs and three-dimensional actions while interactive surfaces enable more natural approaches, they still lack tactile feedback. We present real-virtual bend and twist, a tactile feedback technology that delivers the twist and bends effect into a virtual environment. The method uses two inertial measurement unit (IMU) sensors fixed on both sides on the 3D printed soft material bar to acquire object deformation to simulate the virtual deformation based on the changes in the angle exerted on a physical device. People can customize the 3D printed connection shape to apply to different virtual scenarios.

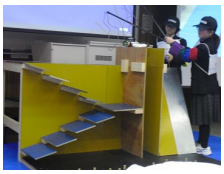
OS21 Educational Application of Control Technology (4)

Chair: Kazuo Kawada (Hiroshima University, Japan)
Co-Chair: Yoshihiro Ohnishi (Ehime University, Japan)

OS21-1 Development of Shock Sensitive Tiny Dummy Robot for Junior High School Rescue Robot Challenge

Kazuo Kawada, Keisuke Iuchi, Keita Murai, Hiroyuki Y. Suzuki
(Hiroshima University, Japan)

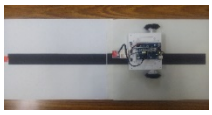
Junior High School Rescue Robot Challenge" is an annual tournament held by our group in Hiroshima Univ. by sponsorship of a construction machinery company. The tournament has 16 years of history and the rescue theme has been changed in each year. The theme in 2019 was to convey injured people "tenderly" from top of half collapsed building to ground, without giving any shocks. We developed shock sensitive tiny dummy robot, controlled by M5STACK microcomputer since it rigged with accelerometer. The dummy can remember how much shocks were given during transportation. The remote (wired) controlled robots developed by junior high school student teams conveyed the dummy and evaluated the "tenderness" during transportation.



OS21-2 Basic Research on Parameter Tuning Skills Evaluation Based on Sensor Car Behavior Data in Technology Education

Teruyuki Tamai (Hiroshima University / Ehime University), Yoshihiro Ohnishi (Ehime University), Kazuo Kawada (Hiroshima University)

In this research, the evaluation of programming included in the contents of junior high school technology education is explained. In that case, a new evaluation method using the sensor car as a teaching material is proposed. First, the guidance of programming in junior high school technology education is explained. In addition, the evaluation method of the programming which has been made so far is explained. Next, the new evaluation method is explained. Quantitative data obtained by operating the sensor car used as a teaching material will be described. And how to analyze the data will be described. Next, the method to evaluate based on the data is explained. Finally, the usefulness of the evaluation method is examined.



OS21-3 Mini Windmill Generator Kit for homework for Hiroshima Univ. Monozukuri Junior Doctor Special Educational Program

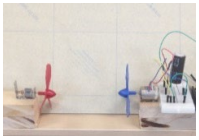
Hiroyuki Y. Suzuki, Kazuo Kawada, Masayasu Nagamatsu (Hiroshima University, Japan)

"Hiroshima Univ. Monozukuri Junior Doctor" is a special educational program for young (5-6 grades in elementary school and junior high school) volunteered students. We originally prepared around 10 seminars on various topics and completed 2/3 of them. We had to give up, however, all remained seminars because of sudden attack of COVID-19. Since then, we introduced a set of homework in which students could study by themselves. We modified commercially available "Mini Windmill Generator Kit" for the homework, to make easy to measure generated voltages with three color LEDs and a tester. Students tried to find best sizes and shapes of tail fin and windmill, using a manual of "Procedure of quantitative research" that we made. Majority of the students could find appropriate sizes and shapes of fins and windmills, through the data collection, drawing figures and by discussion.

OS21-4 Development of Teaching Materials to Learn the Efficient Use of Energy

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

This paper introduces the programming learning at junior high school. In this research, an experimental device using the fan which driven by EDLC was developed. Learning activities using this device is to maximum the driving time of fan by the charged energy on EDLC. The goal is to learn programming as a technique for efficiently using electrical energy.



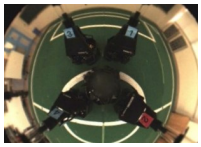
OS22 Robot Competitions and Education (5)

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

OS22-1 Robustness Verification Against Noise of Self-localization Method Using Omni-directional Camera for Soccer Robot

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

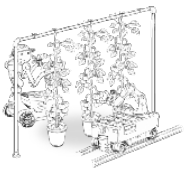
The focus of the RoboCup competitions is the game of soccer, where the research goals concern cooperative multi-robot and multi-agent systems in dynamic environments. In the field of RoboCup, self-localization technique is important to estimate own position including goal and other robot positions and to decide strategy. This paper presents a self-localization technique using an omni-directional camera for an autonomous soccer robot. We propose the self-localization method with white line information of soccer field, and recognizes the robot position by optimizing the fitness function using Genetic Algorithm. Moreover, we also verified the robustness of the proposed method against noise through experiments.



OS22-2 Tomato-Harvesting Robot Competition: Aims and Developed Robot of 6th Competitions

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

Tomato is one of the important fruit vegetables and most tomatoes are produced in the greenhouses, or large-scale farms, where the high temperature and humidity, and long harvest age force the farmer heavy works. To develop the tomato harvesting robot, many research issues exist such as manipulator design, end-effector design, collaborative behavior, artificial intelligence, motor control, image processing, target recognition and so on. With an aim to promote the automation of tomato harvesting, we have organized the tomato harvesting robot competition since 2014. In this paper, we discuss the aim and the results of 6th tomato harvesting robot competition in 2019.



OS22-3 Smart Agriculture IoT Education Course in enPiT-everi (Education Network for Practical Information Technologies - Evolving and Empowering Regional Industries)

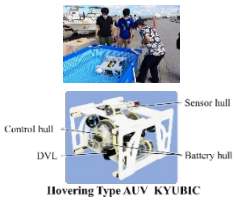
Yasunori Takemura[1, 2], Keiji Kamei[1, 2], Atsushi Sanada[1, 2], Kazuo Ishii[1]
([1]Kyushu Institute of Technology, Japan, [2]Nishinippon Institute of Technology, Japan)

Fostering human resources who can solve social issues by using Information Technology is an important issue in Japan. The Ministry of Education, Culture, Sports, Science and Technology (MEXT) has formed enPiT (Education Network for Practical Information Technologies) programs a practical education network for industry-academia collaboration and practice problem-based learning for the purpose. We have planned a smart agriculture IoT course in the program enPiT-everi (Evolving and Empowering Regional Industries) directed by Kitakyushu university. In the smart agriculture IoT course, the programming of IoT devices to measure the temperature of the green house and soil, soil moisture and CO2, image processing using AI technology to detect maturity of fruits, green worms was carried out.

OS22-4 Development of a Handy Autonomous Underwater Vehicle “Kyubic”

Toshimune Matsumura, Yuuichiro Uemura, Kentaro Yanagise, Yoshiki Tanaka, Yuya Nishida, Kazuo Ishii
(Kyushu Institute of Technology, Japan)

Ocean is one of big challenging and extreme environments, and hard for human to access directly. As the tool for ocean survey, Autonomous Underwater Vehicles: AUVs are expected and developed from ‘80s. The recent rapid progress of computer and information technologies makes the development of AUVs easier and more practical. We had developed a handy AUV “Kyubic” for the observation of shallow water and artificial structures. In this paper, we describe the system architecture of Kyubic and the experimental results in Underwater Robotics Competition in Okinawa 2020.



OS22-5 A Greenhouse Project toward Smart Agriculture

Kazuo Ishii[1], Yuya Nishida[1], Shinsuke Yasukawa[1], Kanako Shirahashi[1], Yasunori Takemura[2], Takayuki Matsuo[3]
([1]Kyushu Institute of Technology, Japan, [2]Nishinippon Institute of Technology, Japan, [3]National Institute of Technology, Kitakyushu College, Japan,)

In the future estimation of 2050, the food demand increases 70% and the production decreases 15% caused by global warming, and farmer population be 1/5 of current workers. Until 2050, we need an agricultural system of twice production with the same farmland area and 5 times effective operations. To realize the sustainable society, smart agriculture including robot technology, AI, IoT is one of the solutions for food issues. We have been working for a greenhouse project for evaluation of robotic, AI and IoT technologies. In this paper, we introduce the project and robotic applications.

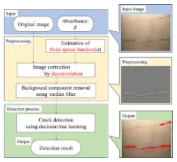
OS23 Advances in Field Robotics and Their Applications (7)

Chair: Keisuke Watanabe (Tokai University)
Co-Chair: Kazuo Ishii (Kyushu Institute of Technology)

OS23-1 Three-dimensional Measurement Using Laser Pattern And Its Application to Underwater Scanner

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

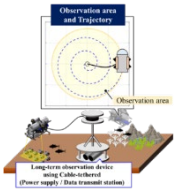
Underwater infrastructure and facilities are getting increasingly degraded and need inspections for cracks, scouring, however, the inspections are not carried out because of underwater environment and water turbidity. As a solution for the inspections, underwater vehicles attract attentions and expected to take precise photos of brides and their seabed. In this paper, to realize efficient underwater infrastructure inspection, automatic crack detection by image processing is proposed. In first process of our method generates enhanced image based on the absorbance from the turbidity meter and removes background component, and then detects crack from the enhanced image by using decision tree learning algorithm. This paper explains the algorithm of our method and shows evaluation experiment results.



OS23-2 Motion control of a cable-restricted underwater vehicle for long-term spot observation

Yoshiki Tanaka, Yuya Nishida, Kazuo Ishii (Kyushu Institute of Technology, Japan)

There are many marine resources in the Japanese EEZ, and recently, un-tethered underwater vehicles, AUVs (Autonomous Underwater Vehicles) are used as the practical tools for wide area seafloor survey. However, AUVs have the risks of their losing by hardware or software failures, AUVs have the risks to be trapped on the seafloor and not to be back on surface. The current trend of observation is 3D data in time series, 4 D data sampling. Underwater station can measure for long period in a certain point, not for wide area survey. This research aims to develop a long-term observation device with a low operation risk and wide area. The proposed system consists of a base station for supplying electric power and an underwater vehicle. The underwater vehicle is tethered to the base station with a cable. In this paper, we explain the developed observation device and report the result of motion control of the vehicle.



OS23-3 Development of current sensors for digitizing expert knowledge in fish feeding towards sustainable aquaculture

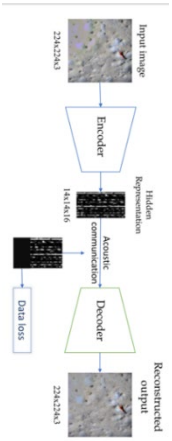
Dominic B. Solpico, Yuya Nishida, Kazuo Ishii (Kyushu Institute of Technology, Japan)

Improving the efficiency of fish feeding contributes to achieving sustainable expansion of the aquaculture industry. However, expert knowledge on efficient feeding remains a skill acquired through experience. This paper presents a new approach of digitizing such knowledge by measuring underwater currents induced by fishes as indicator of their behavior and appetite. Initial measurements to be made shall provide additional insight to the sensor system design. For this, a prototype current sensor suite has been constructed to measure the current around the fish cage, especially during feeding times. It consists of two modified flow sensors to measure the current flowing into or out of the cage at two target depths, and an IMU sensor to detect other induced water movements on the sensor mounting.

OS23-4 Underwater image reconstruction using convolutional auto-encoder

Shinsuke Yasukawa, Sreeraman Srinivasa Raghura, Yuya Nishida, Kazuo Ishii
(Kyushu Institute of Technology)

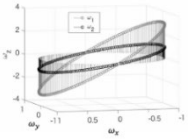
One of the main tasks of AUVs is to capture deep-sea images like fishes, crabs, other living organisms and resources for information leading to research on deep-sea ecosystems. Acoustic transmission are used to establish wireless underwater communications between the AUV and the ship. However, there are some limitations in the communication channels due to limited bandwidth, multi-path, temperature distribution and change in the direction of transmitting source and receiving sensor which results in losses in data being transmitted. Initially, the captured images are enhanced to reduce the effect of light attenuation and then compressed for transmission through acoustic modems. Only an important part of image is being transmitted through set of data packets. The received data packets in the ship will be reconstructed to predict the presence of living organisms. The loss in data during transmission creates a difficulty for the operators to predict the exact information. In this research, to compensate this transmission loss, an efficient compression and reconstruction technique using convolutional autoencoder with minimal distortion is proposed. Finally, for evaluation of the proposed image compression technique, the quality of reconstruction of images with and without data loss will be compared using the quality metrics signal to noise ratio(PSNR), structural similarity index(SSIM) and perceptual quality of image.



OS23-5 Spherical Robot Transfer Problem with Minimal Total Kinetic Energy

Kenji Kimura[1], Kazuo Ishii[2] ([1]Fukuoka Daiichi High School, Japan, [2]Kyushu Institute of Technology, Japan)

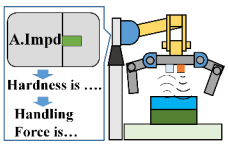
Previous spherical mobile robots were driven by two rollers with a fixed rotational axis, which restricts the angular velocity vector of the sphere to two dimensions. Three-dimensional freedom is expected to improve the rotational diversity of the sphere. This study proposes a spherical mobile robot with a variable roller-rotational axis that allows three-dimensional freedom of movement. Furthermore, the kinetic energy of transporting the sphere by the roller is minimized by an optimization procedure.



OS23-6 Acoustic Impedance Measurement through the Modelling of Ultrasonic Wave Transmission

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

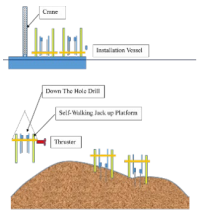
In food industry, shortage of workers is one of a serious problem. Automation of food handling is one of critical issues. To alleviate the damage caused by food picking operation by robotic hand, we propose non-contact acoustic impedance estimation with ultrasonic wave, which is preceded before the picking for optimization of picking force control. By assuming the correlation between hardness and acoustic impedance, the impedance is calculated by the product of sonic velocity and density of a medium. We derive an ultrasonic transmission model considering attenuation by ultrasonic reflection and absorption, then, made an experiment to estimate unevenness of the impedance. As the result, we succeeded in detecting the difference of acoustic impedance from the ultrasonic reflection.



OS23-7 Installation Method of In-situ Drilling Platform (withdraw)

Keisuke Watanabe (Tokai University, Japan)

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



OS24 Mathematical Informatics (5)

Chair: Takao Ito (Hiroshima University, Japan)
Co-Chair: Makoto Sakamoto (University of Miyazaki, Japan)

OS24-1 Verification of CG character operation by brain wave discrimination

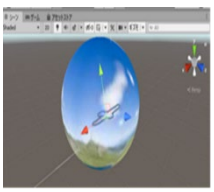
Kenji Sakoma[1], Kodai Miyamoto[1], Taketo Kamasaka[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan)
([2]National Institute of Technology, Ube College, Japan) ([3]Hiroshima University, Japan)

Since 2016, VR technology has been researched and developed all over the world and has made significant progress. In this research, I studied whether VR space could be played simply by thinking in my head, and conducted research. The equipment used at that time is an electroencephalograph, but since this equipment is generally very expensive, we used Neurosky's Mind Wave Mobile to determine if it could be done as cheaply as possible. This time, we used the fast Fourier transform and the support vector machine as the methods of EEG analysis. As a result, various problems were found. In the future, we will improve this problem and try to improve it further by changing the method of EEG analysis and other conditions.

OS24-2 Approach to tourism support by aerial video using CG

Kenji Sakoma[1], Noritake Seto[1], Kodai Miyamoto[1], Taketo Kamasaka[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan)
([2]National Institute of Technology, Ube College, Japan) ([3]Hiroshima University, Japan)

In recent years, rural areas have been declining due to the concentration of work in cities and the aging of the population. So, there are local governments that are focusing on tourism to regain the vitality of the past. As a first step in the tourism business, we will consider whether it is possible to increase the number of tourists by incorporating IT technologies such as CG in videos introducing PVs and commercials. This research is part of a joint development with Takachiho-cho.In this paper, we created a CG image of a bear flying in the sky combined with a real Takachiho video taken with a drone. However, various other problems have been identified, and I hope to improve them in future research to produce even better ones.

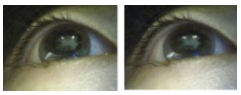


OS24-3 Method for detecting eye misalignment based on movement near the center of the pupil

Uchida Noriyuki[1,2], Kayoko Takatuka[2], Hisaaki Yamaba[2], Masayuki Mukunoki[2], Naonobu Okazaki[2]

([1]Kyushu University of Health and Welfare, Japan), ([2]University of Miyazaki, Japan)

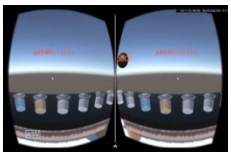
Only ophthalmologists and orthoptists are eligible to diagnose misalignment of the eyes amid persistent understaffing. We automated the traditional eye misalignment evaluation (Cover-test) in our earlier studies and developed a technique to distinguish the misaligned eyes from its behavior. This method, however, had a problem with the vertical eye movements being affected by the eyelids and eyelashes, which prevented thorough detection. Therefore, by observing only the movement near the center of the pupil, where it is less likely to be disturbed by the eyelids and eyelashes, we arranged an alternative method to recognize anomalies. Based on this process, we achieved an inspection system and carried out a performance experiment. We confirmed that we could observe not only horizontal motion, but also that of the vertical eye.



OS24-4 Basic research on video production for educational support by virtual technology

Kodai Miyamoto[1], Taketo Kamasaka[1], Kenji Sakoma[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan) ([2]National Institute of Technology, Ube College, Japan) ([3]Hiroshima University, Japan)

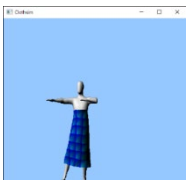
As a result of conducting a questionnaire about science classes to high school students in 2016, the percentage of high school students who answered "I like science" and "Science is important" is lower than other subjects. However, more than 80% of elementary and junior high school students said they like experiments and observations. In addition, the 2019 smartphone penetration rate survey found that it is popular among about 90% of students. In addition, VR technology has recently made remarkable progress. From the above, I researched the idea that creating a simulation application using VR technology using smartphones would change the way high school students think about science classes. In this paper, we have developed a simulation application for science experiments. Subjects were asked to experience the newly created app and complete a questionnaire. As a result, the average score is 4 out of 5 and it is not bad. But at the same time, a problem was found. The problem was that this app was a simulation app, so there wasn't much user operability, so I wanted a little more operability. I want to make apps in other fields while improving the problem.



OS24-5 There is a movement towards the development of hula costume CAD

Taketo Kamasaka[1], Kenji Sakoma[1], Kodai Miyamoto[1], Makoto Sakamoto[1], Amane Takei[1], Tsutomu Ito[2], Takao Ito[3] ([1]University of Miyazaki, Japan), ([2]National Institute of Technology, Ube College, Japan) ([3]Hiroshima University, Japan)

In this paper, the collision between the pow skirt and the body is determined. We verified each simple animation using the Euler method, the FB Euler method, and the Runge-Kutta method. As a result of verification, the Euler method and Runge-Kutta method animations showed contact with the body, movements away from the body of clothes, and violent movements, and the FB Euler method completed a simple and stable animation. However, I encountered problems such as heavy calculations that required manual parameter changes. In addition, issues such as research on texture mapping methods for pow skirts were also raised. Therefore, we will proceed with future research and aim for more realistic reproduction and practical research.

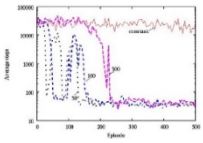


GS abstracts
GS1 Chaos & Application (5)
Chair: Masato Nagayoshi (Niigata College of Nursing, Japan)

GS1-1 A Method of Role Differentiation Using a State Space Filter with a Waveform Changing Parameter in Multi-agent Reinforcement Learning

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

Recently, there have been many studies on the multi-agent reinforcement learning (MARL) in which each autonomous agent obtains its own control rule by RL. Here, it is considered that different agents having individuality is more effective than uniform agents in terms of role differentiation in MARL. Therefore, we have proposed a promoting method of role differentiation using a wave-form changing parameter in MARL. In this paper, we confirm the effectiveness of role differentiation using a state space filter with a waveform changing parameter through computational experiments using "Pursuit Game" as one of multi-agent tasks.



GS1-2 The research about editing system of performance information for player piano. - Make inferences about both handed musical composition by using DP matching system -

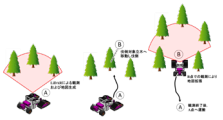
Ryo Kinoshita, Eiji Hayashi (Kyushu Institute of Technology, Japan)

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

GS1-3 Development of a LiDAR based Navigation System for Tree Harvester

Ayumu Tominaga, Ryusuke Fujisawa, Eiji Hayashi (Kyushu Institute of Technology, Japan), Abbe Mowshowitz (The City College of New York, US)

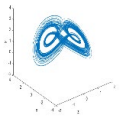
This study deals with an autonomous moving system for the automation of felling process by high-performance machines in the forestry. Many fatal accidents are caused by logging operations. In this research, a navigation system was developed to realize autonomous movement between accumulation sites and trees to be harvested in order to improve productivity and safety. A three-dimensional map is generated by LiDAR observation, and harvester moves autonomously to the tree as specified by the operator. A test of the harvesting process was conducted in an experimental environment. The evaluation was focused on the required time of autonomous movement in the process. The result showed that the effectiveness of the system was confirmed in operations such as row-thinning.



GS1-4 Numerical study on a class of chaotic financial chaotic systems (withdraw)

Lei Gong, Minghan Song (Tianjin University of Science and Technology, China)

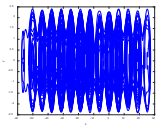
In this paper, a class of chaotic financial system is studied based on numerical simulation. Firstly, chaotic dynamics of the chaotic financial system is briefly introduced. Then, the stability of the equilibrium points is analyzed by using the Routh Hurwitz criterion. Finally, the influence of different parameters on the system is studied by means of phase diagram, Lyapunov exponent diagram and bifurcation diagram, which show a theoretical method to control chaotic dynamics of financial market.



GS1-5 Dynamic characteristics analysis of a multi-scroll conservative chaotic system with sinusoidal nonlinearity

Zhonggao Chen (Tianjin University of Science and Technology, China)

In this paper, a multi-scroll conservative chaotic system with sinusoidal nonlinearity is studied. Based on theoretical analysis and numerical analysis, such as equilibrium point and its stability analysis, Lyapunov exponent spectrum and bifurcation diagram, the system is found to show some complex dynamics. In addition, NIST test and FPGA implementation verify that the pseudo randomness and feasibility of the proposed system is satisfactory.



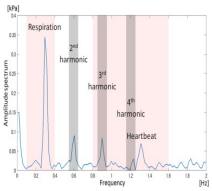
GS2 Image & Signal Processing 1 (4)

Chair: Tohru Kamiya (Kyushu Institute of Technology, Japan)

GS2-1 Unconstrained Measurement of Heart Rate Considering Harmonics of a Respiratory Signal by Tactile Sensor

Kazuya Matsuo (Kyushu Institute of Technology, Japan),
Toshiharu Mukai (Meijo University, Japan),
Shijie Guo (Hebei University of Technology, China)

Measurements of the sleeping state would be useful to monitor the health of a nursed person. The sleeping state can be estimated from biological information such as respiration rate, and heart rate. This study describes a heart rate measurement method by considering the harmonics of a respiratory signal. Respiration and heart rates are measured by applying frequency analysis to the time-series data of body pressure. The harmonics of a respiratory signal serve as noises in heart rate measurement. Therefore, heart rate measurement is improved by eliminating the effects of the harmonics. The average of the frequency errors of heart rate measurement by our proposed method is 0.144 Hz. The results of experiments demonstrated that our proposed method enhances the precision of heart rate measurement.



GS2-2 Image Registration Method for Chest MDCT Images Based on 2-D Finite Element Method

Takuji Ogimoto, Tohru Kamiya (Kyushu Institute of Technology, Japan)
Takatoshi Aoki (University of Occupational and Environmental Health, Japan)

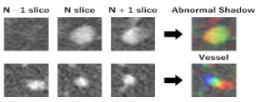
Multi detector-row computed tomography (MDCT) device has been used for early detection of lung cancer. However, there is concern that an increase in the burden on doctors will be caused by improvements in CT performance. Therefore, developing a computer aided diagnosis (CAD) reduces the burden on doctors. A temporal subtraction (TS) technique is one of the CAD systems and it is the subtraction operation of the current image and the previous one of the same patients that emphasizes temporal changes. In the TS image, when the position of the current image and the previous image are misaligned, subtraction artifacts are remained. In this paper, we propose a registration method based on the 2-D finite element method (FEM). In our proposed method, to improve the high computed cost that is the biggest problem of the FEM, we introduce the 2D FEM registration. We applied this method to 31 series MDCT image sets which was obtained previous and current from the same subjects and evaluated. As a result, full width at half maximum (FWHM) of 28.0, artifact to lung volume ratio of 5.77% and computational time of 140 sec were obtained.

(c)output image
Fig.4 Experimental result

GS2-3 Detection of Abnormal Shadows in Low-dose CT Images Using CNN

Hiromu Ikeda, Tohru Kamiya (Kyushu Institute of Technology, Japan)

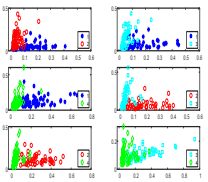
CT imaging is a very effective way to detect abnormal shadows in the lungs. Considering the physical burden on the patient, it should be taken at a low dose. Our approach consists of two main elements. First, candidate abnormal shadow areas are extracted from low-dose CT images of the chest by threshold processing and filtering. Second, we implement a CNN model to classify candidate region on images. To improve identification accuracy in CNN, we devised a method to add spatial information to the input image. In this paper, the proposed method is applied to 13 abnormal shadow images and 100 normal tissue images, and true positive ate of 84.6%, false negative rate of 15.4% were achieved respectively.



GS2-4 EEG signal extraction method based on HHT and CSP

Lei Gong (Tianjin University of Science and Technology, China)

In this paper, the Hilbert Huang transform (HHT) is used to extract the marginal spectrum (MS) of the four-task motor imagery of EEG signals. For the first time, a spatial filter constructed by common spatial pattern (CSP) is used to extract the feature of signal marginal spectrum, namely the marginal spectrum CSP feature (MSCSP). The MI EEG Data2a provided by The University of GRAZ is verified by the experiment, and the results show that compared with the traditional single CSP feature extraction method, the effect of MSCSP feature extraction was significantly improved. Which provide a theoretical and experimental foundation for the application of MI based on BCI system.



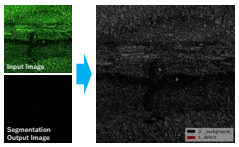
GS3 Image & Signal Processing 2 (3)

Chair: Keiko Sakurai (University of Miyazaki, Japan)

GS3-1 Deep-Learning Based Segmentation Algorithm for Defect Detection in Magnetic Particle Testing

Akira Ueda, Huimin Lu, Tohru Kamiya (Kyushu Institute of Technology, Japan)

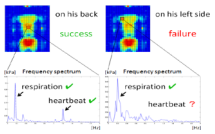
Magnetic Particle Testing (MPT), also referred to as magnetic particle inspection, is a nondestructive examination (NDE) technique used to detect surface and slightly subsurface flaws in most ferromagnetic materials such as iron, nickel, and cobalt, and some of their alloys. In a bad environment, the procedure is complicated, and automation of MPT is strongly desired. To find defects in the formed magnetic powder pattern, it is required to be highly skilled and automation has been considered difficult. In recent years, many defect detection methods based on deep learning have been proposed, and the effectiveness of deep learning has been shown in the task of automatically detecting various types of defects having different shapes and sizes. In this paper, we describe the development of deep learning based segmentation algorithm for defect detection in MPT images. We have achieved a F2 score of 84.04% by using U-Net as the segmentation model and by utilizing a strong backbone network and an optimal loss function.



GS3-2 A Method for Improving Recognition of Lying Postures Using a Measured Signal Intensity of Respiration and Heartbeat by Flexible Tactile Sensor Sheet

Kazuya Matsuo (Kyushu Institute of Technology, Japan), Toshiharu Mukai (Meijo University, Japan),
Shijie Guo (Hebei University of Technology, China)

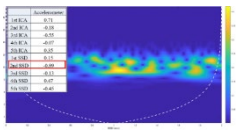
Measurements of the sleeping state would be useful to monitor the health of a nursed person. The sleeping state can be estimated from biological information such as respiration rate, heart rate, and lying postures. This study describes a method for improving recognition of lying postures using a measured signal intensity of respiration and heartbeat. We can obtain respiration and heartbeat by means of using the time series data of the body pressure measured at the suitable location determined by a lying posture. Therefore, a recognition rate of lying postures and a measured signal intensity of respiration and heartbeat have positive correlation. In the experiments, we show that recognition of lying postures is improved by means of using a measured signal intensity of respiration and heartbeat.



GS3-3 Basic research for the realization of online MEG using SSD

Kazuhiro Yagi, Yuta Shibahara, Lindsey Tate, Keiko Sakurai, Hiroki Tamura (University of Miyazaki, Japan)

Neurofeedback systems have been found to be effective in the clinical rehabilitation of paralysis. However, most systems exist only for use with EEG, which is cumbersome to apply to patients and has lower spatial resolution than MEG. Furthermore, the best practices for neural data feature extraction and feature selection are not well established. The inclusion of the best performing feature extraction algorithms is critical to the development of clinical neurofeedback systems. Using simultaneously collected MEG and accelerometer data before and during 10 spontaneous finger movements, we performed an in-depth comparison of independent components analysis (ICA) and spatio-spectral decomposition (SSD) algorithms for their individual abilities to isolate movement-relevant features in brain activity. Having restricted raw data to that from sensorimotor rhythm (SMR) frequencies in select MEG sensors over sensorimotor cortex, we compared ICA and SSD components using: (1) 2D topographies, (2) activations over time, (3) and correlations with accelerometer data at both 0ms and 60ms time delays. SSD performed more quickly and produced components that were more highly correlated with the behavioral data than ICA. We will discuss these results and suggestions for application to neurofeedback systems. In particular, we will present detailed visualizations of SSD results and discuss potential strategies and pitfalls for feature selection.



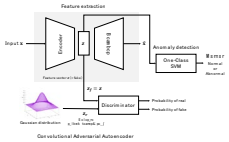
GS4 Image & Signal Processing 3 (3)

Chair: Taro Shibanoki (Ibaraki University, Japan)

GS4-1 Landslide Area Detection from Synthetic Aperture Radar Images Using Convolutional Adversarial Autoencoder and One-class SVM

Shingo Mabu, Soichiro Hirata, Takashi Kuremoto (Yamaguchi University, Japan)

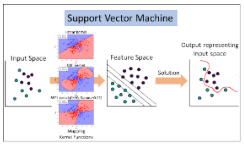
In this paper, an anomaly detection system using deep learning for detecting disaster-stricken (landslide) areas in satellite images is proposed. We used synthetic aperture radar (SAR) images because SAR can observe a wide area of the earth even at night or in bad weather. However, it is difficult to obtain a large number of training images with annotations. Especially it is much more difficult to obtain disaster area images than normal area images. To overcome this problem, we proposed an anomaly detection system that only uses normal area images for the training. The proposed system combines a convolutional adversarial autoencoder (CAAE) and one-class SVM, which realized good feature extraction and anomaly detection. In the experiments, the detection ability of normal and abnormal areas was evaluated.



GS4-2 Anomaly Detection in Time Series Data Using Support Vector Machines

Umaporn Yokkampon[1], Sakmongkon Chumkamon[1], Abbe Mowshowitz[2], Eiji Hayashi[1] and Ryusuke Fujisawa[1] ([1]Kyushu Institute of Technology, Japan) ([2]The City College of New York, USA)

Analysis of large data sets is increasingly important in business and scientific research. One of the challenges in such analysis stems from uncertainty in data, which can produce anomalous results. In this paper, we propose a method of anomaly detection in time series data using a Support Vector Machine. Three different kernels of the Support Vector Machine are analyzed to predict anomalies in the UCR public data set. Comparison of the three kernels shows that the defined parameter values of the RBF kernel are critical for improving the validity and accuracy in anomaly detection. Our results show that the RBF kernel of the Support Vector Machine can be used to advantage in detecting anomalies.



GS4-3 Relationship Between Tactile Stimuli and Human Body Sway

Masaya Tadokoro, Taro Shibanoki (Ibaraki University, Japan)

This paper describes the relationship between tactile stimulation and human body sway. We previously proposed a body sway mitigation system based on tactile stimulation and revealed that simultaneous stimulation behind both auricles were significantly improve human balance function, however, the mechanism of it were not fully discussed. In this paper, some stimulation patterns were applied to participants and COP eccentricities before/after stimulation was extracted. The results showed that COP values after stimulation could be inclined to the opposite of the stimulation site. It indicates that tactile stimuli can control human balance function.

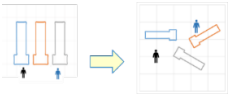
GS5 Genetic Algorithms & Robotics 1 (3)

Chair: Hideyuki Tanaka (Hiroshima University, Japan)

GS5-1 Layout decision system for multiple production lines using work-flow-line and GA

Masato Noda[1], Hidehiko Yamamoto[1] (Gifu University, Japan),
Hirohumi Tsuji[2], Yasuhisa Terawa[2], Yoshinori Nakamura[2], Masayuki Tsuchida[2] (Infofarm Corporation, Japan),
Katsuaki Yamada[3], Yukiyasu Kuriyama[3] (Kai Industries Corporation, Japan)

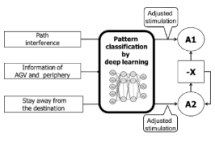
We develop the system to decide the efficient layout of assembly production line by using Genetic Algorithm (GA). The target production line has some operators. We call the system as System of Production-line-layout Decision by Chameleon-code and GA (PDCG). PDCG decides the efficient layout of production line by using GA, work flow-lines acquired by Chameleon code and the machine failure data. Specifically, PDCG evaluates the layout efficiency by calculating the operator's walking time in order to fix the machine failures which sometimes occur on the production line. By the evaluation, PDCG can find the good layout which has multiple production lines with one operator. We applied PDCG to the actual razors assembly line's layout in order to verify the performance of PDCG. We compare the layout obtained by PDCG with the parallel layout currently used in razors assembly factory. As a result, PDCG's layout reduced the walking time, compared with the parallel layout.



GS5-2 Autonomous decentralized FMS's AGVs moving control by mind change with deep learning

Ryunosuke Yamane, Hidehiko Yamamoto (Gifu University)

We have developed the system of autonomous decentralized flexible manufacturing system (AD-FMS) factory. Especially, automated guided vehicles (AGVs) in the AD-FMS factory avoided path interferences between AGVs by inserting the mind model into the AGVs. By using the mind model, the interferences can be avoided by repeating to change two types of mind, the arrogant mind and the modest mind. However, the problem is still left that it takes time to make the decision which way an AGV moves to avoid the interference. In order to solve the problem, we develop the new mind model. The new mind model includes the deep learning system. The new model is called Minimum Unit of Mind with Deep learning (MUMD). We applied the new mind model including the deep learning system to AD-FMS and ascertained MUMD is useful in the time of path interferences avoidances.



GS5-3 Secondary School Robotics Education in Camarin High School: Developments and Challenges for Improvement

Jeffrey Rivera Galino (Camarin High School, Philippines and Hiroshima University, Japan)
Hideyuki Tanaka (Hiroshima University, Japan)

Camarin High School is one of the schools in the Philippines that is making an initiative in improving STEM education through robotics education. In this paper, the authors report the development of a robotics program for students in junior high school. Through the Teacher Training Program of the Japanese Government for international teachers, localized challenges were identified and advances in technology education were examined for consideration. This report is hoped to provide useful insights to both practitioners of robotics education and initiators in a similar situation.

GS6 Robotics 1 (4)

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

GS6-1 Digital Testing Device for Active Range of Motion of Finger Joints Utilizing Artificial Neural Network

Huu-Hieu Quang, Yoshifumi Morita (Nagoya Institute of Technology, Japan), Makoto Takekawa (everfine, Japan)

This paper proposed a digital goniometer device for measuring the active range of motion (A-ROM) of finger joints by artificial neural network (ANN). Although a therapist typically measures the A-ROM by a physical goniometer, it consumes a significant amount of time, and imposes a relatively heavy burden on patients. The proposed device comprises an Intel RealSense depth camera and a computer. The camera is set up toward the patient`s finger joints. Subsequently, the therapist captures to collect RGB-D data. The three-dimensional position coordinates of the specified joint are acquired from the RGB-D data. These data are used as inputs to an ANN model for predicting the joint`s angles. The effectiveness of the proposed device is confirmed experimentally on the third joint of the middle angle.

Digital Testing device for A-ROM of finger joints

GS6-2 Position and Force Teaching Method for 6 DoF Manipulator Using Contact Teaching Tool and Teaching Data Editor

Duy-Do Bui, Hiroki Tanaka, Quang-Trung Chu, Hideki Inuzuka, Yoshifumi Morita (Nagoya Institute of Technology, Japan) Masao Sakai (Aichi Prefecture, Japan)

This paper proposed a method for teaching tasks performed by a six degree-of-freedom robot manipulator while the robot's tool makes contact with a workpiece. By using our previously developed direct teaching device, the time to teach pressing angle and force of the tool is greatly reduced compared to using the teaching pendant. In this study, a contact teaching tool and a teaching data editor were proposed on the assumption that the compliance characteristics of the robot hand are known. The tool allows us to accurately grasp the shape of the workpiece. The editor generates the target trajectory to realize the desired pressing angle and force on the basis of the teaching data and the known characteristics. The effectiveness was confirmed experimentally from the viewpoint of improving the teaching accuracy and reducing the teaching time.

PAWTED with a contact teaching tool

GS6-3 Haptic Device that Presents Sensation Corresponding to Palm on Back of Hand for Teleoperation of Robot Hand Report2: Consideration on Decided Specification

Kyosuke Ushimaru, Noritaka Sato, Yoshifumi Morita (Nagoya Institute of Technology, Japan)

Recently, teleoperated rescue robots are required. However, it is known that the teleoperation of a robot hand mounted on a rescue robot is difficult. Therefore, we propose a new haptic device that presents haptic sensation for teleoperation of a robot hand. The device stimulates the back of the hand instead of the palm of the operator. Determination of required specifications by an experiment with subjects is written in this paper. To design the device, the interval of the stimulation cue (i), the diameter of the stimulation cue (d), and the force of the stimulation (f) should be optimized. As a result of the experiment, we found that the accuracy rate is highest, when (i, d, f) = (30mm, 6mm, 0.9kgf). Moreover, we deeply considered on the decided specification with an additional experiment.

GS6-4 Robot Assisting Water Serving to Disabilities by Voice Control

Yang Chunxin, Sakmongkon Chumkamon, Eiji Hayashi (Kyushu Institute of Technology, Japan)

ROS is an open-source robot operating system. In this paper, we use ROS to control Conbe robot arm. By introducing the YOLACT real-time instance segmentation, we trained our own model for Object Detection. Secondly, the Speech-Recognition system is established through Deep speech and Mozilla Text-To-Speech with Tacotron2 DDC model. Deep speech is an end-to-end speech system, where deep learning supersedes these processing stages. Combined with a language model, this approach achieves higher performance than traditional methods on hard speech recognition tasks while also being much simpler. In this way, we create an artificial intelligence, which accomplished a simple conversation with people. And the voice control system is established based on Speech-Recognition system. In the experiment, we successfully control the robot arm move positions and do water serving for disabilities by voice command. With this research, voice control robot arm can be apply in the life support area, it will be more convenient for disabilities in daily life

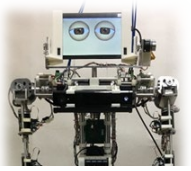
GS7 Robotics 2 (4)

Chair: Wisanu Jitviriya (Kyushu Institute of Technology, Japan)

GS7-1 Development of Interactive Robot – Emotion Estimation System Using Speech by 1dCNN -

Yugo Kawachi, Eiji Hayashi (Kyushu Institute of Technology, Japan)

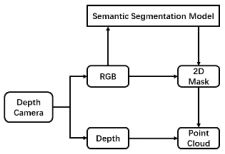
With the expansion of the market for the robotics industry, the development of service robots is becoming more popular. These robots are designed to be used in homes and in medical and welfare setting where they can communicate with people, and they need to act and talk in friendly. In this research, we are developing an interactive robot that pursues human-like movements by focusing on non-verbal interactions such as facial expressions and body language. We can guess the other person's emotions from the intonation of speech. In addition to the facial expressions and body language used in previous studies, we considered that a function for emotion estimation from speech is necessary. Therefore, we developed a machine learning system using 1dCNN for emotion estimation of speech.



GS7-2 Deep Learning Methods for Semantic Segmentation of Dense 3D SLAM Maps

Pei Yingjian, Sakmongkon Chumkamon, Eiji Hayashi (Kyushu Institute of Technology, Japan)

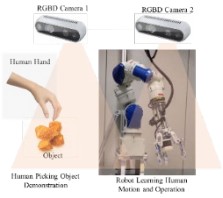
Most real-time SLAM systems can only achieve semi-dense mapping, and the robot lacks specific knowledge of the mapping results, so it can only achieve simple positioning and obstacle avoidance, which may be used as an obstacle in the face of the target object to be grasped, thus affecting the realization of motion planning. The use of semantic segmentation in dense SLAM maps allows the robot to better understand the map information, distinguish the meaning of different blocks in the map by semantic labels, and achieve fast feature matching and Loop Closure Detection based on the relationship between semantic labels in the scene. There are many semantic segmentation datasets based on street scenes and indoor scenes available for use, and these datasets have some common tags. Based on these training data, we can derive a semantic segmentation model based on RGB images by using the Pytorch platform for training.



GS7-3 Robot Motion Generation by Hand Demonstration

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

Since traditional robot teaching requires time and instruction to the robot motion, we present a system framework and experiment for generating robot motion trajectories from human hand demonstration, which the worker could teach robot easier rather than assigning the instruction to the robot controller manually. Therefore, the robot can imitate the action in a new situation instead of directly teaching the robot arm. Our contributions are including three-point 1) the extracting method of hand movement with marker-less using hand detection in 3D from human 2) the motion generalization of the hand trajectories from human 3) Robot path planning for grasping and place the object to the target. We also present the experiment conducted by the user movement for real data and evaluate the system using the manipulator's gripper. The experiment shows the pick-and-place task of the robot for food by hand demonstration.



GS7-4 Medical Telerobotics: IRAPs SHaRE-aGIVeR

Noppadol Pudchuen, Jiraphan Inthiam, Wisanu Jitviriya, Amornphun Phunopas, Chirdpong Deelertpaiboon
(King Mongkut's University of Technology North Bangkok, Thailand)
Aran Blattler (Kyushu Institute of Technology, Japan)

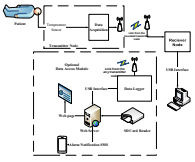
The Coronavirus disease 2019 (COVID-19) pandemic has affected the global population. In particular, the medical personnel in direct contact with patients have been exposed to high risk. To reduce the spread of COVID-19 and protect healthcare workers and patients, we would like to present the fully automated medical telerobot as the IRAPs SHaRE-aGIVeR robot. Our robot is capable of generating both 2D and 3D maps automatically, delivering medical supplies, food, or medical devices such as blood pressure monitors, pulse oximeters, and so on. In addition, the user interface system is also vital part. Users are able to connect and control the robot using a computer, a mobile device, or a tablet via the wireless network which is installed inside the robot. Currently, our robots are being operated on with medical personnel at hospitals, regarding the feedback from the formal caregivers that can prove our robot's efficiency in reducing the risk of COVID-19 spread.

GS8 Medical Data Processing (6)
Chair: Shingo Mabu (Yamaguchi University, Japan)

GS8-1 Development of in-Home Wireless Continuous Temperature Data Logging and Alarming System for Fever Monitoring in Pediatrics

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

Fever is one of the most common concern to be taken care by parents that sometimes force them to bring their child to the hospital emergency for continuous follow up especially at night when sleeping. Fever is defined when a rectal temperature reaches over 38.0 C (100.4 F). Temperatures measured from other sites of body are usually less. There is no defined threshold for fever due to variation of body temperatures between different individuals as much as 1 F. Fever itself is not life threatening unless the rectal temperature is persistent over than 41.6 C (107 F). Fever may be due to a serious illness and usually is caused by common infections that are not serious. However, a fever can be caused by other causes other than infections. Since continuous temperature monitoring is inapplicable at the rectal site, the paper aims at developing a prototype system using Wireless Sensor Network (WSN) for wireless continuous fever monitoring system from the head skin or wrist that are the most applicable area even so one must add 2 degrees for the read temperature correction. The system can record the temperature at the patient terminal and transmit the fever status and critical situations to an alarming system in the side of taking-care people that will help in in-home care for pediatrics suffering from fever.

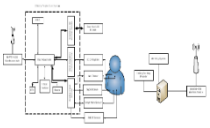


System Block Diagram

GS8-2 Design and Development of in-home Wireless Crucial Events Logging and Alarming System for Elderly and Disabled People Care

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

This paper aims at developing a system that will help in in-home care for elderly or disabled people. The system can record the patient vital parameters such as temperature, SpO2, ECG, heart rate, bed moisture and fall off sensor which could be installed at the bathroom or shower area at the patient terminal and transmit the critical situations such as high or low values to an alarming system. The system will be developed using the National Instrument Wireless Sensor Network (NI-WSN) to control the crucial events transmission and LabVIEW software to design the user interface.



System Block Diagram

GS8-3 Virtual bird's-eye view for remote operation of unmanned construction machinery

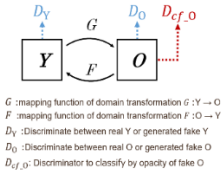
Noritaka Sato, Akihiro Fukuda (Nagoya Institute of Technology, Japan)

Recently, remote operation of construction machinery is required to release humans from dangerous places. However, the operator only watches a video from a camera mounted on a construction machine in general and lacks the sense of distance. Therefore, risk of collisions and operation time increase. In order to solve those problems, we propose a method to display virtual bird's-eye view which is created by superimposing a CG model of a construction machine on pre-captured pictures. The operator can recognize positional relationship between the machine and the environment by using the proposed method. Experiments are carried out to verify the effectiveness of the proposed method which can reduce the number of collisions and operation time comparing to the conventional method.

GS8-4 Domain Transformation of Chest CT Images Using Semi-Supervised Cycle GAN for Opacity Classification of Diffuse Lung Diseases

Masashi Miyake[1], Shingo Mabu[1] , Shoji Kido[2], Takashi Kuremoto[1]
([1]Yamaguchi University, Japan, [2]Osaka University, Japan)

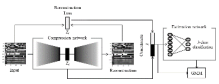
The aim of this research is to perform domain translation of chest CT images so that medical institutions can effectively use a computer-aided diagnosis (CAD) system trained at a different institution. We propose a semi-supervised Cycle GAN for domain transformation by combining the standard Cycle GAN and the trained CAD. In detail, after some images are domain-transformed by Cycle GAN, the trained CAD classifies them to examine whether they are appropriately transformed or not. Then, the results are fed back to the Cycle GAN to re-train. In the experiments, classification of normal opacity and five kinds of abnormal opacities of diffuse lung diseases in CT images are carried out and the effectiveness of the domain transformation of the proposed method is clarified.



GS8-5 Anomaly Detection of Lung Sounds Using DAGMM

Ryosuke Wakamoto[1], Shingo Mabu[1], Shoji Kido[2], Takashi Kuremoto[1]
([1]Yamaguchi University, Japan, [2]Osaka University, Japan)

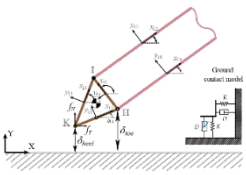
There are few studies using deep learning for auscultation, and also, there are only a few small-scale benchmark datasets of lung sounds that are annotated for the training of machine learning. Therefore, we aim to build an anomaly detection system that only uses normal data that can be obtained more than abnormal data. To realize the anomaly detection system, we propose an algorithm that improves the Deep Autoencoding Gaussian Mixture Model (DAGMM), that simultaneously implements feature extraction and clustering. In this study, various types of neural networks are applied to DAGMM as the compression networks for efficient feature extraction. From the experimental results, it is clarified that the proposed methods show effective classification performance for lung sounds.



GS8-6 A ground reaction force analysis in walking and running gaits in horse leg model on viscoelastic hoof-ground contact

Dondogjamts Batbaatar, Hiroaki Wagatsuma (Kyushu Institute of Technology, Japan)

In this paper, we focused on the hoof-ground interaction in the simplified horse leg model because walking and running gaits are known to be different in trajectories; however, the force analysis still remains as unsolved issues. The computational experiments in Matlab, elastic and inelastic impact with the ground was resolved by using the dissipative contact force model and the ground reaction force was clearly examined in four different conditions from the combination of walking/running and elastic/inelastic contact. The proposed method contributes to the establishment of the detail time course analysis of the ground reaction force for animal and human gaits in a consistent manner.



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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)

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