ICAROB 2015

PROCEEDINGS OF THE 2015 INTERNATIONAL CONFERENCE ON ARTIFICIAL LIFE AND ROBOTICS

January 10-12, 2015

Horuto Hall, Oita, JAPAN

International Meeting Series

Editor-in-Chief

Masanori Sugisaka

Editors: Takao Ito, Ju-Jang Lee, Yingmin Jia

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Proceedings of the 2015 International Conference on

ARTIFICIAL LIFE AND ROBOTICS

(ICAROB 2015)

January 10-12, 2015
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Takao Ito (Hiroshima University, Japan)

HISTORY

This symposium was founded in 1996 by the support of Science and International Affairs Bureau, Ministry of Education, Culture, Sports, Science and Technology, Japanese Government. Since then, 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). We changed this symposium name as The International Conference on Artificial Life and Robotics newly. This conference invites you all.

OBJECTIVE

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 will discuss new results in the field of artificial life and robotics.

GENERAL SESSION TOPICS

GS1 Artificial intelligence(4)
GS2 Complexity(4)
GS3 Evolutionary computation(3)
GS4 Intelligent control(4)
GS5 Neuromorphic systems(4)
GS6 Poster Sessions(14)

GS7 Pattern recognition (4)
GS8 Robotics Ⅰ (5)
GS9 Robotics Ⅱ (5)
GS10 Robotics Ⅲ (5)

ORGANIZED SESSION TOPICS

OS1 Intelligent Control(5)
OS2 Software Development Support Method (6)
OS3 Image Analysis, Human Interface, and Text Mining(5)
OS4 Graph Theory and Its Application(3)

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OS5 Bio-Inspired Algorithms and Their Applications(3)

OS6 Computer Science and Information Processing(4)

OS7 Computer Network and Security(3)

OS8 Kansei Engineering (5)

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Accepted papers will be published in the proceeding of The 2015 International Conference on Artificial Life and Robotics (ICAROB 2015). Some of high quality papers in the proceeding will be requested to re-submit their papers for the consideration of publication in an international journal ROBOTICS, NETWORKING AND ARTIFICIAL LIFE under agreement of both Editor-in- Chief and 3 reviewers. All correspondence related to the conference should be addressed to ICAROB Office.

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MESSAGES

Masanori Sugisaka

General Char

(Professors, Open Univesity(UK), University of Sultan Zainal Abidin, University of Malaysia-Peris (Malaysia) and President of Alife Robotics Co., Ltd..(Japan))

Masanori Sugisaka

General Chair of ICAROB

It is my great honor to invite you all to The International Conference on Artificial Life and Robotics (ICAROB 2015).

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

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

This history and character was inherited also from ICAROB 2014(The 2014 International Conference on Artificial Life and Robotics) now. From now on, ALife Robotics Corporation Ltd. is in charge of management. This year we have The 2015 International Conference on Artificial Life and Robotics (ICAROB 2015). 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 (ICAROB 2015) 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.

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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 2015 International Conference on Artificial Life and Robotics (ICAROB 2015), in Oita City, Oita, Japan from Jan. 10th to 12th, 2015.

ICAROB develops from the AROB that was created in 1996 by Prof. Masanori Sugisaka and celebrated her birthday of 19th years old in 1996. Doubtless, new mission and big challenges in the field of artificial life and robotics will promote ICAROB to start a new stage and attract wide interests among scientist, researchers, and engineers around the world.

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

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

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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 2015 International Conference on Artificial Life and Robotics (ICAROB 2015).This Conference is changed as the old symposium from the first (1996) to the Eighteenth I am pleased to welcome you to the 2015 International Conference on Artificial Life and Robotics in the wonderful city of Oita, Japan

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

Over the years, dramatic improvements have been made in the field of artificial life and its applications. The ICAROB has becoming the unifying the exchange of scientific information on the study of man-made systems that exhibit the behavioral characteristic of natural living systems including software, hardware and/or 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, good ideas, and valuable information about artificial intelligence, complex systems theories, robotics, management of technology, etc.

In order to provide an outstanding technical level for the presentations at the conference, we have invited more than 60 distinguished experts in the field of artificial life in the organizing committee and program committee. We will have 22 sessions during 3 days of conference, including 4 invited sessions.

The conference site is the Horuto Hall, one of the finest congress centers in Oita. It is situated near the center of the city and in front of Oita railway station. You can find many fantastic scenic spots and splendid hot-springs. Enjoy your stay and take your time to visit the city of Oita.

I am looking forward to meeting you in Oita during ICAROB 2015 and to sharing a most pleasant, interesting and fruitful conference

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Ju-Jang Lee

Co-General Chair

(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 2nd ICAROB 2015 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 2nd ICAROB.

I'm looking forward to meeting you at the 2nd ICAROB in Oita City and wishing you all the best.

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TIME TABLE (1/10)

1/10	Room404	Room406	Room407
9:30~	Registration		
10:00-11:40		GS8(5)Robotics Ⅰ Chair T. Sethaput	GS2(4)Complexity Chair K. Kobayashi
11:40-11:50	Coffee break		
11:50-12:10	Opening Ceremony (Room405)		
12:10-13:00	Lunch		
13:00-14:00		GS7(3)Pattern Recognition Chair J. Wang	GS3(3)Evolutionary computation Chair S. Mabu
14:00-14:20	Coffee break		
14:20-16:00		GS9(5)RoboticsⅡ Chair Y. Morita	GS5(4)Neuromorphic Systems Chair T. Kondo
16:00-16:20	Coffee break		
16:20-18:00		GS10(5)RoboticsⅢ Chair S. Kim	GS4(4)Intelligent Control Chair J-M Lee.

GS1 Artificial intelligence(4)
GS2 Complexity(4)
GS3 Evolutionary computation(3)
GS4 Intelligent control(4)
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GS6 Poster Sessions(14)
GS7Pattern recognition (3)
GS8 Robotics Ⅰ(5)
GS9 RoboticsⅡ(5)
GS10 RoboticsⅢ(5)

OS1 Intelligent Control(5)
OS2 Software Development Support Method (6)
OS3 Image Analysis, Human Interface, and Text Mining(5)
OS4 Graph Theory and Its Application(3)
OS5 Bio-Inspired Algorithms and Their Applications(3)
OS6 Computer Science and Information Processing(4)
OS7 Computer Network and Security(3)
OS8 (5) Kansei Engineering(5)

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TIME TEBLE (1/11)

1/11	Room404	Room405	Room406	Room407
9:30～	Registration			
10:00-11:00		GS6(14)Poster Chair J.J. Lee and J. Wang.	Room403 Plenary Speech Prof. Kai-Tai Song	
11:00-12:30			Invited Speech(403) Prof. Henrik H. Lund Prof. Luigi Pagliarini Dr. Jovana Jovan Jovic	
12:30-13:20	Lunch			
13:20-15:00		GS6(14)Poster	GS1(4)Artificial intelligence Chair M.Kubo	OS8(5)Kansei Engineering Chair T.Hattori
15:00-15:20	Coffee break			
15:20-17:00		GS6(14)Poster	OS1(5) Intelligent control Chair Y. Jia	OS3(5) Image Analysis, Human Interface, and Text Mining(5) Chair: Y. Yoshitomi
18:00-20:00	Banquet: HOTEL HOKKE CLUB OITA			

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TIME TABLE (1/12)

1/12	Room404	Room406	Room407
9:30～	Registration		
10:00-10:30		Room403	
		Plenary Speech	
		Prof. Kenji Hashimoto	
10:40-12:40		OS5(3)+OS7(3) Chair Furutani Chair Yamaba	OS2(6) Chair T. katayama
12:40-13:10	Lunch		
13:10-15:30		OS6(4)+OS4(3) Chair M. Sakamoto Chair: T. Ito	
15:40-16:40	Farewell Party (3rd Floor: Restaurant)		

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The International Conference on ARTIFICIAL LIFE AND ROBOTICS 2015 (ICAROB 2015)

January 10 (Saturday)

Room 405 11:50-12:10

Opening Ceremony

Chair: M. Sakamoto (University of Miyazaki, Japan)

Welcome Addresses

1. General Chairman of ICAROB	M. Sugisaka(ALife Robotics Co., Ltd. Japan, The Open University, UK, University of Sltan Zainal Abidin (UniSZA), Malaysia, University of Malaysia-Perlis, Malaysia (UniMAP))
2. Co-General Chairman of ICAROB	Y. M. Jia (Beihang University, China)
3. Co-General Chairman of ICAROB	T. Ito (Hiroshima University, Japan)
4. Co-General Chairman of ICAROB	J. J. Lee (KAIST, Korea)

January 11 (Sunday)

HOTEL HOKKE CLUB OITA

18:00-20:00

Banquet

Chair: J.M. Lee (Pusan National University, Korea)

Welcome Addresses

K.T. Song(National Chiao Tung University(NCTU), Taiwan)

H.H. Lund(Denmark Technical University of Denmark, Denmark)

J.J. Jovic (AIST, Japan),

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TECHNICAL PAPER INDEX

January 10 (Saturday)

9:30- Registration (Room404)

Room 406

10:00-11:40 GS8 (5) Robotics I

Chair: Thunyaseth Sethaput (Thammasat University, Thailand)

GS8-1 *Production effects by form changes of autonomous decentralized FMSs with mind*
Kakeru Yokoi, Hidehiko Yamamoto, and Takayoshi Yamada (Gifu University, Japan)

GS8-2 *Development of an autonomous-drive personal robot*
"Improve the accuracy of object area determination by boundary detection"
Mikiko Hirai, Eiji Hayashi (Kyusyu Institute of Technology, Japan)

GS8-3 *Construction of a supermicro sense of force feedback and vision for micro-objects: development of a haptic device*
Yusei Ishii, Eiji Hayashi (Kyushu Institute of Technology, Japan)

GS8-4 *Error Recovery of Pick-and-Place Tasks in Consideration of Reusability of Planning*
Akira Nakamura, Kazuyuki Nagata, Kensuke Harada and Natsuki Yamanobe
(National Institute of Advanced Industrial Science and Technology (AIST), Japan)

GS8-5 *Design of Sliding Mode Controller for Droplet Position in EWOD Microfluidic Sysem*
Thunyaseth Sethaput (Thammasat University, Thailand), Arsit Boonyaprapasorn
(Chulachomkloa Royal Military Academy,Thailand)

13:00-14:00 GS7 (3) Pattern Recognition

Chair: Jiwu Wang (Beijing Jiaotong University, China)

GS7-1 *Fast motion detection based on cross correlation*
Panca Mudjirahardjo, Joo Kooi Tan, Hyoungseop Kim and Seiji Ishikawa
(Kyushu Institute of Technology, Japan)

GS7-2 *Detecting moving objects on a video having a dynamic background*
FX Arinto Setyawan, Joo Kooi Tan, Hyoungseop Kim, Seiji Ishikawa
(Kyushu Institute of Technology, Japan)

GS7-3 *Study on the Target Recognition and Location Technology of industrial Sorting Robot based on Machine Vision*

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Jiwu Wang, Xianwen Zhang, Huazhe Dou(Beijing Jiaotong University, China)
Sugisaka Masanori (Alife Robotics Corporation Ltd, Japan, Open University, United Kingdom)

14:20-16:00 GS9(5) Robotics Ⅱ

Chair: Yoshifumi Morita (Nagoya Institute of Technology, RIKEN-RSC, Japan)

GS9-1 *Mechanism Designs for Bio-inspired Flapping Wing Robots*
Palakorn Tantrakool, Eakkachai Pengwang
(King Mongkut's University of Technology Thonburi, Thailand)

GS9-2 *Effective rocking motion for inducing sleep in adults – Verification of effect of mother's embrace and rocking motion –*
Keishi Ashida, Yoshifumi Morita (Nagoya Institute of Technology, RIKEN-RSC, Japan)
Ryojun Ikeura (Mie University, RIKEN-RSC, Japan)
Kiyoko Yokoyama (Nagoya City University, RIKEN-RSC, Japan)
Ming Ding, Yuki Mori (RIKEN-RSC)

GS9-3 *Postural Sway Response to Local Vibratory Stimulation in Young, Middle-aged and Elderly People in Standing Position*
Ayaka Yamada, Eishi Nakamura, Noritaka Sato, Yoshifumi Morita
(Nagoya Institute of Technology, Japan)
Tadashi Ito, Yoshihito Sakai (National Center for Geriatrics and Gerontrogy, Japan)
Kazunori Yamazaki (Fujita Health University, Japan)

GS9-4 *Development of Unmanned Transport System for automated systems*
Hyunhak Cho, Jungwon Yu, Yeongsang Jeong, Hansoo Lee, Sungshin Kim
(Pusan National University, Korea)

GS9-5 *Localization method for AGV using magnetic devices and IMU*
Moonho Park, EunKyeong Kim, Yeongsang Jeong, Hansoo Lee, Jungwon Yu, Sungshin Kim (Pusan National University, Korea)

16:20-18:00 GS10(5) Robotics Ⅲ

Chair: Sungshin Kim (Pusan National University, Korea)

GS10-1 *On the Effects of Epigenetic Programming on the Efficiency of Incremental Evolution Of the Simulated Khepera Robot*
Yasuto Nishiwaki , Ivan Tanev and Katsunori Shimohara
(University of Doshisha, Japan)

GS10-2 *The Effect of Duration of Both Stages of Incremental Genetic Programming on its Efficiency of Evolution of Snakebot*
N. Mukosaka, I. Tanev, K. Shimohara (Doshisha University, Japan)

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GS10-3 *Design of an effective shoulder joint mechanism for an upper-limb exoskeleton robot*
Masahito Akiyama, Kazuo Kiguchi (Kyushu University, Japan)

GS10-4 *A Machine Learning Approach to a Lateral Continuous Force Estimation for a Walking Biped Robot*
Yeoun-Jae Kim, Jun-Yong Lee and Ju-Jang Lee (KAIST, Korea)

GS10-5 *The Improvement of Robust Robot SLAM Algorithm Based on Sensor Fusion*
Jiwu Wang, Shunkai Zheng, Fangbo Liao (Beijing Jiaotong University, China)
Sugisaka Masanori (Alife Robotics Corporation Ltd, Japan and Open University, United Kingdom)

Room 407

10:00-11:40 GS2 (4) Complexity

Chair: Kunikazu Kobayashi (Aichi Prefectural University, Japan)

GS2-1 *Interactive musical editing system to support human errors and offer personal preferences for an automatic piano*
Kenji Tsunenari, Eiji Hayashi (Kyushu Institute of Technology, Japan)

GS2-2 *Modeling of collaboration in design process Based on Channel Theory*
Patchanee Patitad, Hidetsugu Suto (Muroran Institute of Technology, Japan)

GS2-3 *Sterilizing system of ballast water using an arc discharge*
Piao shengxu, Jae-cheol Lee, Zheng Tao, Heeje Kim (Pusan National University, Korea)

GS2-4 *The design of medical ruby laser power supply system using LLC resonant converter*
Jaecheol Lee, Piao shengxu, Zheng Tao, Heeje Kim (Pusan National University, Korea)

13:00-14:00 GS3 (3) Evolutionary computation

Chair: Shingo Mabu (Yamaguchi University, Japan)

GS3-1 *Online Rule Updating System Using Evolutionary Computation for Managing Distributed Database*
Wirarama Wedashwara, Shingo Mabu, Masanao Obayashi and Takashi Kuremoto (Yamaguchi University, Japan)

GS3-2 *Reinforcement Learning with Symbiotic Relationships for Multiagent Environments*
Shingo Mabu, Masanao Obayashi and Takashi Kuremoto, (Yamaguchi University, Japan)

GS3-3 *Development of a Dividual Model Using a Modular Neural Network for Human-Robot Interaction*
Toshiyuki Tanaka and Kunikazu Kobayashi (Aichi Prefectural University, Japan)

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14:20-16:00 GS5 (4) Neuromorphic Systems

Chair: Tadashi Kondo (Tokushima University, Japan)

GS5-1 *Associative Memory with Class I and II Izhikevich Model*
Yoshika Osawa, Takashi Kohno (University of Tokyo, Japan)

GS5-2 *Medical image recognition of heart regions by deep multi-layered GMDH-type neural network using principal component-regression analysis*
Tadashi Kondo, Junji Ueno and Shoichiro Takao (Tokushima University, Japan)

GS5-3 *Deep feedback GMDH-type neural network using principal component-regression Analysis and its application to medical image recognition of abdominal multi-organs*
Tadashi Kondo, Junji Ueno and Shoichiro Takao (Tokushima University, Japan)

GS5-4 *Synchronized Response to Grayscale Image Inputs in the Chaotic Cellular Neural Network*
Masayuki Fujiwara, Akihiro Yamaguchi (Fukuoka Institute of Technology, Japan)
Masao Kubo(National Defense Academy of Japan, Japan)

16:20-17:40 GS4(4) Intelligent Control

Chair: Jang-Myung Lee (Pusan National University, South Korea)

GS4-1 *Design of 1/40 scale simulator to apply the Flying Touch Method in hot rolling process*
Sung-jin Kim, Hyun-hee Kim, Min-cheol Lee (Pusan National University, South Korea)

GS4-2 *Improving Accuracy of Inertial Measurement unit using Piscrete Wavelet Transform*
Jae-Hoon Jung, Dong-Hyuk Lee, Jang-Myung Lee
(Pusan National University, South Korea)

GS4-3 *Outdoor Localization for Quad-rotor using Kalman Filter and Path Planning*
Chen-Hu, Yo-Seop Hwang, Jang-Myung Lee (Pusan National University, South Korea)

GS4-4 *Distributed Terminal Backstepping Control for Multi-Agent Euler-Lagrange Systems*
Seong-Ik Han, Yun-Ki Kim, Jang-Myung Lee (Pusan National University, South Korea)

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January 11 (Sunday)

9:30- Registration (Room404)

Room 201

10:00-11:00 Plenary Speech

Chair: Ju-Jang Lee (KAIST, Korea)

PS-1: Kai-Tai Song(National Chiao Tung University, Taiwan)

PS-1 *Vision-Based Grasp Planning and Experiments of a Mobile Manipulator*
Yi-Fu Chiu and Kai-Tai Song(National Chiao Tung University, Taiwan)

11:00-12:30 Invited Speech

Chair: Yingmin Jia (Beihang University, China)

IS-1: Henrik Hautop Lund (Technical University of Denmark, Denmark)
IS-2: Luigi Pagliarini (Centre for Playware, Technical University of Denmark, Denmark, Academy of Fine Arts of Macerata, Italy)
IS-3: Jovana Jovic (AIST, Japan)

IS-1 *Combining playware exergaming with a mobile fitness app*
Emmanouil Giannisakis, Henrik Hautop Lund
(Technical University of Denmark, Denmark)

IS-2 *Parallel Relational Universes – experiments in modularity*
Luigi Pagliarini (Centre for Playware, Technical University of Denmark, Denmark
Academy of Fine Arts of Macerata, Italy)
Henrik Hautop Lund (Centre for Playware, Technical University of Denmark, Denmark)

IS-3 *Identifying humanoid and human physical parameters*
Jovana Jovic, Eiichi Yoshida (AIST, Japan), Gentiane Venture (TUAT, Japan)

Room 405

10:00-17:00 GS6 Poster Session (14)

Chair: J. J. Lee (KAIST, Korea)
Jiwu Wang(Beijing Jiaotong University, China)

GS6-1 *The construction of evaluation index system for graduate course*
Ai Dongmei, Wen Jiawei, Ning Xiaojun
(University of Science and Technology Beijing, China)

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GS6-2 *Extracting Pattern of Arm Movements based on EMG Signal for Stroke Therapy*
Khairunizam Wan, Rashidah Suhaimi, Aswad A.R (Universiti Malaysia Perlis, MALAYSIA)
D. Hazry, Zuradzman M. Razlan, Shahriman AB (Universiti Malaysia Perlis, MALAYSIA)
Mohd Asri Ariffin and Haslina M (Universiti Sains Malaysia, MALAYSIA)

GS6-3 *Cascade Controller Design for Steering Control of Nonholonomic Autonomous Mobile Robot Vehicle*
S. Faiz Ahmed, D. Hazry (*Universiti Malaysia Perlis (UniMAP), Malaysia)*
F. Azim (Hamdard University, Pakistan)

GS6-4 *Research on Iris Recognition Based on the BP Neural Network*
Fengzhi DAI, Li FAN, Chunyu YU, Bo LIU

GS6-5 *Synchronization Control of a Four-wing Fractional-Order Chaotic System and Its Analog Circuit Design*
Hongyan Jia, Qian Tao, Jinfang Li, Wei Xue
(Tianjin University of Science & technology, PR China)

GS6-6 *A fractional-order hyper-chaotic system and its circuit implementation*
Wei Xue, Hui Xiao, Jinkang Xu, Hongyan Jia
(Tianjin University of Science and Technology, PR China)

GS6-7 *Research on Early Crop Monitoring Using Photosynthetic Production Index in China*
Fengzhi DAI[1], Li FAN[1], Daijiro KANEKO, Nozomu HIROSE, Chunyu YU[1]
([1] Tianjin University of Science & technology, China)

GS6-8 *Design and Implementation of Motor Test System based on Virtual Instrument*
Yulong Xia, Huailin Zhao (Shanghai Institute of Technology, China)
Jihong Zhu, Yang He(Tsinghua University, China)

GS6-9 *Consensus Problem of Distributed Multi-agent System*
Huailin Zhao (Shanghai Institute of Technology, China) Wei Ren (UCR, USA),
Masanori Sugisaka (Alife Robotics Corperation LTD, Japan)

GS6-10 *Dingle's Model-based EEG Peak Detection using a Rule-based Classifier*
Asrul Adam, Norrima Mohktar, Marizan Mubin(University of Malaya, Malaysia),
Zuwairie Ibrahim (Universiti Malaysia Pahang, Malaysia),
Mohd Ibrahim Shapiai (Malaysia-Japan International Institute of Technology Universiti Teknologi Malaysia, Malaysia)

GS6-11 *Different Learning Functions for Weighted Kernel Regression in Solving Small Sample Problem with Noise*
Zuwairie Ibrahim, Nurul Wahidah Arshad (Universiti Malaysia Pahang, Malaysia),
Mohd Ibrahim Shapiai
(Malaysia-Japan International Institute of Technology Universiti Teknologi Malaysia, Malaysia),

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Norrima Mokhtar(University of Malaya, Malaysia)

GS6-12 *Simultaneous Computation of Model Order and Parameter Estimation of a Heating System Based on Particle Swarm Optimization for Autoregressive with Exogenous Model : An Analysis*
Teoh Shin Yee, Zuwairie Ibrahim, Kamil Zakwan Mohd Azmi
(Universiti Malaysia Pahang, Malaysia),
Norrima Mokhtar (University of Malaya, Malaysia)

GS6-13 *Maximum Probability Algorithm for Fault Diagnosis*
Fengzhi DAI, Li FAN, Bo LIU (Tianjin University of Science & technology, China)

GS6-14 *The Fractional Order Hyperchaotic Generalized Augmented Lü System and its Circuit Implementation*
Wei Xue, Jinkang Xu, Hongyan Jia
(Tianjin University of Science and Technology, PR China)

Room 406

13:20-14:40 GS1 (4) Artificial intelligence

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

GS1-1 *Selecting Words and Notion Using Literary Data in the Integrated Narrative Generation System*
Jumpei Ono, Takashi Ogata (Iwate Prefectural University, Japan)

GS1-2 *Evaluation of a Narrative Discourse Generation System Based on the Concept of "Norm and Deviation"*
Taisuke Akimoto (The University of Electro-Communications, Japan)
Takashi Ogata (Iwate Prefectural University, Japan)

GS1-3 *An aggregating approach of target enclosure of robot swarm*
Masao KUBO, Hiroshi SATO, Akira Namatame
(National Defense Academy of Japan, Japan)
Akihiro Yamaguchi (Fukuoka Institute of Technology, Japan)

GS1-4 *Probability of mixing up a nearest neighbor robot under target enclosure by robot swarm*
Masao KUBO, Hiroshi SATO, Akira Namatame
(National Defense Academy of Japan, Japan),
Akihiro Yamaguchi (Fukuoka Institute of Technology, Japan)

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15:20-17:00 OS1 (5) Intelligent Control

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

Co-Chair: Weicun Zhang (University of Science and Technology Beijin, P.R.China)

OS1-1 *Adaptive Multiple-Model Control of a Class of Nonlinear Systems*
Chao Yang and Yingmin Jia (Beihang University, P.R. China)

OS1-2 *Attitude reorientation of spacecraft with attitude forbidden zones*
Xuhui Lu and Yingmin Jia (Beihang University, P.R. China)

OS1-3 *Weighted Multiple Model Adaptive Control of Uncertain Plant: Benchmark Problem*
Weicun Zhang, Ya Wang, and Yuzhen Zhang
(University of Science and Technology Beijing, P.R. China)

OS1-4 *A Reduced-Complexity Interacting Multiple Model Algorithm for Location Tracking in Heterogeneous Observation*
Xiaoyan Fu and Yuanyuan Shang (Capital Normal University, P.R. China)

OS1-5 *Single Image Dehazing on Mobile Device based on GPU Rendering Technology*
Yuanyuan Shang, Yue Meng, Xiuzhuang Zhou, Xiaoyan Fu, and Hui Ding
(Capital Normal University, P. R. China)

Room407

13:20-15:00 OS8 (5) Kansei Engineering

Chair: Tetsuo Hattori (Kagawa University, Japan)

Co-Chair: Hiromichi Kawano(NTT AT, Japan)

OS8-1 *Investigation of Feature Quantity in Sound Signal and Feeling Impression Using PCA*
Yusuke Kawakami, Tetsuo Hattori (Kagawa University, Japan),
Hiromichi Kawano (NTT AT, Japan), Tetsuya Izumi (Micro-Technica Co., ltd., Japan)

OS8-2 *Automated Color Image Arrangement Method Using Curvature Computation in Histogram Matching*
Yusuke Kawakami, Tetsuo Hattori, Yoshiro Imai, Haruna Matsushita (Kagawa University, Japan), Hiromichi Kawano (NTT AT, Japan),
R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

OS8-3 *Change Detection Experimentation for Time Series data by New Sequential Probability Ratio*
Yoshihide KOYAMA, Tetsuo HATTORI (Kagawa University, Japan)
Hiromichi KAWANO (NTT AT, Japan) Katsunori TAKEDA (Canon IT Solutions Inc., Japan)

OS8-4 *Analysis of Navier-Stokes Equation from the Viewpoint of Advection Diffusion (I)*
--- Analytical Solution of Diffusion Equation ---

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Hiroki SAKAMOTO, Tetsuo HATTORI (Kagawa University, Japan)
Akiomi TADA (Japan) Vanhoa NGUYEN (Japan) Hiromichi KAWANO (NTT AT, Japan)

OS8-5 *Analysis of Navier-Stokes Equation from the Viewpoint of Advection Diffusion (II)*
--- Approximate Solution ---
Hiroki SAKAMOTO, Tetsuo HATTORI (Kagawa University, Japan)
Akiomi TADA (Japan) Vanhoa NGUYEN (Japan) Hiromichi KAWANO (NTT AT, Japan)

15:20-17:00 OS3 (5) Image Analysis, Human Interface, and Text Mining

Chair: Yasunari Yoshitomi (Kyoto Prefectural University, Japan)

Co-Chairman: Masayoshi Tabuse (Kyoto Prefectural University, Japan)

OS3-1 *Development of Mouse Cursor Control System Based on Face Direction Using Kinect*
Masayoshi Tabuse (Kyoto Prefectural Univ., Japan)
Kaori Tamura (ISI Software Corp., Japan)

OS3-2 *Quantitative Evaluation of Facial Expressions and Movements of Persons While Using Video Phone*
Taro Asada, Yasunari Yoshitomi, Ryota Kato, Masayoshi Tabuse,
(Kyoto Prefectural University, Japan)
Jin Narumoto (Kyoto Prefectural University of Medicine, Japan)

OS3-3 *Facial Expression Recognition Using Facial Expression Intensity Characteristics of Thermal Image*
Yasunari Yoshitomi, Taro Asada, Ryota Kato, and Masayoshi Tabuse
(Kyoto Prefectural University, Japan)

OS3-4 *Method for Character Domain Extraction from Image Using Wavelet Transform*
Taiki Taniguchi (ZENSHO HOLDINGS Co., Ltd., Japan)
Yasunari Yoshitomi (Kyoto Prefectural University, Japan)

OS3-5 *Classification of Japanese Documents and Ranking of Representative Documents Using Characteristic of Frequencies of Words*
Jun Kimura(JustSystems Corp., Japan)
Yasunari Yoshitomi, Masayoshi Tabuse (Kyoto Prefectural University, Japan)

January 12 (Monday)

9:30- Registration (Room 404)

Room403

10:00-10:30 Plenary Speech

Chair: Takao Ito (Hiroshima University, Japan)

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PS-2: Hashimoto (Waseda University, Japan)

PS-2 *Biped Robot Research at Waseda University*
Kenji Hashimoto, Atsuo Takanishi (Waseda University, Japan)

Room 406

10:40-12:40 OS5 (3) + OS7 (3)

OS5 (3) Bio-Inspired Algorithms and Their Applications

Chair Hiroshi Furutani (University of Miyazaki, Japan)
Co-Chair Kenji Aoki (University of Miyazaki, Japan)

OS5-1 *Analysis of Genetic Disease Haemophilia A by Using Machine Learning*
Kenji Aoki, Makoto Sakamoto, Hiroshi Furutani (University of Miyazaki, Japan)

OS5-2 *Analysis of Asymmetric Mutation Model in Random Local Search*
Hiroshi Furutani, Yifei Du, Kenji Aoki, Makoto Sakamoto (University of Miyazaki, Japan)

OS5-3 *Hitting Time Analysis of OneMax Problem in Genetic Algorithm*
Y. Du, Q. Ma, k. Aoki, M. Sakamoto, H. Furutani (University of Miyazaki, Japan)
Y. Zhang (Qinghai University, China)

OS7 (3) Computer Network and Security

Chair Hisaaki Yamaba (University of Miyazaki, Japan)
Co-Chair Kentaro Aburada (Oita National College of Technology, Japan)

OS7-1 *An Authentication Method for Mobile Devices that is Independent of Tap-Operation on a Touchscreen*
Hisaaki Yamaba, So Nagatomo, Shinichiro Kubota, Tetsuro Katayama, Naonobu Okazaki (University of Miyazaki, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)
Mirang Park (Kanagawa Institute of Technology, Japan)
,

OS7-2 *Proposal of Security Evaluation System using User's Reviews and Permissions for Android Application*
Naonobu Okazaki (University of Miyazaki, Japan)
Yoshihiro Kita (Kanagawa Institute of Technology, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)
Mirang Park (Kanagawa Institute of Technology)

OS7-3 *Evaluation of Neighbors Based Routing for ad hoc networks*
Kentaro Aburada (Oita National College of Technology, Japan)
Hisaaki Yamaba, Shinichiro Kubota, Tetsuro Katayama, Naonobu Okazaki (University of Miyazaki, Japan)
Mirang Park (Kanagawa Institute of Technology, Japan)

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13:10-15:30 OS6 (4) +OS4 (3)

OS6 (4) Computer Science and Information Processing

Chair Makoto Sakamoto (University of Miyazaki, Japan)
Co-Chair Yasuo Uchida (Ube National College of Technology, Japan)

OS6-1 *Sufficient spaces for seven-way four-dimensional Turing machines to simulate four-dimensional one-marker automata*
Makoto Nagatomo, Makoto Sakamoto, Hikaru Susaki, Tuo Zhang, Satoshi Ikeda, and Hiroshi Furutani (University of Miyazaki, Japan)
Takao Ito (Hiroshima University, Japan)
Yasuo Uchida (Ube National College of Technology, Japan)
Tsunehiro Yoshinaga (Tokuyama College of Technolory, Japan)

OS6-2 *Some Properties of k-Neighborhood Template A-Type Three-Dimensional Bounded Cellular Acceptors*
Makoto Sakamoto, Makoto Nagatomo, Hikaru Susaki, Tuo Zhang, Satoshi Ikeda, and Hiroshi Furutani (University of Miyazaki, Japan)
Takao Ito(Hiroshima University, Japan)
Yasuo Uchida(Ube National College of Technology, Japan)
Tsunehiro Yoshinaga (Tokuyama College of Technology, Japan)

OS6-3 *Perfect Analysis in miniature Othello*
Yuki Takeshita, Satoshi Ikeda, Makoto Sakamoto (Miyazaki University, Japan)
Takao Ito (Hiroshima University, Japan)

OS6-4 *A proposal for teaching programming through the Five-Step Method*
Y. Uchida, S. Matsuno(National Institute of Technology, Ube College, Japan)
T. Ito (Hiroshima University, Japan)
M. Sakamoto (University of Miyazaki, Japan)

OS4 (3) Graph Theory and Its Application

Chair Takao Ito (Hiroshima University, Japan)
Co-Chair K. Ogata (University of Nagasaki, Japan)

OS4-1 *The Role of National Standards Setter in the Global Convergence Era -In the Case of the Japanese Setter during the first decade-*
Ogata, K. (University of Nagasaki, Japan)

OS4-2 *An Empirical Research on Inter-firm Capital Relationship in Yokokai using IDE Spatial Model*
Takao Ito (Hiroshima University, Japan)
Makoto Sakamoto, S. Ikeda (University of Miyazaki, Japan)
R. Mehta (New Jersey Institute of Technology, U.S.A)
Tsutomu Ito (Hino Motors, Ltd. Japan)

OS4-3 *Design and Experimental Evaluation of a Human Skill-Based PID Controller*
Yuntao Liao, Yamamoto Toru (Hiroshima University, Japan)

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Room407

10:40-12:40 OS2 (6) Software Development Support Method

Chair: Tetsuro Katayama (University of Miyazaki, Japan)

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

OS2-1 *Prototype of a Supporting Tool to Generate Testing Communication Diagram*
Tetsuro Katayama, Seiya Urata, Yohei Ogata, Hisaaki Yamaba, and Naonobu Okazaki (University of Miyazaki, Japan)
Yoshihiro Kita, (Kanagawa Institute of Technology, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)

OS2-2 *Code Coverage Visualization on a Web-Based Testing Tool for Java Programs*
Mochamad Chandra Saputra (Universitas Brawijaya, Indonesia)
Tetsuro Katayama (University of Miyazaki, Japan)

OS2-3 *TFVIS: a Supporting Debugging Tool for Java Programs by Visualizing Data Transitions and Execution Flows*
Hiroto Nakamura, Tetsuro Katayama, Hisaaki Yamaba, Naonobu Okazaki (University of Miyazaki, Japan)
Yoshihiro Kita (Kanagawa Institute of Technology, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)

OS2-4 *Proposal of a testing method using similarity of interleaving for Java multi-threaded programs*
Shoichiro Kitano, Tetsuro Katayama, Hisaaki Yamaba, and Naonobu Okazaki (University of Miyazaki, Miyazaki, Japan)
Yoshihiro Kita (Kanagawa Institute of Technology, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)

OS2-5 *Proposal of a Modification Method of a Source Code to Correspond with a Modified Model in MDA.*
Yuuki Kikkawa, Tetsuro Katayama, Hisaaki Yamaba, and Naonobu Okazaki (University of Miyazaki, Japan)
Yoshihiro Kita (Kanagawa Institute of Technology, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)

OS2-6 *Prototype of a Decision Table Generation Tool from the Formal Specification*
Kenta Nishikawa, Tetsuro Katayama, Hisaaki Yamaba and Naonobu Okazaki (University of Miyazaki, Japan)
Yoshihiro Kita (Kanagawa Institute of Technology, Japan)
Kentaro Aburada (Oita National College of Technology, Japan)

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Abstract
Plenary Speech

PS-1 Vision-Based Grasp Planning and Experiments of a Mobile Manipulator

Yi-Fu Chiu and Kai-Tai Song(National Chiao Tung University, Taiwan)
ivan790721.ece01g@nctu.edu.tw, ktsong@mail.nctu.edu.tw

In this paper, a motion planner is designed and implemented for of a mobile manipulator to travel to a spot for grasping of an object. In this work, the probability of successful grasping inside the workspace of the robot arm is used for grasping planning. A vision SLAM system is combined with reachability calculation to figure out the grasping position. Using a laboratory dual-arm robot, we conducted experiments in different conditions to verify the effectiveness of the developed system.

PS-2 Biped Robot Research at Waseda University

Kenji Hashimoto, Atsuo Takanishi (Waseda University, Japan)
contact@takanishi.mech.waseda.ac.jp

Waseda University has researched on biped robots since 1967. In this talk I will introduce our latest biped robots, WABIAN-2, a running robot and WL-16. WABIAN-2 has 41-DOF, and its height is 1480 mm with 63.8 kg weight. WABIAN-2 has realized a human-like walk with the knees stretched, heel-contact and toe-off motion by utilizing a foot mechanism having a passive toe joint and a 2-DOF (Roll, Yaw) waist mimicking a human's pelvis motion. Now we are going to build a new biped humanoid robot capable of running and walking in order to study human running and other features. The running robot can jump by utilizing a pelvic movement and leg elasticity. WL-16 is a human-carrying biped vehicle consisting of two Stewart Platform type legs and waist with a passenger seat. WL-16 can be used as a substitute for a wheel chair.

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Invited Speech

IS-1 Combining playware exergaming with a mobile fitness app

Emmanouil Giannisakis, Henrik Hautop Lund
(Technical University of Denmark, Denmark)

We propose a novel playware as a merge between exergames and mobile fitness apps to engage the users in physical exercises, not only as competitive play, but also in the form of cooperative play. The concept connects modular interactive tiles with radio communication to Android tablets and smart phones, which can connect to the Internet. This allows the players to monitor their playware exergaming performance on the smart device(s). The test subjects playing the games were school children (12-13 years old). As a social playware, we investigated how the playware mediated cooperative and competitive play amongst the users. It was found that the majority of game play involved social interaction between players, and that 8 out of 10 pupils on the top-10 were girls. The playware seemed to motivate the girls to become physically active.

Figure 1. Modular tiles connected to smart devices and internet.

IS-2 Parallel Relational Universes – experiments in modularity

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

We here describe Parallel Relational Universes, an artistic method used for both the psychological analysis of group dynamics and speculations on aestethics. The design of the artistic system, which mediates group dynamics, emerges from our former experiments on modular playware and remixing playware. Inspired from consolidated psychological and artistic practice and founded on the remixing modular Playware logic, where users remix samples in the form of physical and functional modules, we created an artistic instantiation of such a concept with the Parallel Relational Universes, allowing arts alumni to remix artistic expressions. Here, we report the data emerged from a first pre-test, run with gymnasium's alumni. We then report both the artistic and the psychological findings. We finally discuss possible variations of such an instrument under the light of modern technologies. Between an art piece and a psychological test, at a first cognitive analysis, it seems to be a promising research tool.

Figure 1. An example outcome of Parallel Relational Universes

IS-3 Identifying humanoid and human physical parameters

Jovana Jovic[1], Eiichi Yoshida[1], Gentiane Venture[2]
([1]AIST, Japan),
([2]TUAT, Japan)

Dynamical and kinematic analysis of humanoid and human movements require accurate estimation of segment mass parameters (mass, center of mass, and inertia matrix), and their misinterpretation can lead to significant variation in estimated joint kinematics. In the field of robotics, several methods have been developed for estimation of mass parameters of humanoid robots, as well as human subjects, based on linear properties of dynamic equation of bipedal systems with respect to the set of mass parameters. This talk will focus on those methods addressing the state-of-the-art research in the topic. Examples of both human and humanoid robots mass parameters estimation will be given. Identified mass parameters improve output of human dynamic analysis and humanoid simulation and model-based control.

Examples of exciting trajectories used for the mass parameters estimation.

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OS

OS1: Intelligent Control

OS1-1 Adaptive Multiple-Model Control of a Class of Nonlinear Systems

Chao Yang and Yingmin Jia
(Beihang University, P.R.China)

In this paper, an adaptive multiple-model controller is developed for nonlinear systems in parametric-strict-feedback form. Unlike the previous results, a switching scheme is not required here to switch to the most appropriate model.The new scheme reduces the number of identification models and uses information from all the models more efficiently via convex combination of estimates of parameters. The parameter convergence and global asymptotic stability of tracking errors in the closed-loop system are guaranteed. A simulation example is included to demonstrate the effectiveness of the obtained results.

OS1-2 Attitude reorientation of spacecraft with attitude forbidden zones

Xuhui Lu and Yingmin Jia
(Beihang University, P.R.China)

This paper investigates the attitude reorientation control scheme for spacecraft, considering attitude forbidden zone and external disturbances. Here a novel potential function is proposed. Besides a dynamical scaling factor and backstepping technique are synthesized to accommodate the avoidance of attitude forbidden zones and the disturbance attenuation. Simulation results are given to verify the effectiveness of the proposed method.

OS1-3 Weighted Multiple Model Adaptive Control of Uncertain Plant: Benchmark Problem

Weicun Zhang, Ya Wang, and Yuzhen Zhang
(University of Science and Technology Beijing, P.R.China)

This paper is concerned with the weighted (robust) multiple model adaptive control (WMMAC) of uncertain stochastic plant. A benchmark problem, i.e, the two-cart mass-spring-damper (MSD) system, is investigated through theoretical analysis and computer simulation based on MATLAB and SIMULINK. The benchmark problem has a wide application background, such as, suspension vibration, earthquake, and flexible space structure. Simulation results demonstrated the effectiveness of WMMAC strategy to the benchmark problem.

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OS1-4 A Reduced-Complexity Interacting Multiple Model Algorithm for Location Tracking in Heterogeneous Observation

Xiaoyan Fu and Yuanyuan Shang
(Capital Normal University, P.R.China)

This paper is devoted to the problem of state estimate of discrete-time stochastic systems with Markov jump parameters. A low-complexity and high accuracy algorithm is presented to reduce the computational load of the traditional interacting multiple model algorithm with heterogeneous observations for location tracking. By decoupling the x and y dimensions to simplify the implementation of location and formulating the problem in a factor graph framework, updated information is iteratively passed based on an adaptive fusion decision to obtain the state estimation of maneuvering target. Extensive Monte Carlo simulations show that the proposed algorithm is more computationally attractive than existing multiple model methods.

OS1-5 Single Image Dehazing on Mobile Device based on GPU Rendering Technology

Yuanyuan Shang, Yue Meng, Xiuzhuang Zhou, Xiaoyan Fu, and Hui Ding
(Capital Normal University, China)

Images captured in bad weather conditions such as haze, dust, fog, and rain are often substandard because of the attendant poor visibility and low intensity contrast. Over the past few years, image dehazing has become popular in imaging science communities because of its potential application in many vision tasks. Image dehazing utilizes a very complex algorithm that requires intensive filtering and floating-point arithmetic operations. Consequently, processing speed is the most significant bottleneck in its application in some vision tasks such as mobile platforms. On the other hand, graphic processing unit (GPU) rendering technology is widely used in image processing applications to speed up image processing algorithms. In this paper, we propose an optimized single image parallel processing dehazing algorithm for mobile platforms and implement it on a Windows Phone device based on GPU rendering technology. Experimental results on hazy images demonstrate the efficacy and effectiveness of our proposed approach in improving image quality.

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OS2 Software Development Support Method

OS2-1 Prototype of a Supporting Tool to Generate Testing Communication Diagram

Tetsuro Katayama*, Seiya Urata*, Yohei Ogata*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada‡ and Naonobu Okazaki*
(*University of Miyazaki, Japan)
(†Kanagawa Institute of Technology, Japan)
(‡Oita National College of Technology, Japan)

This research has implemented a prototype of a supporting tool to generate testing communication diagram. The testing communication diagram visualizes messages, which are written in a part of test cases, between objects in software system and helps a developer to understand where the software system is tested by a large quantity of test cases written in text. The testing communication diagram is generated by adding the information of test cases to communication diagram in UML (Unified Modeling Language). The implemented prototype can support that a developer draws testing communication diagram. Moreover, it can detect more efficiently deficiency and/or contradiction in communication diagram and/or test cases.

OS2-2 Code Coverage Visualization on a Web-Based Testing Tool for Java Programs

Mochamad Chandra Saputra*, Tetsuro Katayama†
(*Universitas Brawijaya, Indonesia)
(†University of Miyazaki, Japan)

This research implements a web-based testing tool which displays code coverage visualization result testing for java programs using statement coverage (C0) and branch coverage (C1). The result displays for visual information have been highlighted in bright green as information of executed lines, bright yellow for C0 and dark green for C1. The testing tool informs the user using visualization to understand the behavior of the tested code as a sequence of the executed lines. The results of testing are satisfied C0 and C1 100%, it's meant the testing tool successfully checked each line and verified as a true condition of all based on the covering status of a statement and branch coverage. The testing tool significantly reduces the time for testing a sample software code, 716 ms using our testing tool and over 4 minutes using manual testing.

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OS2-3 TFVIS: a Supporting Debugging Tool for Java Programs by Visualizing Data Transitions and Execution Flows

Hiroto Nakamura*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada‡ and Naonobu Okazaki*
(*University of Miyazaki, Japan)
(†Kanagawa Institute of Technology, Japan)
(‡Oita National College of Technology, Japan)

We have developed TFVIS in order to improve efficiency of debugging for Java programs. TFVIS can perform the visualization of data transitions and the visualization of execution flows. The visualization of data transitions shows the flow of variable renewals in executing programs. It becomes easier to grasp the behavior in executing the programs whose behavior is unexpected by a bug. The visualization of execution flows shows an entire flow of the execution. It is useful to select the part where users want the visualization of the data transitions. When we use the visualization of the data transitions based on the source code, the visualization of execution flows supports to grasp behavior of the program and the place where users visualize. At last, the efficiency of TFVIS is shown.

OS2-4 Proposal of a testing method using similarity of interleaving for Java multi-threaded programs

Shoichiro Kitano*, Tetsuro Katayama*, Yoshihiro Kita†,
Hisaaki Yamaba*, Kentaro Aburada‡ and Naonobu Okazaki*
(*University of Miyazaki, Japan)
(†Kanagawa Institute of Technology, Japan)
(‡Oita National College of Technology, Japan)

In order to improve the efficiency of testing Java multi-threaded programs, this research proposes a testing method to detect order violation in them using similarity of interleaving. Order violation is one of the distinctive bug patterns in concurrent programs. This pattern means that some threads can be executed as an access to a certain memory in an unexpected order. Our proposed method improves the efficiency of testing by executing interleaving which can test the places where lead the order violation easily in source codes and by reducing interleaving which is similar to executed one already. The efficiency of our method is shown by experiments for confirmation.

```
class OnePrinter extends Thread {
  public void run() {
    PreemptionPointer.preemptionPoint(0);
    System.out.println(1);
    PreemptionPointer.preemptionPoint(1);
  }
}

class TwoPrinter extends Thread {
  public void run() {
    PreemptionPointer.preemptionPoint(2);
    System.out.println(2);
    PreemptionPointer.preemptionPoint(3);
  }
}
```


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OS2-5 Proposal of a Modification Method of a Source Code to Correspond with a Modified Model in MDA.

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This study improves efficiency of software development using MDA. This paper proposes a method that reduces time and effort to keep consistency between models and a source code after requirement specification is modified. The proposed method consists of four steps as below. (1) The method generates EAD (Extended Activity Diagram) from an activity diagram and a source code added detail specification. EAD is a diagram that adds a part of the source code which has the detail specification to the activity diagram. Here, the detail specification is information omitted in drawing an activity diagram. (2) A developer modifies the activity diagram to fit the changed requirement specification. (3) The method modifies EAD to correspond with the modified activity diagram. (4) The method generates a new source code from the modified EAD.

OS2-6 Prototype of a Decision Table Generation Tool from the Formal Specification

Kenta Nishikawa*, Tetsuro Katayama*, Yoshihiro Kita†,
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This research has implemented a prototype of a decision table generation tool from the specification (the formal specification) described in a formal specification language. This paper uses the formal specification description language VDM++ which is the lightweight formal methods VDM (Vienna Development Method) to write the formal specification. This prototype generates a decision table from the specifications of VDM++, and displays it. We applied some general specifications to the prototype, in order to evaluate its usefulness. This prototype could generate decision tables from each of the applied specifications. We confirmed that this prototype works properly. As a result, the prototype has improved the efficiency in test design with formal methods.

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OS3 Image Analysis, Human Interface, and Text Mining

OS3-1 Development of Mouse Cursor Control System Based on Face Direction Using Kinect

Masayoshi Tabuse[1], Kaori Tamura[2]
([1]Kyoto Prefectural Univ., Japan)
([2]ISI Software Corp., Japan)

We propose a method of operating mouse cursor and controlling television based on face direction using Kinect. Using our system anyone can control television by motion of a user easily and cheaply. It is not necessary to fix a user's head or to restrict user's head movement. Therefore, it can ease a user's burden compared with conventional devices. Furthermore, a person with trouble in a hand can control television easily. Our system measures face direction and controls mouse cursor using 4 face directions of rightward, leftward, upward and downward directions using Kinect. It changes a television's channel and volume by controlling mouse cursor based on face direction using Kinect in a range with distance less than 4 meters between a user and Kinect. It is also applicable to operation of other application software controlled by mouse cursor.

OS3-2 Quantitative Evaluation of Facial Expressions and Movements of Persons While Using Video Phone

Taro Asada[1], Yasunari Yoshitomi[1], Ryota Kato[1], Masayoshi Tabuse[1], and Jin Narumoto[2]
([1]Kyoto Prefectural University, Japan)
([2]Kyoto Prefectural University of Medicine, Japan)

We have developed a method for analyzing facial expressions and movements of a person while speaking with another person using a video phone to improve the QOL of elderly people living in care facility, or at home. In the present study, the video is analyzed using image processing software (OpenCV) and the newly proposed feature parameters of facial expressions and movements, which are extracted in the mouth-part area. The feature parameter for expressing facial expression is defined as the average of facial expression intensity. The feature parameter for expressing facial movement is defined as the average of absolute value of vertical coordinate for the center of gravity of mouth area in the relative coordinate system. The experimental result shows the usefulness of the proposed method.

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OS3-3 Facial Expression Recognition Using Facial Expression Intensity Characteristics of Thermal Image

Yasunari Yoshitomi, Taro Asada, Ryota Kato, and Masayoshi Tabuse
(Kyoto Prefectural University, Japan)

In the present study, we proposed a method for recognizing facial expressions. The recorded video is analyzed by thermal image processing and the feature vector of facial expression, which is extracted in the area of mouth and jaw by applying 2D-DCT (Discrete Cosine Transform) for each domain having 8×8 pixels in the area of mouth and jaw. The facial expression intensity defined as the norm of difference vector between the feature vector of neutral facial expression and that of observed one can be used for analyzing a chance of facial expression. The average and the standard deviation of facial expression intensities are used for recognizing facial expression. The average and the standard deviation of time of utterance are helpful for recognizing facial expression. The experimental results show the usefulness of the proposed method.

OS3-4 Method for Character Domain Extraction from Image Using Wavelet Transform

Taiki Taniguchi[1] and Yasunari Yoshitomi[2]
([1]ZENSHO HOLDINGS Co., Ltd., Japan)
([2]Kyoto Prefectural University, Japan)

The number of images having private information and/or URL of illegal Web site has been increasing in the cyber space on the Internet. These images might cause infringement of human right and/or criminal act. In the present study, a method for extracting the region(s) having characters on an image has been developed using Wavelet Transform (WT) and the empirical knowledge that a character has strong vertical and/or horizontal element(s). Finally, the output RGB image is generated by the operation that the color of the pixel on the original RGB image is changed into white when the value of corresponding pixel on the mask image made by the proposed method is '0', resulting in extracting the region(s) having characters on the original RGB image. The experimental results show the usefulness of the proposed method.

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OS3-5 Classification of Japanese Documents and Ranking of Representative Documents Using Characteristic of Frequencies of Words

Jun Kimura[1], Yasunari Yoshitomi[2], and Masayoshi Tabuse[2]
([1]JustSystems Corp., Japan)
([2]Kyoto Prefectural University, Japan)

It is very difficult to read through all of Web pages in which we are interested. A Web page has some kinds of media, such as document, image, and sound. We have developed a method for classification of Japanese documents and ranking of representative documents using characteristic of frequencies of words. All nouns in a document are extracted with use of MeCab (http://mecab.sourceforge.net/) with which the document is resolved into several morphemes. For clustering, we use ward method. The representative document is defined as the document whose feature vector is the closest to the center of gravity of the class in the feature vector space among all documents belonging to the class. The ranking of the representative documents is decided in the descending order of the number of documents belonging to the class.

Order of Clustering	Document No.	Number of Document in Cluster	Ranking
1	7	20	1
2	3	11	2
2	11	9	3
3	3	11	–
3	6	5	4
3	15	4	5
4	3	8	–
4	6	5	–
4	15	4	–
4	17	3	6

Ranking : 7=>3=>11=>6=>15=>17

OS4 Graph Theory and Its Application

OS4-1 The Role of National Standards Setter in the Global Convergence Era -In the Case of the Japanese Setter during the first decade-

Ogata, K. (University of Nagasaki, Japan)

An aim of this paper is to explain that the change of standard-setting activities of ASBJ, Japanese accounting standard setter, in the 2000s was caused by its own standard-setting development strategy. Researches on accounting standard-setting processes have had two different ideas about characteristics of the setters: the pluralistic organization regarded as a political forum of some stakeholders related to accounting standards, and the autonomous organization regarded as an actor which behave with a will to achieve desirable policy purposes. Through an analysis of organizational structure using graph theory, we show that the ASBJ strategically alter its structure, and that the structure can trigger the change of setting activities. It means that the ASBJ has a nature not so much pluralistic as autonomous organization.

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OS4-2 An Empirical Research on Inter-firm Capital Relationship in Yokokai using IDE Spatial Model

Takao Ito[1], Makoto Sakamoto[3], R. Mehta[2], Tsutomu Ito[4], and S. Ikeda[3]
(1 Hiroshima University, Japan)
(2 New Jersey Institute of Technology, U.S.A)
(3 University of Miyazaki, Japan)
(4 Hino Motors, Ltd. Japan)

This paper introduces recent fundamental modifications to Japanese alliance system known as the keiretsu, and analyses how these changes have affected corporate performance. Specially, the performance of Japanese auto manufacturers, such as Toyota, Nissan and others, has significantly improved due to sophisticated production system technologies, highly productive workers, and recurring transaction relationship with other partners in their network family. One possible determinant of their success could be due to their unique organization forms –the keiretsu– which provides a strong platform to forge their strategic alliance relationship with their parts suppliers as well as collaboration in research and development with other automobile makers. After economic bubble of the 1990', the strong ties between automobile makers and their supplier partners experienced significant changes, which are known as "keiretsu loosening". Consequently, what is the status quo of automotive keiretsus? Does cross-shareholding, which is one specific form of capital relationship in keiretsu, still contribute to improving corporate performance? To answer these questions, this paper reports the results of a study that collected data on cross-shareholdings to shed light on the relationship between inter-firm capital relationship and corporate performance. The findings of this empirical investigation reveal that: (1) Keiretsu is a flexible, highly adaptive organizational form; its scale changes in response to economic situations; (2) Capital relationship is still a significant determinant of increasing profits for keiretsu partners even after the bubble burst in the 1990s..

Influence in Yokokai from 1985 to 2004.

OS4-3 Design and Experimental Evaluation of a Human Skill-Based PID Controller

Yuntao Liao, Yamamoto Toru (Hiroshima University, Japan)

Nowadays less and less people are willing to do hard works.Which model articulation controller (CMAC) is a kind of neural networks (NNs) that can easily solve problems of nonlinear system. Compared with other NNs the advantage of CMAC is that it takes shorter learning time. Moreover because of the widely used of PID controller a human skill-based PID controller using CMACs has been proposed in this paper.

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OS5 Bio-Inspired Algorithms and Their Applications

OS5-1 Analysis of Genetic Disease Haemophilia A by Using Machine Learning

Kenji Aoki, Makoto Sakamoto, Hiroshi Furutani
(University of Miyazaki, Japan)

Haemophilia A is a genetic disease resulting from deficiency of factor VIII. The database of mutations causing haemophilia A has been developed by the world wide collaboration. In this study, we examined the relation between activity of factor VIII and the missense mutation by using machine learning. As parameters, we used four physical-chemical parameters of amino acids. We predicted the severity of haemophilia A by using machine learning in factor VIII. As the result, logistic regression is not better than other methods in the prediction of haemophilia A severity. The result of the prediction improved in order to SVM, Bagging, AdaBoost, RandomForest. These results suggested that we can predict the haemophilia severity by using these methods, and Random Forest was the best method in these five methods to predict the haemophilia A severity.

OS5-2 Analysis of Asymmetric Mutation Model in Random Local Search

Hiroshi Furutani, Yifei Du, Kenji Aoki, Makoto Sakamoto
(University of Miyazaki, Japan)

There are many reports that the asymmetric mutation model is a very powerful strategy in EAs to obtain better solutions more efficiently. In this paper, we report stochastic behaviors of algorithms that are asymmetric mutation models of Random Local Search (RLS). The mathematical structure of asymmetry model can be derived in terms of a finite Markov chain.We demonstrate some useful results representing the effects of asymmetric mutation.

OS5-3 Hitting Time Analysis of OneMax Problem in Genetic Algorithm

Y. Du[1], Q. Ma[1], k. Aoki[1], M. Sakamoto[1], H. Furutani[1], Y. Zhang[2]
([1]University of Miyazaki, Japan)
([2]Qinghai University, China)

Genetic algorithms (GAs) are stochastic optimization techniques, and we have studied the effects of stochastic fluctuation in the process of GA evolution. A mathematical study was carried out for GA on OneMax function within the framework of Markov chain model. We treated the task of estimating convergence time of the Markov chain for OneMax problem. Next, in order to study hitting time, we study the state after convergence. Our results demonstrate that the hitting time distribution *h(t)* has an exponential form, and the logarithmic of *h(t)* is linearly decreasing function.

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OS6 Computer Science and Information Processing

OS6-1 Sufficient spaces for seven-way four-dimensional Turing machines to simulate four-dimensional one-marker automata

Makoto Nagatomo[1], Makoto Sakamoto[1], Hikaru Susaki[1], Tuo Zhang[1], Takao Ito[2], Yasuo Uchida[3], Tsunehiro Yoshinaga[4], Satoshi Ikeda[1], and Hiroshi Furutani[1]
(1:University of Miyazaki, Japan)(2:Hiroshima University, Japan)
(3:Ube National College of Technology, Japan) (4:Tokuyama College of Technolory, Japan)

We think that recently, due to the advances in many application areas such as motion image processing, computer animation, and so on, it is very useful for analyzing computational complexity of multi-dimensional information processing to explicate the properties of four-dimensional automata, i.e., three-dimensional automata with the time axis. As far as we know, there is no investigation about four-dimensional automata. Then, in 2002, we first introduced four-dimensional finite automata in the world. In 2003, we investigated four-dimensional alternating Turing machines. In this paper, we continue the investigations, and deal with sufficient spaces for four-dimensional Turing machines to simulate one-marker automata.

OS6-2 Some Properties of k-Neighborhood Template *A*-Type Three-Dimensional Bounded Cellular Acceptors

Makoto Sakamoto[1], Makoto Nagatomo[1], Hikaru Susaki[1], Tuo Zhang[1], Takao Ito[2], Yasuo Uchida[3], Tsunehiro Yoshinaga[4], Satoshi Ikeda[1] and Hiroshi Furutani[1]
([1]University of Miyazaki, Japan, [2]Hiroshima University, Japan,
[3]Ube National College of Technology, Japan, [4]Tokuyama College of Technology, Japan)

In this paper, we investigate multi-dimensional computational model, k-neighborhood template *A*-type three-dimensional bounded cellular acceptor on four-dimensional tapes, and discuss some basic properties. This model consists of a pair of a converter and a configuration-reader. The former converts the given four-dimensional tape to three-dimensional configuration. The latter determines whether or not the derived three-dimensional configuration is accepted, and concludes the acceptance or non-acceptance of given four-dimensional tape. We mainly investigate some open problems about k-neighborhood template *A*-type three-dimensional bounded cellular acceptor on four-dimensional tapes whose configuration-readers are L(m) space-bounded deterministic (nondeterministic) three-dimensional Turing machines.

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OS6-3 Perfect Analysis in miniature Othello

Yuki Takeshita[1], Satoshi Ikeda[2], Makoto Sakamoto[3], Takao Ito[4]
([123]Miyazaki University, Japan)
([4]Hiroshima University, Japan)

In 1993, mathematician Joel. Feinstein found that a perfect play on 6×6 board of Othello gives a 16-20 win for the second player; the perfect play is a score and the sequence in the case where both players were the best play. More than 20 years have passed since then, in a recent the mainstream board game study is computer game such as chess and Go, but standard 8×8 board of Othello has not been solved at this time. Therefore, we suppose the nature of the game from the perfect analysis of the board which is smaller than it. Additionally, this study also includes the meaning of the double-check, because we were not able to find the article that checked the result of Feinstein. In this paper, we show the perfect play of 4×4, 4×6, 4×8, 4×10 and 6×6 board. From this result, we discuss the nature of the game in 8×8 board or more board.

OS6-4 A proposal for teaching programming through the Five-Step Method

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([1]National Institute of Technology, Ube College, Japan)
([2]Hiroshima University, Japan)
([3]University of Miyazaki, Japan)

We teach computer programming to students aged 17 through 18 years. In the course, a few students consider themselves to have insufficient understanding of programming or think that they are not good at programming. In response, we adopted and implemented a part of the Computer Science Unplugged (CS Unplugged) method, which is considered an effective way of teaching information science. However, although CS Unplugged has generated considerable results in motivating students to learn and in initial learning, we feel that it is not sufficiently connected to full-fledged programming languages such as C and Java. Accordingly, we propose advancing from CS Unplugged to full-fledged programming through a new Five-Step Method. In this paper, we describe the thinking and concepts behind this proposed method.

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OS7 Computer Network and Security

OS7-1 An Authentication Method for Mobile Devices that is Independent of Tap-Operation on a Touchscreen

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([3]Kanagawa Institute of Technology, Japan)

In these days, mobile devices such as tablet type PCs or smart phones widely penetrated. This causes a new need for authentication method that has tolerant to shoulder surfing. Under this situation, we are investigating a new user authentication method for mobile devices not using screen touching but using surface electromyogram signals. In this paper, a series of experiments were carried out in order to investigate the prospect of the authentication method using s-EMG. Concretely, several motion patterns of wrist are introduced, and s-EMG signals generated at each gesture were measured. And we compared the s-EMG signal patterns generated by the same subject and the patterns generated by different subjects. As a result, it was found that patterns of same subjects were similar and those of different ones were different each other.

OS7-2 Proposal of Security Evaluation System using User's Reviews and Permissions for Android Application

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Yoshihiro Kita, (Kanagawa Institute of Technology, Japan)
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Leakage of the personal information in Android OS powered device by mal-applications is becoming the heavy matter. The Android OS users must be careful not to install mal-applications. The reviews and the using permissions of applications are useful by users to detect mal-application. However, the most of users read the reviews only. All users must be cautious about not only the using permissions but also the combination of them.In this paper, we propose the security evaluation system to prevent the installation of mal-applications on Android OS. This system indicates the user reviews with the using permission information of application to new users. Reviews have two types: positive reviews and negative reviews. Positive reviews include selling points or good features for the application. Negative reviews include wrong points or problems of the application. New user evaluates the one of reviews, and determines to download the application. The evaluation report of the review is transmitted to the reviewer which wrote it. Therefore, the reviewer can use the report as reference for the better.

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OS7-3 Evaluation of Neighbors Based Routing for ad hoc networks

Kentaro Aburada[1], Hisaaki Yamaba[2], Shinichiro Kubota[2],
Tetsuro Katayama[2], Mirang Park[3], Naonobu Okazaki[2]
([1] Oita National College of Technology, Japan)
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([3] Kanagawa Institute of Technology, Japan)

In ad hoc networks, due to the mobility of nodes, radio wave interference, and limited resources, such as batteries, communication links are unstable and restricted. As such, an efficient routing protocol is needed in order to solve these problems. The existing protocols cannot adapt to the route repair when the route is disconnected. In the present paper, we propose a neighbors-based routing (NBR) protocol by constructing paths in an area in which a large number of nodes exists. Simulations confirm that the proposed protocol has higher connectivity and a lower control overhead than existing protocols in topologies in which nodes move.

OS8 Kansei Engineering

OS8-1 Investigation of Feature Quantity in Sound Signal and Feeling Impression Using PCA

Yusuke Kawakami, Tetsuo Hattori (Kagawa University, Japan),
Hiromichi Kawano (NTT AT, Japan),
Tetsuya Izumi (Micro-Technica Co., ltd., Japan)

This paper investigates the relationship between feature quantity of sound signal and feeling impression using PCA (Principal Component Analysis). As the feature quantity, we use Fluctuation value and sum of squared errors (Residual) which is calculated by regression analysis of sound signal, in the same way as our previous paper. As a result, we have found that the feeling response of examinees can be classified into three groups by a clustering analysis. And also we have obtained the results of PCA for the feeling effects depending on each group of examinees and four kinds of frequency zone of sound signal. In this paper, we discuss the analysis results on the Kansei (or feeling) effect.

OS8-2 Automated Color Image Arrangement Method Using Curvature Computation in Histogram Matching

Yusuke Kawakami, Tetsuo Hattori, Yoshiro Imai, Haruna Matsushita (Kagawa University, Japan),
Hiromichi Kawano (NTT AT, Japan),
R.P.C. Janaka Rajapakse (Tainan National University of the Arts, Taiwan)

This paper proposes an improved method for automated color image arrangement method by using histogram curvature computation. The previous paper that we have presented the principle of our method using Histogram Matching based on Gaussian Distribution (HMGD), and how to detect input color image peakedness in its histogram. In this paper, we describe about Variance Estimated HMGD (VE-HMGD) as improvement HMGD. We also show how to estimate the histogram variance of original image based on the curvature computation. Moreover we compare processing results between VE-HMGD and HMGD through some experimentation. As the result, we show that, in the color, VE-HMGD is more natural than HMGD.

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OS8-3 Change Detection Experimentation for Time Series data by New Sequential Probability Ratio

Yoshihide KOYAMA, Tetsuo HATTORI (Kagawa University, Japan)
Hiromichi KAWANO (NTT AT, Japan)
Katsunori TAKEDA (Canon IT Solutions Inc., Japan)

Previously, we have proposed a novel method using New Sequential Probability Ratio (NSPR) for the structural change detection problem of ongoing time series data instead of using SPRT (Sequential Probability Ratio Test). In this paper, for comparison. we present the experimental results by applying the both methods, i.e., NSPR and SPRT, to time series data that are generated by a multiple regression model in the case where one explanatory variation is a periodic function (sine function). And also we discuss the effectiveness of the both methods.

OS8-4 Analysis of Navier-Stokes Equation from the Viewpoint of Advection Diffusion (I) --- Analytical Solution of Diffusion Equation ---

Hiroki SAKAMOTO, Tetsuo HATTORI (Kagawa University, Japan)
Akiomi TADA (Japan)
Vanhoa NGUYEN (Japan)
Hiromichi KAWANO (NTT AT, Japan)

We propose an approximate analysis method for the Navier-Stokes Equation (NSE) based on the similarity between NSE and Advection Diffusion Equation (ADE). In this paper, we present an analytical solution and a Green function (integral kernel) which are obtained from the diffusion equation over uniform flow field (or velocity field) in three dimensional (3D) boundless region under arbitrary initial condition. The solution shows that the diffusion process is a Markov one and that the Green function becomes a Gaussian-like exponential function.

$$\frac{\partial C}{\partial t} = D_x \frac{\partial^2 C}{\partial x^2} + D_y \frac{\partial^2 C}{\partial y^2} + D_z \frac{\partial^2 C}{\partial z^2} - u\frac{\partial C}{\partial x} - v\frac{\partial C}{\partial y} - w\frac{\partial C}{\partial z} - \lambda C + Q$$

(ADE)

OS8-5 Analysis of Navier-Stokes Equation from the Viewpoint of Advection Diffusion (II) --- Approximate Solution ---

Hiroki SAKAMOTO, Tetsuo HATTORI (Kagawa University, Japan)
Akiomi TADA (Japan)
Vanhoa NGUYEN (Japan)
Hiromichi KAWANO (NTT AT, Japan)

We propose an approximate analysis method for the Navier-Stokes Equation (NSE) based on the similarity between NSE and Advection Diffusion Equation (ADE). In the preceding paper titled “Analysis of Navier-Stokes Equation from the Viewpoint of Advection Diffusion (I)”, we have presented the analytical solution of the ADE. Subsequently in this paper, we point out the explicit similarity between NSE and ADE by illustrating the corresponding equations. Then, we show an approximate solution of NSE using the aforementioned analytical solution of ADE.

$$\frac{\partial C}{\partial t} = D\nabla^2 C - (\boldsymbol{v}\cdot\nabla)C - \lambda C + Q$$
$$(D = D_x = D_y = D_z)$$

(ADE)

$$\frac{\partial \boldsymbol{v}}{\partial t} = k\nabla^2 \boldsymbol{v} - (\boldsymbol{v}\cdot\nabla)\boldsymbol{v} - \frac{gradp}{\rho} + \frac{\boldsymbol{f}}{\rho}$$
$$(div\boldsymbol{v} = 0)$$

(NSE)

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GS

GS1 Artificial intelligence

GS1-1 Selecting Words and Notion Using Literary Data in the Integrated Narrative Generation System

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

We have developed a narrative generation system called "Integrated Narrative Generation System: INGS". The architecture of INGS has two types of macro level's parts: "generation mechanism" and "knowledge mechanism". The main elements of the latter "knowledge mechanism" are "conceptual dictionaries (for noun concepts and verb concepts)", "language notation (or literation) dictionary", and so on. Though the present mechanism of INGS randomly selects a noun concept from the choices, various types of noun concepts are mixed in a set such as old/new, ordinary/extraordinary, etc. This paper presents a common idea based on the frequency analysis of external texts' words for the above two problems. For the first processing relevant to noun concepts, we automatically analyze frequency information of noun words in novels stored in "Aozora Bunko", to select noun concepts according to the frequency information. For example, if we use noun concepts according to high-frequency noun words, the output text will be more readable. In this presentation, we will present the basic idea, text analysis programs with language parsing, several results, and the verification including comparing the results with the processing without the proposed mechanisms.

GS1-2 Evaluation of a Narrative Discourse Generation System Based on the Concept of "Norm and Deviation"

Taisuke Akimoto[1], Takashi Ogata[2]
([1]The University of Electro-Communications, Japan)
([2]Iwate Prefectural University, Japan)

This paper deals with the verification of the narrative discourse system that automatically produces a variety of "discourse" structures from an inputted "story" structure through an iterative mutual action between a "narrator" mechanism and a "narratee" mechanism. We objectively consider the system's behavior for identifying its achievements and issues to be addressed. In particular, we analyze a series of 10000 generated discourse structures according to their structural feature values by focusing on the diachronic alternation of "norm", the narratee's expectation in receiving discourses, caused by its "deviation" by the narrator. Overall, the mechanism produced a large number of different discourse structures through the restriction of generation space based on the norm at the time and the accumulation of small shifts in the norm.

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GS1-3 An aggregating approach of target enclosure of robot swarm

Masao KUBO[1], Hiroshi SATO[1], Akihiro Yamaguchi[2], Akira Namatame[1]
([1]National Defense Academy of Japan, Japan)
([2] Fukuoka Institute of Technology, Japan)

This paper presents a robot swarm model to enclose a target. The robots use information of the target and their neighbor information. In this paper, the robot observes the most robot dense direction as the neighbor information. We expect that this new approach makes the robot swarm more simple and robust for noisy environment. We confirm this model by computer simulations.

GS1-4 Probability of mixing up a nearest neighbor robot under target enclosure by robot swarm

Masao KUBO[1], Hiroshi SATO[1], Akihiro Yamaguchi[2], Akira Namatame[1]
([1]National Defense Academy of Japan, Japan)
([2]Fukuoka Institute of Technology, Japan)

This paper presents a robot swarm model to enclose a target. The robots use information of the target and their neighbor information. In this paper, the robot observes the most robot dense direction as the neighbor information. We expect that this new approach makes the robot swarm more simple and robust for noisy environment. We show a result of probabilistic analysis of this target enclosure approach.

GS2 Complexity

GS2-1 Interactive musical editing system to support human errors and offer personal preferences for an automatic piano

Kenji Tsunenari, Eiji Hayashi (Kyushu Institute of Technology, Japan)

Recently, electronic musical instruments are achieving progress for development of electronics and seen everywhere. However, their sound quality and ambience are inferior to real musical instruments. Therefore, we developed automatic piano by using grand piano. Pre-edit is needed to play music in the manner of a live pianist. In the case of piano music, there are often1000 or more notes in the score of even a short piece of music, requiring that an editor spend a huge amount of time to accurately simulate the emotionally expressive performance of a highly skilled pianist. Therefore, we have developed an interactive musical editing system that utilizes a database to edit music more efficiently.

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GS2-2 Modeling of collaboration in design process Based on Channel Theory

Patchanee Patitad, Hidetsugu Suto
(Muroran Institute of Technology, Japan)

Collaboration is one of the effective approaches that help us to share knowledge together and exchange ideas within a team member. Sometimes, new helpful knowledge that is not held by the members emerges as a result of the collaboration. Such knowledge often contributes to get prime solutions during collaboration process. However, the way to generate such new knowledge is implicit. In this paper, a method of creating a model, which represents effects of collaboration in design process is proposed. By using this scheme, we can illustrate what new knowledge can be gotten from a collaboration and we can know the effect of the collaboration.

GS2-3 Sterilizing system of ballast water using an arc discharge

Piao shengxu, Jae-cheol Lee, Zheng Tao, Heeje Kim
(Pusan National University, Korea)

The inadvertent transfer of harmful aquatic organisms and pathogens in the ballast water of ships has been determined to cause a significant adverse impact to all around the world coastal regions. The recognition of these effects has made the ballast management system that is extremely important for protection of the marine environment. Recently, in order to solve this issue, a number of technologies have been developed and commercialized. Most of the treatment technologies are barely used independently. In addition, there are several combined methods to treat the ballast water. the overall aim of this study is to suggest on of the best way of sterilization of ballast water using high voltage pulsed arc discharge.

GS2-4 The design of medical ruby laser power supply system using LLC resonant converter

Jaecheol Lee, Piao shengxu, Zheng Tao, Heeje Kim
(Pusan National University, Korea)

Because of its usability, the use of ruby laser for medical therapy has attracted a lot of interest. LLC resonant converter is used to control laser power density in ruby laser power supply. Zero voltage switching(ZVS) is implement to minimize switching loss by LLC resonant converter. The power supply of solid state laser consists of trigger, simmer and main power supply. In this paper, simmer mode triggering circuit is used. It has advantage of miniaturizing a circuit and getting stability of a circuit by disconnecting trigger power supply from main power supply. We use DAB(Dual Active Bridge) to charge the capacitor. We obtained maximum laser output of 0.5J. Repetition of laser out is 3Hz.

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GS3 Evolutionary comutation

GS3-1 Online Rule Updating System Using Evolutionary Computation for Managing Distributed Database

Wirarama Wedashwara, Shingo Mabu, Masanao Obayashi and Takashi Kuremoto
(Yamaguchi University, Japan)

Research proposed decision support of database clusters optimization using genetic network programming (GNP) with on-line rule based clustering. GNP optimize cluster quality by reanalyze weak point of each cluster and maintain rules definition that stored on each cluster. Maintenance of rules definition includes : 1) adds new relevant rules, 2) moves rules between cluster and 3) removes irrelevant rules. Research simulation focused to optimize cluster quality response against several data unbalanced data growth to the data-set that already mapped with storage rules. Simulation results of proposed method shows better result and much lower iteration time.

GS3-2 Reinforcement Learning with Symbiotic Relationships for Multiagent Environments

Shingo Mabu, Masanao Obayashi and Takashi Kuremoto
(Yamaguchi University, Japan)

Studies on multiagent systems have been widely studied and realized cooperative behaviors between agents, where many agents are working together to achieve their objectives. In this paper, a new reinforcement learning framework considering the concept of Symbiosis in order to represent complicated relationships between agents and analyze the emerging behavior. In addition, distributed state-action value tables are also used to efficiently solve the multiagent problems with large number of state-action pairs. From the simulation results, it is clarified that the proposed method shows better performance comparing to the conventional reinforcement learning without considering symbiosis.

Symbiotic relationships between agents

GS3-3 Development of a Dividual Model Using a Modular Neural Network for Human-Robot Interaction

Toshiyuki Tanaka and Kunikazu Kobayashi
(Aichi Prefectural University, Japan)

Currently, in the field of human-robot interaction (HRI), robots have a problem that can only interact the same at all times with humans in a stereotypical way. We, therefore, introduce the concept called a dividual, which is originally proposed by Japanese novelist Keiichiro Hirano to interact properly with another human. We use two machine learning techniques, i.e. a modular neural network and an actor-critic reinforcement learning method, to construct a model of the dividual to grow through interactions with others. Through computer simulations, we confirmed a process to form an appropriate individual-oriented dividual.

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GS4 Intelligent control

GS4-1 Design of 1/40 scale simulator to apply the Flying Touch Method in hot rolling process

Sung-jin Kim, Hyun-hee Kim, Min-cheol Lee
(Pusan National University)

In the hot rolling process, scratches are occurred on the surface of a slab because of its strong friction. One of the methods to solve this scratches problem of slab is proposed which is the flying touch hot rolling process. This paper is focused on how the flying touch method can be applied to the gap control between upper and under roll in hot rolling process. This paper also introduces that the simulator of 40:1 size miniature model for applying flying touch method is manufactured to evaluate a performance of the flying touch method. Furthermore, it is evaluated by the simulator how much the flying touch hot rolling process can reduce the scratch.

GS4-2 Improving Accuracy of Inertial Measurement Unit using Discrete Wavelet Transform

Jae-Hoon Jung, Dong-Hyuk Lee, Jang-Myung Lee
(Pusan National University, South Korea)

In this paper, using discrete wavelet transform in the way of noise removal, and wavelet analysis has been used to denoise a digital image corrupted by noise in the acquisition step. this study proposed to minimize noise caused by internal characteristics and external factors of inertial measurement unit. By resolution decomposition which is characteristics of discrete wavelet transform, the noise can be removed actively with applying threshold. Previous studies use Low-pass filter or moving average filter for removing noise. But these filters are corresponded unsuitably for the rapidly changing data. This correspondence cause distortion of the original signal and cause another error for removing noise. In order to compensate for these disadvantages, discrete wavelet transform is applied.

GS4-3 Outdoor Localization for Quad-rotor using Kalman Filter and Path Planning

Chen-Hu, Yo-Seop Hwang, Jang-Myung Lee
(Pusan National University, South Korea)

This paper proposes a new technique that produces the improved local information using low-cost GPS/INS system combined by Kalman filter and Path Planning when a Quad-rotor flies. Throughout the research, the low cost GPS is combined with INS by using the Kalman filter in order to improve local information. However, this system has certain some disadvantages. In order to deal with these disadvantages, the algorithm based on the path planning can be adopted. When the quad-rotor flies outdoor, it is possible to predict that its moving path is short, since all the short moving paths of the quad-rotor can be assumed to be straight. Through the foregoing process, an improved kind of local information can be obtained when the quad-rotor flies. Also, the performance of the proposed system can be verified based on the outdoor experiments.

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GS4-4 Distributed Terminal Backstepping Control for Multi-Agent Euler-Lagrange Systems

Seong-Ik Han, Yun-Ki Kim, Jang-Myung Lee
(Pusan National University, South Korea)

This paper presents a distributed terminal (finite-time) backstepping consensus control for multi-agent Euler-Lagrange systems. Terminal virtual error surfaces and virtual controls are proposed to guarantee the finite-time error consensus and formation convergence of a group of one-leader and multi-follower cooperative tracking Euler-Lagrange system. Finite-time stability including infinite-time stability was proved by the finite-time Lyapunov candidate function. Simulation example shows the effectiveness of the proposed finite-time backstepping coordinated tracking controller.

GS5 Neuromorphic Systems

GS5-1 Associative Memory with Class I and II Izhikevich Model

Yoshika Osawa, Takashi Kohno
(University of Tokyo, Japan)

In the nervous system, information processing is performed by electrical signals, spikes, transmitted between the neurons. Spiking neural network is a system that qualitatively reproduce this complex behavior. It was shown in previous researches that the performance of associative memory task in all-to-all connected networks is higher when they are composed of Class II neurons than Class I neurons. The Izhikevich model in its Class II mode, however, does not have this performance boost. In this study, we focus on Phase Resetting Curve (PRC) as an index that reflects neuronal properties related to neuron classes more in detail and examined the relation between the shape of PRC and performance of associative memory task.

GS5-2 Medical image recognition of heart regions by deep multi-layered GMDH-type neural network using principal component-regression analysis

Tadashi Kondo, Junji Ueno and Shoichiro Takao
(Tokushima University, Japan)

In this study, the deep multi-layered GMDH-type neural network algorithm using principal component-regression analysis is developed and applied to the medical image recognition of the heart regions. The multi-detector row CT (MDCT) images of the heart regions are used and the deep GMDH-type neural network architecture which has many hidden layers, is automatically organized from MDCT images of the heart regions so as to fit the complexity of the MDCT images of the heart regions. The deep GMDH-type neural network algorithm can automatically organize the deep neural network architectures so as to minimize the prediction error criterion defined as AIC or PSS.

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GS5-3 Deep feedback GMDH-type neural network using principal component-regression analysis and its application to medical image recognition of abdominal multi-organs

Tadashi Kondo, Junji Ueno and Shoichiro Takao
(Tokushima University, Japan)

The deep Group Method of Data Handling (GMDH)-type neural network algorithms were proposed in our early works and can automatically organize the deep neural network architectures with many hidden layers by using heuristic self-organization method which is a type of the evolutionary computation. In this study, deep feedback GMDH-type neural network algorithm is developed and applied to medical image recognition of the abdominal multi-organs such as the liver and spleen. The recognition results are compared with those obtained by the conventional sigmoid function neural network trained using the back propagation method.

GS5-4 Synchronized Response to Grayscale Image Inputs in the Chaotic Cellular Neural Network

Masayuki FUJIWARA[1], Akihiro YAMAGUCHI[1], Masao KUBO[2]
([1] Fukuoka Institute of Technology, Japan)
([2] National Defense Academy of Japan)

In this article, we study synchronized responses in the chaotic cellular neural network (Chaotic-CNN) for gray-scale visual stimulus. One fundamental goal of this study is to realize visual segmentation using chaotic neural synchronization. The Chaotic-CNN consists of chaotic spike response neurons that exhibits chaotic inter-spike intervals. Fig. 1 (a) is the gray-scale image pattern as visual stimulus. For this visual stimulus, a response of the Chaotic-CNN is numerically simulated. Then, the cross-correlation between one specific neuron that indicated by the arrow and others are calculated (Fig. 1 (b)). As shown in Fig. 1(b), high correlation is observed for the neurons in the direction of y axis and relatively lower correlation is observed for the others. Here, the neurons with the same input value form cell assembly for each input value. Each assembly is distinguished from the others in terms of cross-correlation. This result indicate a possibility of the visual segmentation using synchronized chaotic response.

Fig.1 (a) Grayscale visual stimulus

Fig.1 (b) Cross-correlation among neurons

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GS6 Poster Sessions

GS6-1 The construction of evaluation index system for graduate course

Ai Dongmei, Wen Jiawei, Ning Xiaojun
(University of Science and Technology Beijing, China)

Establishing the index system is the key to carry out the student assessment, evaluation of teaching largely quality depends on scientific index system. The related factors influencing the reliability and feasibility of teaching evaluation is analyzed in this article, and fair and scientific evaluation index system is established. Based on the summary of domestic and foreign existing evaluation index system, a set of new evaluation index system with our school teaching characteristics are established. Using the analytical hierarchy process to set up corresponding weights for each indicator, which makes the evaluation index system more complete and accurate.

$$A=\begin{pmatrix} 1 & a_{12} & \cdots & a_{1n} \\ a_{21} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \dots & 1 \end{pmatrix}=\begin{pmatrix} 1 & a_{12} & \cdots & a_{1n} \\ \frac{1}{a_{12}} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ \frac{1}{a_{1n}} & \frac{1}{a_{2n}} & \dots & 1 \end{pmatrix}$$

GS6-2 Extracting Pattern of Arm Movements based on EMG Signal for Stroke Therapy

Khairunizam Wan[1], Rashidah Suhaimi[1], Aswad A.R[1], D. Hazry[2], Zuradzman M. Razlan[2], Shahriman AB[2], Mohd Asri Ariffin[3] and Haslina M[3]
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([3]Universiti Sains Malaysia, MALAYSIA)

This paper presents the investigation pattern of arm movements for the purpose of the rehabilitation for a stroke patient in the virtual reality (VR) environments. The investigation results are used to design the virtual objects in the virtual environments. The muscle activities are analyzed by using electromyography (EMG). Six EMG channel are attached to the right arm of the subject, which is at the location of deltoid anterior fibers, deltoid middle fibers, bicep, triceps, flexor and extensor while performing arm movements. The electrical signals acquired from EMG are analyzed to extract the signal's pattern by using signal processing technique. In the studies, several fundamental arm movements are performed by the subject and the acquired patterns of EMG signals are defined as muscle activities. The experimental results show that deltoid, bicep and triceps move with a significant value compared with flexor and extensor and are used to investigate the muscle activities, which is suitable to the stroke therapy.

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GS6-3 Cascade Controller Design for Steering Control of Nonholonomic Autonomous Mobile Robot Vehicle

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([2]Hamdard University, Pakistan)

In this research article the cascade control system is presented for steering control of control of nonholonomic autonomous mobile robot vehicle. The propose system consist of a master controller and two slave controllers. The master controller is based on Fuzzy Logic Controller (FLC) which computes the required speed and angular speed needed by the two motors to drives the robot. Fuzzy logic is used to generate target trajectory movement. The two slave controllers are Proportional+Integral+Derivative (PID) controllers which ensured the desired speeds that needed for the both DC motors. PID controller parameters were tuned according to four ranges of speeds using model based tuning method. In addition, the control law is offered to select a suitable rule base for fuzzy controller in order to ensure the system is stable. The proposed cascaded controller is implemented on a nonholonomic mobile robot and the results have shown that, the proposed controller achieved the desired turning angle and the mobile robot tracks the target efficiently.

GS6-4 Research on Iris Recognition Based on the BP Neural Network

Fengzhi DAI, Li FAN, Chunyu YU, Bo LIU

Iris recognition is the high confidence personal identification technology among the other biometrics recognition. This is not only because the iris's unique feature, but also due to its stability that the iris is immune to age and environment. In this paper, we design a feed forward neural network and use the back propagation algorithm to explore an elementary iris recognition system model. Ten iris samples that were pre-processed in a simple methodology are used as the recognition objects. Finally, the experiment demonstrates that though the recognition model is simply constructed, it has a high recognition rate and the recognition speed is reasonable. The proposed method provides a convenient way for iris recognition.

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GS6-5 Synchronization Control of a Four-wing Fractional-Order Chaotic System and Its Analog Circuit Design

Hongyan Jia, Qian Tao, Jinfang Li, Wei Xue
(Tianjin University of Science & technology, PR China)

The four-wing fractional-order chaotic system is firstly introduced in this paper, and the state trajectories are given by using frequency domain approximate method . Then, a chaotic synchronization control of the four-wing fractional-order systems is also discussed, which is constructed by master-slave configuration with linear coupling. Simulation results are shown to verify the effectiveness of the proposed synchronization control. and the results from numerical analysis also show the chaotic synchronization control reported in the paper is simple and practical. An last, an analog circuit is designed to implement the synchronization control of the four-wing fractional-order system, and the results of circuit simulation are in agreement with those of numerical analysis, which probably provide an practical technology for application of fractional-order chaos , such as secure communication and image encryption.

GS6-6 A fractional-order hyper-chaotic system and its circuit implementation

Wei Xue, Hui Xiao, Jinkang Xu, Hongyan Jia
(Tianjin University of Science and Technology, PR China)

In this paper, the commensurate 3.6-order Qi hyper-chaotic system is investigated. Based on the predictor-corrector method, we obtain phase portraits, bifurcation diagrams, Lyapunov exponent spectra of the fractional-order system, and find that a four-wing hyper-chaotic attractor exists in the system when the system parameters change within certain ranges. On this basis, an analog circuit is designed to implement the fractional order hyper-chaotic system by using the method of approximation conversion from time domain to frequency domain, which verifies that the hyper-chaotic characteristic indeed exists in the fractional-order hyper-chaotic system on the physical level, and thus provides the technical basis for further application of the fractional-order hyper-chaotic system in engineering.

GS6-7 Research on Early Crop Monitoring Using Photosynthetic Production Index in China

Fengzhi DAI[1], Li FAN[1], Daijiro KANEKO, Nozomu HIROSE, Chunyu YU[1]
([1]Tianjin University of Science & technology, China)

On the condition that there is great pressure on population growth and water resources shortage in China, aiming to monitor the early stage of crop growth, this paper presents a photosynthesis-based monitoring model for grain production. Not only the normalized difference vegetation index and elements such as the growing degree day are considered, the factors of sunshine and the cost of water resource are also considered in the model. Combined the meteorological data with the vegetation index that is adopted from remote-sensing, the model contains the elements of solar radiation, effective air temperature, vegetation biomass, stomatal opening, water stress, and the influence of temperature on grain plants, such as low-temperature sterility and high-temperature injury.

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GS6-8 Design and Implementation of Motor Test System based on Virtual Instrument

Yulong Xia [1] , Huailin Zhao[1], Jihong Zhu[2] and Yang He[2]
([1] Shanghai Institute of Technology, China)
([2] Tsinghua University, China)

Most of the existing motor test systems based on the general computer with windows multimedia clock have problems of inaccurate timing and poor real-time capacity. A new motor test system is developed for improving the above problems and testing more motors simultaneously by serial communication with high baud rate. The test system software applys LabVIEW developping platform and is developped with the idea of the software engineering which makes each module functionally independent and improves the system reliability. Simultaneously the test system takes advantage of the characteristics of LabVIEW to complete relative accurate timing tasks and achieve excellent portability. To its communication, a professional serial port circuit is applied to support the high baud rate and bus connection. The experiment shows that the system is not only reliable, easy to operate, high availability and low test cost, but also satisfactory to the practical test.

GS6-9 Consensus Problem of Distributed Multi-agent System

Huailin Zhao[1], Wei Ren[2], Masanori Sugisaka[3]
([1]Shanghai Institute of Technology, China)
([2] UCR, USA)
([3]. Alife Robotics Corperation LTD, Japan)

This paper introduces the basic concept about the consensus of the distributed multi-agent systems. To a group of autonomous vehicles which are distributed, the consensus problem is the basic one in cooperative control to the multi-agent system. It disscusses the problem based on the different conditions including the stochastic network toplogy, complex dynamic system, time delay effect, and the other ones. It gives the main research topics and some research achievements.

GS6-10 Dingle's Model-based EEG Peak Detection using a Rule-based Classifier

[1]Asrul Adam, [2]Zuwairie Ibrahim,[1]Norrima Mohktar,[3]Mohd Ibrahim Shapiai and [1]Marizan Mubin
([1]University of Malaya, Malaysia)
([2]Universiti Malaysia Pahang, Malaysia)
([3]Universiti Teknologi Malaysia, Malaysia),

The employment of peak detection algorithm is prominent in several clinical applications such as diagnosis and treatment of epilepsy patients, assisting to determine patient syndrome, and guiding paralyzed patients to manage some devices. In this study, the performances of four different peak models of time domain approach which are Dumpala's, Acir's, Liu's, and Dingle's peak models are evaluated for EEG signal peak detection algorithm. The algorithm is developed into three stages: peak candidate detection, feature extraction, and classification. Rule-based classifier with an estimation technique based on particle swarm optimization (PSO) is employed in the classification stage. The evaluation result shows that the best peak model is Dingle's peak model with the highest test performance is 88.78%.

EEG Signal Peak Detection Algorithm

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GS6-11 Different Learning Functions for Weighted Kernel Regression in Solving Small Sample Problem with Noise

Zuwairie Ibrahim[1], Nurul Wahidah Arshad[1], Mohd Ibrahim Shapiai[2], Norrima Mokhtar[3]
([1] Universiti Malaysia Pahang, Malaysia)
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([3] University of Malaya, Malaysia)

Previously, weighted kernel regression (WKR) for solving small samples problem has been reported. In the original WKR, the simple iterative learning technique and the formulated learning function in estimating weight parameters are designed only to solve non-noisy and small training samples problem. In this study, an extension of WKR in solving noisy and small training samples is investigated. The objective of the investigation is to extend the capability and effectiveness of WKR when solving various problems. Therefore, four new learning functions are proposed for estimating weight parameters. In general, the formulated learning functions are added with a regularization term instead of error term only as in the existing WKR. However, one free parameter associated to the regularization term has firstly to be predefined. Hence, a simple cross-validation technique is introduced to estimate this free parameter value. The improvement, in terms of the prediction accuracy as compared to existing WKR is presented through a series of experiments.

GS6-12 Simultaneous Computation of Model Order and Parameter Estimation of a Heating System Based on Particle Swarm Optimization for Autoregressive with Exogenous Model : An Analysis

Teoh Shin Yee[1], Zuwairie Ibrahim[1], Kamil Zakwan Mohd Azmi[1], Norrima Mokhtar[2]
([1]Universiti Malaysia Pahang, Malaysia),
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System identification is one of the method for solving a mathematical model of a system by performing on analysis only at its input and output behaviour. In system identification, the procedure of modelling the system is separated into four main parts. The first part is constructing an experiment to collect the input and output data of the system. Then, with some criteria, the model order and structure are selected. The next part is to estimate the parameters of the model. For the final part, the mathematical model is verified. Model order selection and parameter estimation are two important parts of finding the mathematical model for system identification. Previously, a technique called simultaneous model order and parameter estimation (SMOPE), which is based on Particle Swarm Optimisation (PSO) and ARX model, has been introduced to combine these two parts simultaneously. This technique, however, exclude the error term of ARX model. In this study, an analysis is shown to prove that the performance of SMOPE based on PSO and ARX model degraded as the magnitude of error increases.

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GS6-13 Maximum Probability Algorithm for Fault Diagnosis

Fengzhi DAI, Li FAN, Bo LIU
(Tianjin University of Science & technology, China)

This paper considers the fault diagnosis by outside fault phenomena.The method only depends on experience and statistical data to set up the fuzzy query relationship between the outside phenomena (fault characters) and the fault sources (fault patterns). From this relationship, the most probable fault sources can be located, and the standard fuzzy relationship matrix is stored as database.

ω_{ir}	X_0^i			
	x_{i1}	x_{i2}	…	x_{ip}
A_1	ω_{11}	ω_{12}	…	ω_{1p}
A_2	ω_{21}	ω_{22}	…	ω_{2p}
:	:	:	:	:
A_i	ω_{i1}	ω_{i2}	…	ω_{ip}
:	:	:	:	:
A_n	ω_{n1}	ω_{n2}	…	ω_{np}

GS6-14 The Fractional Order Hyperchaotic Generalized Augmented Lü System and its Circuit Implementation

Wei Xue, Jinkang Xu, Hongyan Jia
(Tianjin University of Science and Technology, PR China)

In this paper, a commensurate fractional-order hyperchaotic generalized augmented Lü system is investigated. we analyze its chaotic characteristics by drawing phase portraits, Poincaré maps, Lyapunov exponent spectra and power spectrum, and find that the system can present a four-wing hyperchaotic attractor. In addition, a circuit is designed for this system and the circuit implementation result show the existence of the four-wing hyperchaotic attractor, which verifies the correct of the theoretic analysis and provides the support for its application in engineering.

GS7 Pattern Recognition

GS7-1 Fast motion detection based on cross correlation

Panca Mudjirahardjo, Joo Kooi Tan, Hyoungseop Kim and Seiji Ishikawa
(Kyushu Institute of Technology)

Abstract: We present a fast motion detection as an abnormal motion based on cross correlation. Since the camera view is not in perpendicular with motion direction, the velocity of motion is not uniform spatially. Instead of object detection directly, we separate an image into several blocks. We calculate the cross correlation of the pixel intensity series in these blocks between current and previous frame. The maximum correlation is achieved at a certain delay. This delay shows a shift of a similar pattern between the current and previous frame. To localize the abnormal motion, we employ hierarchical block size. The performance of the proposed method is experimentally shown.

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GS7-2 Detecting moving objects on a video having a dynamic background

FX Arinto Setyawan, Joo Kooi Tan, Hyoungseop Kim, Seiji Ishikawa
(Kyushu Institute of Technology, Japan)

This paper proposes a method of detecting moving objects in a video having a dynamic background using a method which infers the background sequentially. The proposed method performs the update of the pixel values in the background which are influenced by the value of the current pixel. The aim is to cope with changes in the value of the pixels in the background caused by the movement of the background objects such as the leaves swaying on trees, the water droplets of the rain or the change in light intensity according to the time lapse. The performance of the proposed method is shown experimentally using the video taken on a rainy and windy day.

GS7-3 Study on the Target Recognition and Location Technology of industrial Sorting Robot based on Machine Vision

Jiwu Wang[1], Xianwen Zhang[1], Huazhe Dou[1], Sugisaka Masanori [2]
([1]Beijing Jiaotong University)
([2]Alife Robotics Corporation Ltd, Japan and Open University, United Kingdom)

In order to improve the applications for an industrial sorting robot, it is necessary to increase its flexibility and control accuracy. The prerequisite is to automatically extract the multiple target positions accurately and robustly. The machine vision technology is an effective solution. Here an industrial robot arm is designed and set up for experiment simulation with machine vision. In order to reduce the influence of the size, deformation, and lighting etc., the target recognition and location method with fusion of scale invariant feature transform (SIFT) and moment invariants is developed. The experiments results showed that the developed image processing algorithms are robust, and the flexibility of the industrial robot can be improved by machine vision.

Fig.5 Illustration on the target positioning

GS8 Robotics I

GS8-1 Production effects by form changes of autonomous decentralized FMSs with mind

Kakeru Yokoi, Hidehiko Yamamoto, and Takayoshi Yamada
(Gifu University, Japan)

An autonomous decentralized FMS does not have a management mechanism to control the entire factory and avoid the route interference of automatic guided vehicles (AGVs). This research aims to develop an autonomous decentralized FMS and focus on the development of the behavior control of AGVs to avoid the route interference, inspired by human mind; To express the mind, we propose the Minimum Unit of Mind (MUM) which has been used to simulate the production line in order to switching between arrogant and humble mind of AGVs. The result of simulation has shown it is possible to avoid the AGVs collisions. We examined the production line by applying different conditions such as changing the number of machining centers, AGVs and the position of products' warehouse.

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GS8-2 Development of an autonomous-drive personal robot "Improve the accuracy of object area determination by boundary detection"

Mikiko Hirai, Eiji Hayashi
(Kyusyu Institute of Technology, Japan)

In the near future, autonomous self-driving robots are expected to provide various services in human living environments. The ability to work autonomously and accurately recognize surrounding objects are required for the autonomous robot. In previous research, the robot has enabled the recognition of the single object by the form, color, and the local characteristic of the object. In this paper, we present the system in the robot that enable to detect the single object area from plural objects in the camera image by using the function of the camera.

GS8-3 Construction of a supermicro sense of force feedback and vision for micro-objects: development of a haptic device

Yusei Ishii, Eiji Hayashi
(Kyushu Institute of Technology, Japan)

Recently, the technologies that can accurately perform minute work are now being sought for both medical treatments and in the field of manufacturing semiconductors. Such minute work is improved by using the micromanipulators, but their operation is difficult because the operator has no sense of force; he relies only on sight through microscope. As a result, a person skilled in the use of this technology is needed for all minute work. It is thought that the efficiency of minute work would be improved if the operator could obtain a sense of force while using a manipulator. We made and controlled the haptic device which shows the reaction force to the operator.

GS8-4 Error Recovery of Pick-and-Place Tasks in Consideration of Reusability of Planning

Akira Nakamura, Kazuyuki Nagata, Kensuke Harada and Natsuki Yamanobe
(National Institute of Advanced Industrial Science and Technology (AIST), Japan)

In manipulation tasks of complicated plant maintenance and industrial production, error recovery is an important research theme for robots that need to perform actual tasks. We have proposed error recovery using the concepts of both task stratification and error classification. Programming of error recovery will be simplified if the same planning can be used in many recovery paths. In this paper, reusability of planning in error recovery is verified by using pick-and-place tasks which are used frequently in plant maintenance and industrial production.

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GS8-5 Design of Sliding Mode Controller for Droplet Position in EWOD Microfluidic System

Thunyaseth Sethaput (Thammasat University, Thailand),
Arsit Boonyaprapasorn (Chulachomkloa Royal Military Academy,Thailand)

In microfluidic lab-on-chip devices, electrowetting on dielectric (EWOD) are widely used for various applications. To manipulate the micro droplet to achieve the desired path and accurate target position by using electrowetting technique are one of the common applications. In this paper, the motion of droplet is modeled as a single rigid body driven by both linear and nonlinear forces. In order to evaluate the potential of controller, the sliding mode controller is applied to this nonlinear microfluidic system. The effect of bounded disturbances is included in the designed controller. Simulation results provided the feasibility of the sliding mode controller for EWOD microfluidic manipulation under the effect of bounded disturbances.

The micro droplet motion on the EWOD plate.

GS9(5) Robotics Ⅱ

GS9-1 Mechanism Designs for Bio-inspired Flapping Wing Robots

Palakorn Tantrakool, Eakkachai Pengwang
(King Mongkut's University of Technology Thonburi, Thailand)

This paper presents the design of flapping systems for small air vehicle used in surveillance and surveying robot for an area that is hard to access. This paper also focuses on flapping mechanism of micro unmanned aerial robots that are similar to birds and insects. Our design consideration will have a wingspan up to 15 centimeters and a capability to hover. Enable technologies for fabrication of these designs are Computer-aided design (CAD) and 3D printers by using polymer materials with low density and weight. These structures are also connected by carbon rods for creating a crank-rocker mechanism. Characterizations of flapping wings are simulated and examined in this paper. With an external microcontroller board and power supply, this micro flapping wing robot will be tested and performed in real environments.

GS9-2 Effective rocking motion for inducing sleep in adults – Verification of effect of mother's embrace and rocking motion –

Keishi Ashida, Yoshifumi Morita (Nagoya Institute of Technology, RIKEN-RSC, Japan)
Ryojun Ikeura (Mie University, RIKEN-RSC, Japan)
Kiyoko Yokoyama (Nagoya City University, RIKEN-RSC, Japan)
Ming Ding, Yuki Mori (RIKEN-RSC)

The final goal of this research is to develop a relaxation machine for reducing stress and inducing sleep by using a rocking vibration. In our previous work, we measured the mother's embrace and rocking motion, constructed two types of the mother's rocking motion and developed an excitation apparatus simulating the mother's rocking motions. In this paper, we investigated the most effective rocking motion for inducing sleep in adults. We prepared ten types of rocking motion including two types of mother's rocking motions. The sleep-inducing effect of all the rocking motions was evaluated using Thurstone's paired comparison method (Case V). From statistical analysis of the subjective experimental results we found that, of the ten types of rocking motions, the linear motion component of a mother's rocking motions (Type 2) was the most effective for inducing sleep in adults.

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GS9-3 Postural Sway Response to Local Vibratory Stimulation in Young, Middle-aged and Elderly People in Standing Position

Ayaka Yamada, Eishi Nakamura, Noritaka Sato, Yoshifumi Morita
(Nagoya Institute of Technology, Japan)
Tadashi Ito, Yoshihito Sakai (National Center for Geriatrics and Gerontrogy, Japan)
Kazunori Yamazaki (Fujita Health University, Japan)

The final goal of this research is to develop a treatment system for proprioception for recovery of low back pain and fall prevention. In this paper, we investigated the postural sway response to local vibratory stimulation in young, middle-aged and elderly people in the standing position. For this purpose, we developed a variable-frequency vibratory stimulation device and measured the postural sway response using a gravicorder when the vibratory stimulations of 30, 60, 150, or 240 Hz were applied to the subjects' lumbar multifidus or gastrocnemius muscles. Moreover, we evaluated the postural sway using the anterior movement of CoP and the relative proprioceptive weighting (RPW) ratio. As a result, when the vibratory stimulation was applied to the gastrocnemius muscles, the CoP moves backward in all subject groups. It was seen in all cases of the vibration frequencies. It was found from the results for the RPW ratios that elderly people with low back pain performed balance control using their trunk more than their lower legs when vibratory stimulation with higher vibration frequency was applied.

GS9-4 Development of Unmanned Transport System for automated systems

Hyunhak Cho, Jungwon Yu, Yeongsang Jeong, Hansoo Lee, Sungshin Kim
(Pusan National University, Korea)

is paper introduces application and composition of the unmanned transport systems in industry to the transport, and describes the selected method by the environment conditions. Unmanned transport system is comprised of an AGV (Automatic Guidance Vehicle) and a Monitoring system. The applied AGV is guided by a laser navigation guidance system with encoders and gyroscope and AGV require a virtual driving path method with map information from conveyor positions and rotation points in an environment. The monitoring system is composed of the main monitoring system and sub monitoring system. The role of the main monitoring system is communication with other equipment; transmission/receipt of order commands with the AGV, and Sub Monitoring system, and the role of the sub monitoring system is the confirmation of the state. The proposed application case was reported in video.

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GS9-5 Localization method for AGV using magnetic devices and IMU

Moonho Park, EunKyeong Kim, Yeongsang Jeong, Hansoo Lee, Jungwon Yu, Sungshin Kim
(Pusan National University, Korea)

This paper is a research of the localization method for AGV(Automonous Guided Vehicle) with a guidance system using magnetic localization devices. For navigation of AGV, an established magnetic guidance AGV detects a magnetic tape and follows the line. However, there are some weaknesses: disturbance and damage. To make up for the weak points, this paper proposed the localization method using two magnetic localization devices, a gyro sensor and encoders. In order to compensate global position, AGV's location and angle were compensated for a magnet position and gradient information using two magnetic localization devices. Between spot points, a relative position was calculated by kinematics with the devices. To verify the performance of the proposed method, it was compared with the method using a gyro sensor and encoders. As a result, the proposed method is more efficient than the existing one.

GS10 Robotics Ⅲ

GS10-1 On the Effects of Epigenetic Programming on the Efficiency of Incremental Evolution of the Simulated Khepera Robot

Yasuto Nishiwaki , Ivan Tanev and Katsunori Shimohara
(University of Doshisha, Japan)

e objective of this study is to develop an approach of Epigenetic Programming (EP) and to verify the feasibility of incorporating histones in genotype from both a computational and natural perspectives. In EP, we introduce histones as genetic ON and OFF “switches” that modify the gene expression by activating and deactivating the nodes in the tree representations (i.e., the “genotype”) of the controllers of simulated floor-cleaning Khepera robot, evolved via Genetic Programming (GP). We hypothesize that at the first stage of GP, when we evolve basic moving and cleaning abilities, histones inactivate genotypic areas that could be used during the second stage of evolution as a playground to evolve the novel obstacle-avoiding capabilities without damaging the already evolved basic abilities of the robot.

GS10-2 The Effect of Duration of Both Stages of Incremental Genetic Programming on its Efficiency of Evolution of Snakebot

N. Mukosaka, I. Tanev, K. Shimohara (Doshisha University, Japan)

The objective of our work is to investigate the optimal combination of durations of both stages of incremental Genetic Programming (IncGP) on the simulated Snake-like robots (Snakebots). In proposed IncGP we first evolve the bot in smooth terrain, and then evolve a population, partially seeded with these bots, in a challenging terrain. We experimented with various combinations of durations of both stages of IncGP, while fixing the total number of evolved generations. The obtained results suggest that neither the number of generations nor the obtained fitness value at the first stage of IncGP can be used as criteria for separating the two stages of IncGP. We hypothesized that another, qualitative criterion, such as the emergence of smooth sidewinding locomotion could be used instead, and conducted additional experiments that proved its worthiness.

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GS10-3 Design of an effective shoulder joint mechanism for an upper-limb exoskeleton robot

Masahito Akiyama, Kazuo Kiguchi
(Kyushu University, Japan)

This paper proposes an effective shoulder joint mechanism for an upper-limb exoskeleton robot. A power-assist robot for human is regarded as one of the most promising machines which can assist labors in a heavy physical work, rehabilitation and so on. Human glenohumeral joint moves in 3-dimention in accordance with the movement of the upper-limb such as the shoulder flexion/extension and abduction/adduction motion. It makes the exoskeleton's shoulder mechanism complicated. In order to reduce the difference between the human glenohumeral joint position and the exoskeleton shoulder joint position, we propose a passive compensation mechanism which consists of links and sliders. This mechanism can imitate the movement of human glenohumeral joint without additional motors.

GS10-4 A Machine Learning Approach to a Lateral Continuous Force Estimation for a Walking Biped Robot

Yeoun-Jae Kim, Jun-Yong Lee and Ju-Jang Lee (KAIST, Korea)
e-mail addresses

In this paper, a regressor for determining a lateral external continuous force applied upon a walking biped robot is investigated and verified by a numerical simulation. A pre-defined walking gait of a biped robot is constructed by the Tchebyshev method. And a continuous force-action classifier is generated. It determines whether the lateral external force is a continuous force or not. A regressor which estimates a lateral external continuous force acted upon a walking biped robot is constructed by SVR(Support Vector Regressor). The regressor is verified by a numerical simulation. We assumed that only lateral force is applied upon the COG(Center of Gravity) of the walking biped robot.

GS10-5 The Improvement of Robust Robot SLAM Algorithm Based on Sensor Fusion

Jiwu Wang[1], Shunkai Zheng[1], Fangbo Liao[1], Sugisaka Masanori [2]
([1]Beijing Jiaotong University)
([2]Alife Robotics Corporation Ltd, Japan and Open University, United Kingdom)

The Kinematic model of the robot is a very important part in SLAM, It's error model will influence the positioning accuracy of robot and map building. Generally, the motion model relies simply on the data from encoder feedback. Due to cumulative error, the robot pose accuracy is relatively poor by mileage positioning with encoder. Here a new method is put forward based on data fusion of gyro sensor with the encoder data, and the robot pose accuracy is analyzed and improved. Then using the optimization Kinematic model on SLAM to verify the robustness.

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