

[Program at a Glance]

Nov 4, Wednesday - Nov 5. Thursday

Wednesday, 4 NOV	
18:00-20:00	Welcome Reception @ Shangria Beach Hotel

Thursday, 5 NOV						
	Room 501	Room 502	Room 503	Room 504	Room 505	Room 506
	T1a	T1b	T1c	T1d	T1e	T1f
9:00-10:30	Applications of Intelligent Technology	Complex Systems, Economics, Geopolitics	Advanced and Convergence Technologies	Robot Service Architecture and Its Applications	Intelligent Systems for People with Disabilities	Intelligent Data Analysis and Application
10:30-10:40	Tea Break					
10:40-11:10	Special Talk, Prof. Kaoru Hirota @ 1 st Floor					
11:10-11:20	Tea Break					
11:20-11:40	Opening Ceremony @ 1st Floor					
11:40-12:30	Plenary Lecture-I, Prof. Michico Sugeno @ 1 st Floor					
12:30-14:00	Lunch					
	T3a	T3b	T3c	T3d	T3e	T3f
14:00-15:30	Applications of Intelligent Systems	Big Data Analysis for Intellectual Property-R&D (IP-R&D)	Advanced Network Technology and Its Application	Intelligent Diagnosis Technique in Heavy Chemical Equipment Plant	Smart City and Big Data	Invited Talk 2 Prof. Shun-Feng Su Invited Talk 3 Prof. Masafumi Hagiwara
15:30-15:40	Tea Break					
15:40-16:30	Plenary Lecture-II, Prof. Takeshi Yamakawa @ 1st Floor					
16:30-16:40	Tea Break					
	T5a	T5b	T5c	T5d	T5e	T5f
16:40-18:00	Statistical Prediction Model with Fuzzy Data	Intelligent Systems for Automation and Logistics	Emerging Pattern Classification Techniques	Bio and Brain Computing	Soft Intelligent SoC	Novel Media in Ubiquitous VR

Nov 6, Friday – Nov 7, Saturday

Friday, 6 NOV						
	Room 501	Room 502	Room 503	Room 504	Room 505	Room 506
9:30-11:00	F1a Neural Networks & its Applications	F1b Data Mining & its Applications	F1c Artificial Intelligence & Knowledge Engineering	F1d Big Data Analysis & Learning System	F1e Information Fusion & Decision Making	F1f Invited Talk 4 Prof. Takahiro Yamanoi
11:00-11:20	Tea Break					
11:20-12:30	F2p @ 1st Floor Poster Session					F2f Invited Talk 5 Prof. Sungshin Kim
12:30-14:00	Lunch					Future Planning Committee Meeting
14:00-15:30	F3a Neural Networks, Fuzzy, and Genetic/Evolutionary Algorithms	F3b Machine Learning	F3c Vision and Sensors & Applications I	F3d Vision and Sensors & Applications II	F3e Intelligent Robotics	F3f Invited Talk 6 Dr. Valentin Todorov
15:30-15:40	Tea Break					
15:40-16:30	Plenary Lecture-III, Prof. Daniel Lee @ 1st Floor					
16:30-16:40	Tea Break					
16:40-18:00	F5a Rough Set and Granular Computing: Theoretical Aspects and Applications	F5b Computational Intelligence	F5c HCI (Human-Computer Interaction)	F5d Rehabilitation and Therapeutic Robot	F5e KITECH Project Symposium	F5f Advancement of Intelligent Systems & Cool Systems
19:00-20:30	Banquet @ Shangria Beach Hotel					
Saturday, 7 NOV						
9:00-15:00	Cultural Tour, Departure @ Shangria Beach Hotel					

[Technical Program Details and Paper Abstracts]

Thursday, 5 November

T1a / Rm #501 / Applications of Intelligent Technology

09:00-10:30 Chairs : C.W. Tao, National Ilan University, Tiwan

Shun-Fung Su, National Ilan University, Tiwan

T1a-1 09:00-09:15

Development and Control of a Novel Pneumatic Muscle Active Suspension System

I-Hsum Li, Lian-Wang Lee, Chen-Chia Chuang and Shun-Feng Su

LeeMing Institute of Technology, Lunghwa University of Science and Technology, National Ilan University, National Taiwan University of Science and Technology, Taiwan

In order to reduce vibration and to increase performance for vehicles, a pneumatic muscle actuator (PMA) was integrated with an active vehicle suspension system (VSS) in this paper. The dynamic of the VSS is usually complexity, causing high dynamic variation. In the aspect of controller design, therefore, a grey-prediction algorithm was first applied to predict states of next sampling time, and the predicted states were then used in the proposed interval type-2 adaptive fuzzy controller; that is, the car vibration could be significantly reduced. The proposed the grey-prediction interval type-2 adaptive fuzzy controller (GP-IT2AFC) was implemented in a self-made quarter-car active vehicle suspension system, and the experimental results showed that the built active vehicle system has good performance in vibration reduction.

T1a-2 09:15-09:30

A Modified Hierarchical Fuzzy Logic Algorithm

Chia-Wen Chang, Yi-Chen Huang, and C.W. Tao

Ming-Chuan University, Nation Ilan University, Taiwan

This paper aims to propose a modified hierarchical fuzzy logic algorithm. Although the fuzzy logic controller (FLC) can be utilized to control a complex nonlinear system, the FLC has a well-known problem that rules increase exponentially with the number of variables increases. To cope with this rule-explosion problem, a common strategy is to hierarchically decompose the control problem into a number of low-dimensional fuzzy systems. In this paper, a simplified defuzzification-fuzzification algorithm is proposed to instead of the processes of defuzzification and fuzzification in conventional hierarchical system. Based on the proposed algorithm, the middle-layer FLC in the hierarchical structure need only an inference engine and the fuzzifier and defuzzifier can be eliminated. From simulation results, it can be seen that the feasibility of the modified hierarchical fuzzy logic algorithm can be ensured.

T1a-3 09:30-09:45

Rough Interval Possibilistic C-means Clustering Algorithm

Sheng-Chieh Chang, Jin-Tsong Jeng, Kuang-Yang Kou and Chen-Chia Chuang

National Chung-Shan Institute of Science and Technology, National Formosa University, National Central Police University, National Ilan University, Taiwan

In general, possibilistic c-means (PCM) clustering algorithm has been shown that it has advantageous over fuzzy c-means (FCM) clustering algorithm with outlier. For the engineering applications, outlier may occur due to various reasons, such as erroneous measurements or noisy data from the tail of noise distribution functions. It means that an observation which deviates so much from other observations as to arouse suspicions. However, the PCM clustering algorithm cannot to deal with symbolic data with outlier. Besides, the interval

fuzzy c-means (IFCM) clustering method was proposed to deal with symbolic interval data. However, it still has outlier problems. Hence, we proposed interval PCM with Euclidean distance measure (IPCME) clustering algorithm to deal with symbolic data with outlier. Besides, in order to enhance IPCME clustering algorithm we proposed another rough IPCM with Euclidean distance measure (RIPCME) clustering algorithm that is combine rough set with IPCME. From the results of simulation shows that the proposed RIPCME clustering algorithm has better performance than IFCM and IPCME on symbolic data analysis.

T1a-4 09:45-10:00

A Taguchi-Based Evolutionary Artificial Immune System for Optimal Locomotion Control of Holonomic Mobile Robots

Hsu-Chih Huang and Chih-Hao Chiang

National Ilan University, Taiwan

This paper presents an evolutionary approach of Taguchi method and artificial immune system (TAIS) swarm intelligence to locomotion control of holonomic mobile robots. Simulation result is conducted to show the merit of the proposed methods.

T1a-5 10:00-10:15

Bipedal Robot Standing Posture Balance Control under Disturbance

Yun-Han Lee, Bing-Gang Jhong, and Mei-Yung Chen

National Taiwan Normal University, Taiwan

To stand up successfully, the balance control for falling prevention of the bipedal robot upright posture is the prime consideration of motion control. If the instantaneous capture point exceeds the boundary of the center of pressure, it switches to the hip strategy derived from the LIPFM to get push recovery. The values of the ankle joint and hip joint are derived from the approach of virtual model control. The paper focuses on robot standing balance control and demonstrates the experimental result by applying Solidworks and SimMechanics module of Simulink toolkit of Matlab. It shortens the time to build the virtual model for simulation and the result is more visualized.

Thursday, 5 November

T1b / Rm #502 / Complex Systems, Economics, Geopolitics

09:00-10:30 Chairs : Grigoriy Mun, Al-Farabi Kazakh National University, Kazakhstan

Jin Hee Yoon, Sejong University, Korea

T1b-1 09:00-09:15

The main problem of geopolitics in terms of information theory

I.E. Suleimenov I.E., O.A. Gabrielyan, S.V. Panchenko

Al-Farabi Kazakh National University, Kazakhstan

Prolegomena to the interpretation of a subject field of geopolitics in terms of the information theory is offered. The hypothesis according to which complication of system of any nature brings to emergence of some information structure formed by communications between its elements which as a first approximation can be considered as analog of a neural network, complementary to complex system is stated. The assumption according to which this information structure gains properties of the internal macroscopic regulator of complex system substantiates. Importance of considering such macroscopic regulators in relation to the analysis of ethnos as a complex system, generated and structured by a concrete natural language is justified.

T1b-2 09:15-09:30

The problem of regulation the quality of education in the post-Soviet period

P.V. Obukhova, Zh.-P.Gishar, O.A. Gabrielyan, S.V. Panchenko, G.A.Mun

Almaty University of Power Engineering and Telecommunications, Al-Farabi Kazakh National University, Kazakhstan

State University of Nice, France

Crimean Federal University, Russia

Birmingham University, UK

It is shown that the low productivity of capital in the field of science and education post-Soviet states is largely due to the specific post-transition crisis associated with the inertia of the mass consciousness, assimilated stereotypes in the transition from a planned to a market economy. It was found that crises of this kind lead to low efficiency of typical financial instruments used to manage innovation activity. It is shown that the successful use of these tools should be supplemented by means based on the approaches of institutional economics. We consider a specific example of the use of such tools.

T1b-3 09:30-09:45

Irreversible phase transitions in complex systems

I.E. Suleimenov I.E., S.V. Panchenko, O.A. Gabrielyan

Almaty University of Power Engineering and Telecommunications, Kazakhstan

Al-Farabi Kazakh National University, Kazakhstan

Crimean Federal University, Russia

In approach of an average field the model evolving systems are considered. It is shown that in such systems spasmodic phase transitions can be observed. Conditions in which such jumps become irreversible are revealed. It is shown that irreversible nature of such transitions can be interpreted as recording of the distributed information in system as a whole.

T1b-4 09:45-10:00

Peer Training: Mathematical Model of Effectiveness

I.E. Suleimenov I.E., O.A. Gabrielyan, S.V. Panchenko, I.T. Pak, G.A. Mun, D.B. Shaltykova,

V.V. Buryak, P.V. Obukhova1, K.I. Suleimenova

Almaty University of Power Engineering and Telecommunications, Kazakhstan

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Al-Farabi Kazakh National University, Kazakhstan

Institute of information and computing technologies of NAS of RK, Kazakhstan

Birmingham University, UK

In the following material there is presented a mathematical model for estimation of the number of successful college graduates based on peer education. It is shown that when classroom teaching proves to be of rather low efficiency, purposeful formation of horizontal groups, within which there is an exchange of information, is a factor that improves quality of education in general.

T1b-5 10:00-10:15

Concept of creative consumption as a means to overcome the current global crisis

I. Suleimenov, O. Gabrielyan, G. Mun, D. Shaltykova, P. Obukhova, K. Suleymenova

Almaty University of Power Engineering and Telecommunications, Kazakhstan,

Crimean Federal University, Russia,
Al-Faraby Kazakh National University, Kazakhstan,
Kazakh National Technical University, Kazakhstan
Birmingham University, UK

The work is based on the theory of J. Baudrillard that there are two components of goods cost - material and symbolic (information). It is shown that in modern society, there is a rapidly flowing evolution of the symbolic component of the goods, and it is proved that such an evolution can be made manageable in macroeconomic scale. As a means to control the symbolic component of the goods the proposed concept of creative consumption can be used, implying that the consumer is a "co-sponsor" of products with individual characteristics, and participation in the creation of new products or in giving individual features of existing products is carried out in a mode similar to modern social networks.

T1b-6 10:15-10:30

Noosphere's project of socio-natural evolution as a process of development of a complex system
D.E. Muza, E.B. Ilyanovich, I.T. Park
Crimean University of Culture, Arts and Tourism, Russian Federation
Institute of information and computing technologies of NAS of RK, Kazakhstan

The proposed material reveals the essence and dynamics of noosphere studies by using the categories of "noosphere" and "sustainable development" in a normative manner. In addition, this paper clarifies the correlation between these two concepts within the framework of the description of forms and mechanisms of the global socio-natural evolution of complex systems.

Thursday, 5 November

T1c / Rm #503 / Advanced and Convergence Technologies

09:00-10:30 Chairs : **Hwachang Song, Seoul Nat'l University of Science & Technology, Korea**
 Yeonwoo Lee , Mokpo National University, Korea

T1c-1 09:00-09:15

Feedback Linearizing Control of BESS for Load Frequency Regulation for Microgrids
Jung-Su Kim and Hwachang Song
Seoul National University of Science & Technology, Republic of Korea

This paper presents a feedback linearizing control of BESS (Battery Energy Storage System) for load frequency regulation. As renewable energy has been excessive, frequency variation in power grid has been also becoming higher. In addition, since load demand is increasing too much higher than an expected level due to global warming, frequency level can change easily beyond certain limits. To cope with this problem, BESS is considered as a frequency stabilizing unit in grid. In other words, when abrupt frequency deviation occurs, BESS is used as a control mean to compensate it quickly. To this end, feedback linearizing control is proposed in order for the output of the BESS to track the output reference which is determined properly for the purpose of making up for the frequency deviation.

T1c-2 09:15-09:30

An Economic-Based Decision Making for Off-Grid Hybrid Renewable Energy Developments with Battery Energy Storage Systems at the Jung Ma Do Island
Amir Ahadi, Jang-Ho Lee and Hwachang Song

Kunsan National University, Republic of Korea.

Seoul National University of Science & Technology, Republic of Korea.

Electricity must come from some source be it natural gas, coal, oil, hydro, nuclear, geothermal, wind, solar, etc. Due to the several practical issues regarding the usage of fossil fuels, for instance environmental pollution, penetration of renewable energy systems in community-based projects is ever-increasing. This paper deals with the optimum design of an autonomous hybrid renewable systems incorporated with battery energy storage systems at the Jung Ma Do island, South Korea. The proposed hybrid system consists of wind turbine, photovoltaic system, power converter, and a battery system in order to ensure the consistencies in supply as well as mitigation of renewable energy fluctuations. In this study, we implemented the lead-acid batteries with the nominal capacity of 1000 Ah and total bus voltage of 312V (i.e., 156 cells in the battery module). The real data at the Jung Ma Do site such as load demand, solar radiation, and wind speed were considered. In addition, the effects of variations in solar radiation, wind speed, and load were taken into account in this study. Moreover, we investigated the range of batteries and the effects of wind turbine fraction on the system. The simulations have been carried out using the Hybrid Optimization Model for Electric Renewables (HOMER) simulation software. Several case studies were accomplished to demonstrate the effectiveness of the proposed approach in optimum sizing of the hybrid renewable energy systems.

T1c-3 09:30-09:45

Short-Term Algebraic Load Prediction Using Least Square Method for On-line Application

Marlon Capuno, Hwachang Song

Seoul National University of Science & Technology, Republic of Korea

This paper presents a model for very short-term load prediction based on algebraic sequence using least squares algorithm for linear estimation. With only a five-day historical data as input parameter, the method of least squares is used to extract information on the algebraic relationships of the sequence data and build an algebraic model to extrapolate past behavior into future load points. The algebraic load prediction technique is compared with the support vector regression method of different kernels to show the competitiveness of the proposed strategy. One of the objectives of the prediction method is to serve as an on-line support for power system operation such as peak-shaving application of large-scale battery energy storage systems to maintain expected benefit from its off-line implementation. Testing and simulations are done using the actual 2014 load data of mainland South Korea during the summer and winter months to show the potential of the proposed method.

T1c-4 09:45-10:00

Mixed Integer Linear Programming-Based Peak Shaving Algorithm Considering Various C-rate and Multiple BESS

Won-Bin Choi and Hwachang Song

Seoul National University of Science and Technology, Republic of Korea

This paper proposes a Battery Energy Storage System (BESS)-based peak shaving algorithm to deal with the load peak. BESS that has a different C-rate (charge rate) is applied to the grid. BESS has relatively high C-rate and can be applied to the short-cycle applications, and more effective application plan is required for the operation of two or more purposes. This paper mainly deals with the mixed integer linear programming (MILP)-based peak shaving algorithm considering multiple BESS groups and batteries that have various C-rate and characteristics.

T1c-5 10:00-10:15

Simple Harmonic Compensation Scheme for a Grid-connected Inverter in Distributed Generation System

Lai Ngoc Bao and Kyeong-Hwa Kim

Seoul National University of Science and Technology, Republic of Korea

A new simple and effective scheme to improve power quality for a grid-connected inverter in distributed generation (DG) system under distorted grid voltages will be presented. The proposed scheme is constructed with two controllers to regulate fundamental and harmonic components separately. In order to accomplish the proposed control scheme, the fourth order band pass filter is used to extract harmonic components from the distorted grid voltages. Then, the undesired harmonic components are excellently suppressed by proportional decoupling controller. Simulation and experimental results are presented to verify the simplicity and effectiveness of the proposed scheme.

T1c-6 10:15-10:30

Dynamic Channel Allocation of an ECMA-368 based WiMedia UWB Piconetwork using Intelligent Algorithm

Dong-Keun Jeon, Yeonwoo Lee

Incheon National University, Republic of Korea

Mokpo National University, Republic of Korea

This paper proposes an intelligent algorithm applicable to an ECMA-368 based WiMedia UWB pico-network, thus to intelligently perform dynamic channel allocation of medium access time slots. The proposed intelligent dynamic channel allocation algorithm applies a fuzzy logic to managing the amount of channels allocated to both prioritized contention access (PCA) protocol and distributed reservation protocol (DRP), which is based on priority and traffic load of HD video stream and data traffic. It is shown that the proposed intelligent dynamic channel allocation can provide better performance of the aggregated throughput than that of without intelligent algorithm.

Thursday, 5 November

T1d / Rm #504 / Robot Service Architecture and Its Applications

09:00-10:30 Chairs : **Jae Young Choi, Swoongsil University, Korea**

Jin-Woo Jung, Dongguk University, Korea

T1d-1 09:00-09:15

Strategy for Sprint Game of Humanoid Robot

Woo-Ram Gill, Young-Ho Lee and Young-Jae Ryoo

Mokpo National University, Republic of Korea

In this paper, a strategy for a sprint game of a humanoid robot, which imitates that for the human, is proposed. The game strategies that the humanoid robot can succeed at a sprint game in HuroCup, the representative sprint competition supervised by FIRA(Federation of International Robot Soccer Association), will be suggested and applied to the humanoid robot 'CHARLES'. Lastly, through the specific game of HuroCup, the humanoid robot using the proposed strategies demonstrated its playing in the sprint game.

T1d-2 09:15-09:30

Rule and Strategy for Marathon Event of Humanoid Robot

Ki-Nam Lee, Young-Jae Ryoo, Jongsun Choi, and Jaeyoung Choi

Mokpo National University, Soongsil University, Republic of Korea

This paper deals with a marathon event of FIRA Cup challenge. Hu-roCup, one of the fields of FIRA Cup, is a challenge called a marathon for humanoid robots, and consists of nine events; marathon, united soccer, basketball, sprint, penalty kick, obstacle run, and weight lifting. The winners are determined through the competition among teams within the rules of each event. This paper will introduce the rules of marathon and the strategy of a humanoid robot to demonstrate in the marathon event of HuroCup.

T1d-3 09:30-09:45

Robot Software Platform for IoT-Based Context-awareness

Yong-seong Cho, Jongsun Choi and Jaeyoung Choi

Soongsil University, Republic of Korea

As IoT-based sensors have emerged recently, new technologies are being developed for users to provide suitable services by recognizing the surrounding situations. In the service robot sector, many researches are being carried out in order to exploit the collected data from IoT-based sensors. In addition, researches on robot middleware using context information are actively performed.

In this paper, we propose a robot SW platform, which provides IoT-based context-aware services. This robot SW platform consists of Ontology Agent, Robot Service Execution Engine, and Context Handler. The Ontology Agent is a module that searches information, such as sensor location, value type, and etc., of the IoT devices stored in Ontology Repository and that provides them to the Context Handler. The context handler reads IoT device.s data and checks whether service transition conditions are met. If the conditions are satisfied, the data is delivered to the Robot Service Execution Engine, which is in charge of executing services. We showed the process to execute a context-aware service on the proposed robot SW platform, and we confirmed that we can effectively provide IoT-based context-aware robot services.

T1d-4 09:45-10:00

Intelligent Personal Mobility with Diagonal Driving Mode

SuSan Park, Dae-Yeong Im, Hyun-Rok Cha and Young-Jae Ryoo

Mokpo National University, Republic of Korea

Korea Institute of Industrial Technology, Republic of Korea

In this paper, we propose an intelligent personal mobility which can drive diagonally. Mobility is a prerequisite involved in basic human life and activities. Personal mobility is a new mobility which can replace the automobile of wheel structure. The proposed personal mobility can overcome the limitations of mobility because its rear wheels can be steered to a diagonal direction. In addition, the handicapped can drive it through a narrow road such as an alleyway or corridor and avoid obstacles on the traveling route. The performance of the proposed personal mobility is tested by experiments.

T1d-5 10:00-10:15

Design of Platform of Tracked Electric Vehicular Robot

Yong-Jun Lee, Young-Hak Chang, Kyung Seok Byun, and Young-Jae Ryoo

Mokpo National University, Republic of Korea

In this paper, a platform of a tracked electric vehicular robot is proposed. Nowadays, there have been many researches on mobile robots in the various ways. Many different fields such as military, exploration, agricultural assistance and disaster relief have applied the mobile robot. According to their purposes, researches on qualified movement structures for traveling to rough territories, development of mobile robots, control method and structures have been conducted. In this paper, the tracked electric vehicular robot based on to

prevent its turning over is designed, because of the robot is possible to turn over by an unpredicted road condition in a working area.

T1d-6 10:15-10:30

Pseudo-Inked Signature for On-line Signature Recognition

Young-One Cho and Jin-Woo Jung

Dongguk University, Republic of Korea

A fusion method for three different types of information during online signature writing, pressure of the pen, tilting angle of the pen, and theta angle of the pen, is addressed in this paper. The result is called as Pseudo-Inked Signature image. Therefore, Pseudo-Inked Signature image shows different results even though the original signature image is very close to each other. In addition, since the format of Pseudo-Inked Signature is just a single gray image, it is very effective for handling; comparing, storing and management. Using this Pseudo-Inked Signature, a user verification system has been developed and tested with k-NN classifier. The experimental result shows that Pseudo-Inked Signature is enough good for the real application.

Thursday, 5 November

T1e / Rm #505 / Intelligent Systems for People with Disabilities

**09:00-10:30 Chairs : Noboru Takagi, Toyama Prefectural University, Japan
Jianjun Chen, Toyama Prefectural University, Japan**

T1e-1 09:00-09:15

A Study of User Interface of Tactile Graphics Production Systems Available for Visually Impaired People

Noboru Takagi, Shingo Morii, and Tatsuo Motoyoshi

Toyama Prefectural University, Japan

INTEC Inc., Japan

Sighted people use not only verbal information, but also non-verbal information such as graphs, pictures and so on, when they study mathematics and physics etc. Although blind people are able to receive non-verbal information when the information is expressed by a tactile graphic, it is quite difficult for the blind to produce figures by themselves. Using refreshable braille displays is one of the possible methods when blind people draw figures by themselves. So, we discuss assistant systems for blind people to draw figures by themselves using a refreshable braille display.

In this paper, we introduce two object input methods. Furthermore, two scrolling methods are also introduced, which are needed to show the drawing area that a user wants to touch. We have examined which object input method is efficient for blind users and which scrolling method is easy to use; five blind people have participated to our experiments. The results of the experiment are shown in this paper.

T1e-2 09:15-09:30

An Extraction Method of Character Strings from Natural Scene Images

Jianjun Chen, Noboru Takagi

Toyama Prefectural University, Japan

Scene text is often used for finding public places and other locations. However, the text information is inaccessible to many visually impaired people, unless represented non-visually such as Braille, tactile graphic, and speech. In this paper, we propose an approach to extract character strings from natural scene images. In

our method, we first segment the scene image into homogeneous regions by applying toggle mapping. Second, we detect the character edges from homogeneous region, after that, single characters are detected. A fuzzy inference system is then applied to extract character strings. Finally, we conduct computer experiments to show the effectiveness for the proposed method.

T1e-3 09:30-09:45

Characteristics of Visual Saliency for Character Feature

Hironobu Takano, Taira Nagashima and Kiyomi Nakamura

Toyama Prefectural University, Japan

Visual saliency map has been proposed as a computational model for estimating the bottom-up visual attention of a human. However, under the condition including the top-down visual attention, the saliency map has difficulty in estimating the visual attention. The character feature is considered as one of the factors that the deterioration of the saliency map accuracy is induced. In this study, we hypothesized that the character features have the saliency to induce the visual attention. To test this hypothesis, the experiment was conducted by using still images inserted with both characters (Japanese HIRAGANAs) and simple symbols as visual stimuli. The visual stimuli were presented to the subjects for a short period (2s) to exclude the effect of the top-down attention. From the experimental result, the fixation probability of the character region in the image was higher than that of the symbol region. The paired t-test provided the significant difference of the fixation ratio between characters and symbols ($p < 0.01$). Therefore, the present results indicate the visual saliency of characters.

T1e-4 09:45-10:00

P-CUBE: Tangible programming tool for Inexperienced Persons in PC operation

Tatsuo Motoyoshi, Hiroyuki Masuta, Ken'ichi Koyanagi, Toru Oshima, and Hiroshi Kawakami

Toyama Prefectural University, Japan

Kyoto University, Japan

We developed the P-CUBE algorithm education tool, with which users are able to control a mobile robot simply by positioning wooden blocks on a mat. The fundamental programming concepts taught by P-CUBE consist of three elements: sequences, branches and loops. The P-CUBE system consists of a program mat, programming blocks and a personal computer (PC) for controlling the mobile robot. The programming blocks utilize radio frequency identification (RFID) tags alone, and thus require no precision equipment such as microcomputers. Furthermore, since P-CUBE is designed to be operated via tactile information for visually impaired. In this paper, we report on the P-CUBE system configuration and a study conducted on the usefulness of P-CUBE as an education tool for a programming beginner. We conducted an experiment for comparing P-CUBE and a conventional programming software for a mobile robot. We record the time required for programming exercise during the experiment. The result showed that P-CUBE is useful as a programming education tool for beginners.

T1e-5 10:00-10:15

A Measurement of the P300 after the Occurrence of Eye Movement using ICA

Junwei Fan and Hideaki Touyama

Toyama Prefectural University, Japan

Using the human brain wave to evaluate the products, neuromarketing has attracted attention. However, there are some artefacts in the ElectroEncephaloGram (EEG) which is caused by eye movement or eye blink. The artefacts give a bad influence on the identification rate of Event-Related Potential (ERP). In this study, we

measured an ERP P300 after the occurrence of eye movement, and confirmed that there was ERP P300 component in target task. Furthermore, we used Independent Component Analysis (ICA) to remove the artefacts in the EEG.

Thursday, 5 November

T1f / Rm #506 / Intelligent Data Analysis and Application

09:00-10:30 Chairs : Myung-Mook Han, Gachon University, Korea

Jeong Jung Sik, Mokpo National Maritime University, Korea

T1f-1 09:00-09:15

Study on Correlation Algorithm Technique of Major Feature Selection for Event Log Data Analysis
Dong-Wok Kim and Myung-Mook Han,
Gachon Univ, Republic of Korea

The aim of the study is to remove unnecessary and redundant traits among multiple event data features, as a pre-step prior to machine learning for event log feature analysis, and examine the technique to obtain quality data for improving stability, performance and accuracy only through major feature selections. To achieve this aim, the research is to be performed on efficiency and effectiveness of major features by the use of correlation-based algorithm method between and among features.

T1f-2 09:15-09:30

A Study on Association Rule Using Sequential Pattern for Detecting Advanced Persistent Threat Attack
Jong-Hwan Kong, Myung-Mook Han
Gachon University, Republic of Korea

The major intrusions that have recently occurred can be considered as Advanced Persistent Threat attacks. After targeting a specific entity and penetrating into its system by using various attack techniques, an APT attack continues to collect its system data, and identify its internal vulnerabilities to damage the organization or enterprise. The process of APT attacks can mainly be expressed in the following sequence: defining a target, penetrating into the target, exploring the target, capturing the target and destroying the trace. In this paper, we propose an APT detection model which generates sequential-pattern association rules for the attackers and attack procedures of APT attacks and uses the similarity of threat data about a new intrusion to detect these APT attacks.

T1f-3 09:30-09:45

A Method of Object Classification and Video Data Classification based on Motion Vector in Video Data
Sung-Sam Hong and Myung-Mook Han
Gachon University, Republic of Korea

In these days, the user can easily produce video content by using various mobile video recording devices such as CCTVs, black boxes, mobile phones, etc. Thus, video data is becoming big data due to its size. In particular, there are various videos on the web through social network services (SNS); therefore, the quantity of video data is growing exponentially. In this paper, we propose a video object modeling method and a video object classification method using the modeling method to classify video data and video objects effectively. In addition, we proposed a video data classification method based on a motion vector using the

motion of each object. The object modeling is performed to make the object and video data classification easier, and the video data classification method based on motion vectors is proposed to support effective data classification only with minimal computational complexity and processing time.

T1f-4 09:45-10:00

Malware Detection Using API Sequences of Variable Lengths

Seung-Tae Ha and Myung-Mook Han

Gachon University, Republic of Korea

As the IT industry keeps growing, attacks on the cyberspace are also increasing. Recently, the malware used as the attacker's weapon has been evolved to be metamorphic and polymorphic to avoid the detection. It also adopts obfuscation method to disturb a signature generation by analysis. Responding to the trend, a new study is emerging to define the malware feature based on the recent activities surrounding malware and classify the malicious codes. Most of these studies categorize the malware using the API sequence. In a study performing a feature selection from API sequence and classify the malware through machine learning, the feature selection has a great impact on the classification accuracy. Therefore, the present study provides a new feature selection method to improve the classification accuracy through a calculation using N-Gram and weights from API sequence.

T1f-5 10:00-10:15

A Study on the Analysis of Ship Encounter Data using Logistic Regression

Kwang-Il Kim, Jung Sik Jeong, Gyei-Kark Park

Mokpo National Maritime University, Republic of Korea

Near-collision means that both navigating ships encounter in collision or near-passing. In maritime traffic situation, there are many independent variables causing near-collision event e.g., distance closest point of approach divided by ship's length (DCPA/L), ship length, traffic, collision avoidance and encounter type. The purpose of this study is to analyze ship encounter data by calculating near-collision probability based on the occurrence of near-collision event and the relevant ship encounter data. To calculate the regression coefficients, logistic regression is carried out with the ship trajectory data in Mokpo port located SW part of the Korea.

Thursday, 5 November

T2p-s / Rm 1st Floor / Special Talk

10:40-11:10 Chair : Jongmyung Choi, Mokpo National University, Korea

"International Research Collaboration by Various JSPS Program"

Kaoru Hirota, Professor, Japan Society for the Promotion of Science, Beijing Office, PRC

Thursday, 5 November

T2p-p / Rm 1st Floor / Plenary Lecture-1

11:40-12:30 Chair : Gyei-Kark Park, Mokpo Nat'l Maritime Univ., Korea

"Introduction to Choquet Calculus"

Michico Sugeno, Professor, Tokyo Institute of Technology, Japan

Thursday, 5 November

T3a / Rm #501 / Applications of Intelligent Systems

14:00-15:30 Chairs : **C.W. Tao, National ILan University, Tiwan**
 Shun-Fung Su, National ILan University, Tiwan

T3a-1 14:00-14:15

Performance Improvement on Fuel Cell in a Vehicle via Magnetic Flywheel Control

Chung-Neng Huang, Yui-Sung Chen and Ze-Si Huang

National University of Tainan, Taiwan

For the global-warming effect and fossil fuel depletion are getting serious, hydrogen fuel which exists everywhere around the world has become a salvation for human to solve above problems. For the hydrogen is possible to be extracted from water, air, or nature gas etc., and can be stored long time, there different kinds of fuel cell have been developed to generate clean power, especially used in vehicles. However, the driving of vehicles is like an unstable and irregular loading for fuel cell that will not only jeopardize the usage life and efficiency of fuel cell, but also affect the driving safety for the slow response of fuel cell. For the magnetic flywheels are with the nature of small volume, low loss, and high-speed charging ability, being popularly used in formula one racing cars. In order to solve the problems of fuel cell applications in vehicles, the designed control on a magnetic flywheel system is proposed to improve the output performance for fuel cell in vehicle powertrain.

T3a-2 14:15-14:30

Attitude Control of the Biped Robot Using Intelligent Fuzzy Neural Control

Chih-Cheng Liu, Chun-Fei Hsu, Tsu-Tian Lee and Ching-Chang Wong

Tamkang University, Taiwan

This paper proposes an intelligent fuzzy neural control (IFNC) to rectify the nonlinear system dynamic of a biped robot. The proposed IFNC system is composed of a neural controller and a robust controller. The neural controller uses a perturbed fuzzy neural network (PFNN) to approximate an ideal controller and the robust controller is designed to guarantee system stability. The controller parameters of the IFNC system are on-line tuned in the sense of Lyapunov function, thus the system stability can be guaranteed. Finally, the proposed IFNC system is applied to a nine-link biped robot to show its effectiveness. The simulation results show that the proposed IFNC system can achieve favorable attitude control performance for a biped robot.

T3a-3 14:30-14:45

Image Trigger for Container Verification System

Shun-Feng Su, Wei-Ming Chen, Ming-Chang Chen and Yu-Shan Lin

National Taiwan University of Science and Technology, Taiwan

National Chung-Shan Institute of Science and Technology, Taiwan

The paper proposes a novel container vehicle gate system by using computer image process algorithm. Generally, a container vehicle needs to stop and check their container number in the customs station. In this study, we use only the image of monitoring system to capture the image that the back of container vehicle. Consider scenes change or high motion, the view of the camera will be predefined as range of interest (ROI). Through observing the variation in foreground pixels, the proposed image trigger method can capture the image of container vehicle. In addition, vertical lines on the back of a container vehicle are considered as features and are used to confirm whether the captured image is the complete image of the back of container vehicle. In the experiment results, it is evident that our proposed method can effectively acquire the complete image of the back of container vehicle from the monitoring system.

T3a-4 14:45-15:00

Enhanced Simultaneous Localization and Map Building Based on Cloud Computing
Tung-Yuan Lin, Chen-Chien Hsu, Chung-Ying Li and Wei-Yen Wang
National Taiwan Normal University, Taiwan

In this paper, we propose a cloud computing based architecture for enhanced simultaneous localization and map building (SLAM), relieving the computation burden commonly encountered in FastSLAM algorithms, particularly when the number of landmarks is dramatically increased. By taking advantage of ubiquitous network, cloud computing is capable of handling intensive computation. We make use of particle filter and parallel computation to upload computational load to the cloud so that the architecture can greatly reduce the computational time. Simulation results show that the proposed architecture in this paper can reduce the computational burden from robots, and speed up SLAM computation in complicated or larger environment.

T3a-5 15:00-15:15

An Evolutionary Qualified Immune Computing and Its Application to Optimal Holonomic Control of Mobile Robots
Hsu-Chih Huang and Chih-Hao Chiang
National Ilan University, Taiwan

This paper presents a hybrid approach of Taguchi method and artificial immune system (TAIS) computational intelligence to optimal holonomic control of embedded Swedish wheeled mobile robots by using system-on-a-programmable chip (SoPC) methodology in field-programmable gate array (FPGA). Both the TAIS computational intelligence and locomotion controller are implemented in one FPGA chip to address the optimal holonomic control problem of embedded mobile robotics. Taguchi method for robust parameter design is employed for finding the optimum control parameters in the holonomic controller of Swedish wheeled omnidirectional mobile robots to achieve both trajectory tracking and point-to-point stabilization. Experimental results are conducted to provide effective optimization, considerable convergence speed and high accuracy of the proposed TAIS computing. This FPGA-based TAIS intelligent controller outperforms the conventional non-optimal controllers, the genetic algorithm (GA) controller and the particle swarm optimization (PSO) controller.

Thursday, 5 November

T3b / Rm #502 / Big Data Analysis for Intellectual Property-R&D (IP-R&D)

14:00-15:30 Chairs : Sangsung Park, Korea University, Korea

Sunghae Jun, Cheongju University, Korea

T3b-1 14:00-14:15

Understanding Big Data Technology using Patent Analysis
Sunghae Jun, Seung-Joo Lee, and Sangsung Park
Cheongju University, Republic of Korea
Korea University, Republic of Korea

Big data is an interdisciplinary approach to statistics, computer science, and management engineering. Big data technology is also integrated results combined by them. Big data has been in the limelight in academic and industry fields. This becomes one of the driving forces behind the economic development. So we need to better understand the big data technology for taking advantage of big data. In this paper, using statistics and visualization, we propose a technology analysis method for efficient understanding of big data. We also carry

out experiment using patent documents related to big data.

T3b-2 14:15-14:30

Firm's Profitability Prediction Model Based on Support Vector Machine

Joonhyuck Lee, Sangsung Park, Dongsik Jang

Korea University, Republic of Korea

Recently, due to the development of computer science and machine learning algorithm, various machine learning algorithms such as neural network, decision tree and Support Vector Machine are developed and used for prediction in many fields. The Support Vector Machine, proposed by Vapnik, maps independent variables into high-dimensional vector spaces and finds the optimal hyperplane, which can separate a dependent variable from other dependent variables. Due to this feature, SVM can improve generalization performance of prediction models. In this study, we propose a prediction model that forecasts a company's profitability using SVM. And we analyze its performance empirically.

T3b-3 14:30-14:45

A Study on Prior Art Search using Latent Semantic Analysis

Sungjun Ahn, Jongchan Kim, Joonhyuck Lee, Sangsung Park, Dongsik Jang

Korea University, Republic of Korea

Recently, as technology competitiveness have been fiercer, many companies are interested in patent which protect technology right. Before patents are registered, patent agents or experts conduct prior art search from patent data-bases. But retrieving information from the patent database is unduly burdensome and time consuming through existing qualitative analysis. To solve the problem, this study suggests a process of prior art search using LSA which is objective and quantitative.

T3b-4 14:45-15:00

Development of Document Filtering Methodology Based on Signal-to-Noise Ratio

Jiho Kang, Jongchan Kim, Joonhyuck Lee, Sangsung Park and Dongsik Jang

Korea University, Republic of Korea

This paper is aimed at developing a methodology for document filtering based on a newly defined classifier called Signal-to-Noise ratio (SN ratio) which has been widely used in various engineering areas with different definition. By estimating the statistical distributions of SNR over documents, we can figure out the standard value of SNR for noise document filtering. In the experiment of filtering irrelevant documents from the patent data set, the classification accuracy of the filtering methodology using SNR was about 92 %.

T3b-5 15:00-15:10

Technology Classification for Patent Analysis

Jongchan Kim, Ji ho Kang, Joonhyuck Lee, Sangsung Park and Dongsik Jang

Korea University, Republic of Korea

Recently, Patent analysis has been widely used in technology management to improve business competition and international competition. Technology classification is very important and essential for patent analysis. But it requires experts, a lot of money and time. So we propose quantitative classification method of technology using text mining and machine learning. Using this classification method, we can save money and time in patent analysis, with which even laymen can easily do the patent analysis.

T3b-6 15:10-15:20

Research for Excellent Patent Discovery System
Junseok Lee, Hyun woo Kim, Jongchan Kim and Joonhyuck Lee
Korea University, Republic of Korea

Since business competitions have been intensified recently, companies attempt to improve their competitiveness by using intellectual property, particularly patents. In this circumstance, companies try to build patent portfolios in order to protect their exclusive rights as well as to secure competitive advantages. In addition, several companies are filing patent lawsuits against their competitors based on their patent portfolios. This research paper uses data mining technique and quantitative patent indicators to propose a discovery system for predicting patents which are potential to be litigated. It is also possible to extract core patents by using this novel discovery system.

T3b-7 15:20-15:30

Patent Information Analysis for Establishing R&D Strategy
Hyun Woo Kim, Jongchan Kim, Joonhyuck Lee, Sangsung Park, Dongsik Jang
Korea University, Republic of Korea

The importance of patent information analysis has been increasing these days since technologies are developing rapidly more than ever. In terms of management of technology, it is strongly necessary to understand and deal with the intellectual property which can lead to successful MOT. In this paper, several quantitative methods, which are citation and social network analysis, are presented in order to extract core patents and propose how to establish R&D strategy.

Thursday, 5 November

T3c / Rm #503 / Advanced Network Technology and Its Application

14:00-15:30 Chairs : In-Ho Ra, Kunsan National University, Korea
Yonsik Lee, Kunsan National University, Korea

T3c-1 14:00-14:15

Distributed Generations Penetration Levels and Its Effects on a Distribution System: A Simulation-based Study
Nemia H. Mabaquiao, Godelyn Gallega-Hisole, Rodel D. Dosano, Regin A. Cabacas, Dong-Dae Hwang and In-Ho Ra
Iloilo Science and Technology University
West Visayas State University
Kunsan National University, Republic of Korea

With the publicized benefits offered by renewable energy resources, more households tend to embrace the utilization of stand-alone installations ranging from small to medium scale systems. In literature, several studies provide insights on the effects of the integration of renewable energy (RE) re-sources but have inadequacy of considering the penetration levels. This paper presents a simulation-based comparative study of a distribution system with and without integration of RE sources that considers effects of varying penetration levels of distributed generation (DG) systems like photovoltaic (PV) and wind turbines. The study utilizes a set of actual data from existing distribution system for the simulation. Simulation results show that as penetration level increases, higher possibility of bus voltage violations occur. Furthermore, uncoordinated and unregulated highly penetrated DG's integration in the distribution systems creates line flow congestions.

T3c-2 14:15-14:30

Determining the Optimal Reactive Power Dispatch of a Distribution System with Renewable Energy Sources using Differential Evolution Algorithm

Godelyn Hisole, Rodel Dosano, Regin A. Cabacas, Hong-Keun Park, Sung-Ho Kim and In-Ho Ra
Iloilo Science and Technology University

West Visayas State University

Kunsan National University, Republic of Korea

Optimal reactive power dispatch's (ORPD) main objective on the distribution system is to minimize the active power loss via the optimal adjustment of the power system control variables, while at the same time satisfying various equality and inequality constraints. This paper presents a simulation-based solution of finding ORPD using Differential Algorithm (DE) considering the integration of renewable energy resources. The results show consistency on a identifying a specific bus and capacitor capacity where renewable energy source such as photovoltaic systems should be installed.

T3c-3 14:30-14:45

Design and Implementation of Current Bypass Cell Balancing algorithm with Arduino based Monitoring System

Muhammad Talha, Furqan Asghar and Sung Ho Kim

Kunsan National University, Republic of Korea

The trend toward more electric vehicles has demanded the need for high efficiency, high voltage and long life battery systems [1]-[2]. Battery systems are affected by many factors, cells unbalancing is one of most important among these factors. Without the balancing system, individual cell voltages will differ over time that will decrease the battery pack capacity quickly. This condition is especially severe when the battery has a long string of cells and frequent regenerative charging is done via battery pack. Cell balancing is a method of designing safer battery solutions that extends battery runtime as well as battery life. Balancing mechanism can help in equalizing the state of charge across the multiple cells, therefore increasing the performance of battery system. Different cell balancing methodologies have been proposed for battery pack in recent years. These methods have some merits and demerits in comparison to each other; e.g. balancing time, complexity and active or passive balancing etc. In this paper, current bypass cell balancing and Arduino based monitoring system designing and implementation is carried out. In charging process, this balancing technique provides partial current bypass using charging slope for weak cells. Output result shows that this proposed balancing technique can perform cell balancing in much effective and efficient way as compared to previous balancing techniques. Using this cell balancing technique, we can improve overall battery health and lifetime.

T3c-4 14:45-15:00

Battery State of Charge Estimation using Kalman Filter

Furqan Asghar, Muhammad Talha, Sung Ho Kim and In Ho Ra

Kunsan National University, Republic of Korea

Low power dissipation and maximum battery runtime are crucial in portable electronics and EV's. Battery characteristics and performance varied at different operating conditions. By using accurate, efficient circuit and battery models, designers can predict and optimize battery runtime, current state of charge (SoC) and circuit performance. A great factor in determining the stability of battery system lies within the state of charge (SOC) estimation. Failing to predict SOC will cause overcharge or over discharge which potentially will bring permanent damage to the battery cells. This paper proposed an accurate and comprehensive battery state of charge (SOC) estimation method by using the Kalman Filter. Electrical battery model is being implemented

with Kalman filter in matlab Simulink to estimate the exact battery SOC using estimated battery open circuit voltages (OCV). The proposed model Simulink result shows that system is estimating battery SOC more accurately than commonly used methods which can help to improve battery performance and lifetime.

T3c-5 15:00-15:15

A Distributed Clustering for Secure Energy-Efficient Routing in Wireless Sensor Networks

Wega Simo Harold Wilfried, Yon Sik Lee and Eun Hong Cheon

Woosuk University, Kunsan National University, Republic of Korea

The wireless sensor networks (WSN) have become an economically viable monitoring solution for a wide variety of civilian and military applications. The limited computational ability and battery resources restrictions of the sensors make them vulnerable to different kinds of attacks. The main challenge in WSN is the secure transmission of information through the network in a hostile or unattended environment, which not only provides the necessary services to the user but also ensures that the network is secure, energy-efficient and able to identify and prevent intrusions. In that correspondence, this paper proposes a distributed clustering process that integrates the necessary measures for secure wireless sensors to ensure integrity, authenticity and confidentiality of the aggregated data. We use the notion of pre-distribution of symmetric and asymmetric keys for a secured key management scheme, and then describe the detailed scheme which each sensor node within its cluster makes use of the pre distribution of cryptographic parameters before deployment. We also make use of a distance mapping function to generate a new network secret key for cluster formation at the end of each network operation round so that a new network key is always available at the beginning of the next round.

Thursday, 5 November

T3d / Rm #504 / Intelligent Diagnosis Technique in Heavy Chemical quipment Plant

14:00-15:30 Chairs : Youngchul Bae, Chonnam National University, Korea

Kyungjo Park, Chonnam National University, Korea

T3d-1 14:00-14:15

Chirplet Transform for Mode Separation of Torsional Guided Waves Measured by Magnetostrictive Sensors

Kyung-Jo Park, Hyun-Sung Lee, Ji-Won Jung, Sung-Jin Cho and Yi-Gon Kim

Chonnam National University, Republic of Korea

The sensor configuration of a magnetostrictive guided-wave system can be described as a single continuous transducing element which makes it difficult to separate the individual modes from the reflected signal. In this work, we develop the mode decomposition technique employing chirplet transform, which is able to separate the individual modes from dispersive and multimodal waveforms measured using the magnetostrictive sensor, and estimate the time-frequency centers and individual energies of the reflection, which would be used to locate and characterize defects.

T3d-2 14:15--14:30

Analysis of Fault diagnosis in Pumps and Motors by Chaotic Theory

Young-Ok Jung, Sangsun Shin, Kang Jung and Youngchul Bae

Chonnam National University, Republic of Korea

In this paper, we measure the vubration signal of one dimensional time series that are occurred in motor and pump respectively. Then, in order to diagnose fault sign for pump and motor, we transform from one

dimensional time series to two dimensional phase portrait by using Taken's embedding method.

T3d-3 14:30-14:45

Long Range Displacement Measurements Systems Using Guided Wave

Li Chen, Wangrim Choi, Wenming Lin, Youngchul Bae, Hongsik Moon and Yigon Kim

Chonnam National University, Republic of Korea

Magnetostrictive displacement measurement is the main method to measure the liquid level. Many research have been done to improve the performance of the system and circuit. But we found that signal processing is also an important factor of the displacement system. To improve the signal to noise ratio and stability of magnetostrictive displacement sensor, this paper presented wounded coils around the waveguide wire constitute the transmitting and receiving sensor. Both simulation and experiment were done. We also introduce three kinds of method to do the signal processing and find out that the method combination of auto-correlation processing and pike value is the best way to deal with the signal. And the error of the magnetostrictive displacement measurement we designed is $\pm 6\text{mm}$.

T3d-4 14:45-15:00

Defect Detection of Oil-Tank Using EMAT

Li Chen, Wangrim Choi, Wenming Lin, Yigon Kim, Hongsik Moon and Youngchul Bae

Chonnam National University, China

Tanks are the most usually way to storage the oil of petrochemical industry, the quality of it has a lot of do with the safety of equipment. Recently, Electromagnetic Acoustic Technology (EMATs) technology are interested in many non-destructive examination. EMATs can generate elastic waves in without contact, which makes the detection processing easy to be carried out. Shear horizontal (SH) guided waves generated by an EMAT are modelled in a plate made of ferromagnetic material, which are particularly interesting to use for testing the welded structures. This paper provides a design of the EMAT sensor, which can be able to find out the crack in the weld of the tank without people to climb onto the tank. As for the amplitude signal of the SH wave EMATs is too low, this paper proposes a method to improve the transducing efficiency of it by using simulation.

Thursday, 5 November

T3e / Rm #505 / Smart City and Big Data

14:00-15:30 Chairs : Young Im Cho, Gachon University, Korea

Eric Matson, Purdue University, United States

T3e-1 14:00-14:15

Development of Success Model of e-Government and Feasibility Study

Young Im Cho, Gachon University, Republic of Korea

In this research, I will research about the development of the success model of e-Government and feasibility study. For this research, I will compare Korea e-Government to other countries especially CIS(Commonwealth of Independent States) countries in an aspect of technical issues, governance issues and political issues respectively.

T3e-2 14:15-14:30

A New Guideline of EA Utilization

Jae Du Lee, Young Im Cho

National Information Society Agency, Republic of Korea

Gachon University, Republic of Korea

EA (Enterprise Architecture) is a supporting tool for constructing super-connection society, and it is evolving as a concept that can be introduced and applied not only to the public sector but also to the private sector. In particular, the public sector has been utilizing EA for systematic management of information resources, identification of overlapping investments of informatization budgets, and evaluation of informatization performance since the mid 2000s in which EA was introduced. Now, even the private sector needs to proactively consider the introduction of EA for implementing informatization based on the successful experience and knowledge acquired in the public sector. Particularly, EA will render still bigger effects in the private sector which involves various types of business, because it can play a role as an essential tool for informatization-oriented communication, and for standardization of various processes of enterprises. This guide presents methods of applying EA to planning, implementation and operation of informatization, and evaluation of informatization performance. It also presents various cases found in the private sector that pursues EA-based informatization proactively.

T3e-3 14:30-14:45

Methods of representation data for the integration

Kassymova Aizhan, Young Im Cho, Uskenbayeva Raissa, Kuandykov Abu

International Information Technology University, Kazakhstan

Gachon University, Republic of Korea

Information systems (IS) are a large class of software used by various organizations to automate their work. Nowadays, the volume of processed information is huge and growing every day. The issue of storage of this information is not as acute as before, and, most importantly, changed the type of stored and processing information. Organizations are growing and incorporating together and therefore there is a problem of integration of data from different systems.

T3e4 14:45-15:00

Processing different types of data used within a BPM solution

Yedilkhan D., Young Im Cho, Bektemyssova G.U.

International Information Technology University, Kazakhstan

Gachon University, Republic of Korea

This paper shortly describes how to handle various types of data used within a Business process management (BPM) application. It provides information on using data objects and business objects to define the data structures used within BPM project.

T3e-5 15:00-15:15

A HARMS-based Heterogeneous Human-Robot Team for a Gathering and Collection Function

Miae Kim, Eric T. Matson, Byung Cheol Min, Inseok Koh, Hyewon Jeon, Jiyoung Choi, John Gallagher and Young Im Cho

Purdue University, Wright State University, United States

Chonbuk National University, Soongsil University, Kyung Hee University, Gachon University, Republic of Korea

Agriculture production is a critical task in all parts of the world. The process to grow and harvest crops is very human labor intensive in many parts of the world. Much of the difficult labor of crop production can be automated with intelligent and robotic platforms. We propose an intelligent, agent-oriented robotic team which

can enable the process of harvesting, gathering and collecting crops and fruits, of many types, from agricultural fields. This paper describes a novel robotic organization enabling humans, robots and agents to work together for automation of gathering and collection functions. The focus of the research is a model, called HARMS which can enable humans, software agents, robots, machines and sensors to work together indistinguishably. With this model, any capability-based human-like organization can be considered and modeled, such as manufacturing or agriculture. In this work we model, design and implement an application of knowledge-based robot-to-robot and human-to-robot collaboration for an agricultural gathering and collection function. The gathering and collection functions were chosen as they are some of the most labor intensive and least automated processes in the process acquisition of agricultural products. The use of robotic organizations to can reduce human labor and increase efficiency allowing people to focus on higher level tasks and minimizing the back breaking tasks of agricultural production, in the future. In this work, the HARMS model was applied to three different robotic instances and an integrated test was completed with satisfactory results that show the basic promise of this research.

T3e-6 15:10-15:30

Android-based Dot-Pattern Recognition Technology for E-board System

Young Im Cho, Giyenko Andrey, Altayeva Aigerim, Suleimenov Zharas, Dauletbek Yergali

Gachon University, Republic of Korea

The purpose of our work is to build the Android version of the e-board project. We converted the web version to the OS Android Kitkat. Mobile version on Android, will support all of the functionality available in the Web version of the e-board project. Idea is, by using Android device your will connected to screen projector by using digital pen-based dynamic UI/UX dot pattern. Instead of numbers of running process sequences, our solution gives a chance to start working on one click. It is extremely decreases launching time and no need of extra hardware equipment purchase.

Thursday, 5 November

T3f / Rm #506 / Invited Talk

T3f-1 14:00-14:30 chair: Byung-Jae Choi, Daegu University, Korea

"Decomposed Fuzzy System and Its Application to Direct Adaptive Fuzzy Control"

Shun-Feng Su, Professor, National Taiwan University of Science and Technology, Taiwan

T3f-2 14:40-15:10 chair: Namkyun Im, Mokpo National Maritime University, Korea

"Sympathetic Intelligence: Integration of Intelligence, Emotion and Will"

Masafumi Hagiwara, Professor, Keio University, Japan.

Thursday, 5 November

T4p-p / Rm 1st Floor / Plenary Lecture-2

15:40-16:30 Chair : Young-Chul Bae, Chonnam National University, Korea

"Potential Treatment for Epilepsy"

Takeshi Yamakawa, Professor, Sojo University, Japan.

Thursday, 5 November

T5a / Rm #501 / Statistical Prediction Model with Fuzzy Data

**16:40-18:00 Chairs : Choi, Seunghoe, Korea Aerospace University, Korea
Jin Hee Yoon, Sejong university, Korea**

T5a-1 16:40-16:55

A novel forecasting method based on F-transform and fuzzy time series

Woo-Joo Lee, Hye Young Jung and Seung Hoe Choi

Yonsei University, Seoul National University, Korea Aerospace University, Republic of Korea

The main goal of time series analysis is to establish forecasting model based on past observations and to reduce forecasting error. For these, this paper propose a new forecasting algorithm based on F(Fuzzy)transform and fuzzy logical relationships. First, F-transform is performed based on partitioning of the universe, and fuzzy logical relationships are employed to forecast. Two experimental applications are illustrated to verify proposed algorithm. The accuracies are evaluated on the basis of average forecasting error percentage(AFEP) and index of agreement(d) to compare the proposed algorithm with other existing methods suggested in many studies.

T5a-2 16:55-17:10

Fuzzy regression model with non-linear response function

Hye-Young Jung, Woo-Joo Lee, Jin Hee Yoon and Seung Hoe Choi

Seoul National University, Yonsei University, Sejong University, Korea Aerospace University, Republic of Korea

Fuzzy linear regression is a famous model in which it has been studied by many authors but there have been only a few studies on the fuzzy regression model with non-linear response function. In this paper, we propose the fuzzy linear regression model with the monotonic response function which has served as a useful model to various applications. In addition, the algorithm to construct the proposed model is proposed by using a-level set of fuzzy number. To evaluate the performance of the proposed model, two performance measures of goodness of fit are introduced. The numerical analysis indicates the proposed model is preferable to the fuzzy linear regression.

T5a-3 17:10-17:25

Fuzzy Logistic Regression with Fuzzy Covariate and Its Application in Clinical Studies

S. Mahmoud Taheri, Alireza Abadi, Fatemeh Salmani, Jin Hee Yoon, Hamid Alavi Majd and Abbas Abbaszadeh

University of Tehran, Shahid Beheshti University of Medical Sciences, Iran
Sejong University, Republic of Korea

Logistic regression is an important tool to evaluate the functional relationship between a binary response variable and a set of predictors. However, in clinical studies, there is owing to insufficiently precise or indefiniteness of state. Therefore, we need to investigate some soft methods for inference when variables are reported as imprecise quantities. In this regard, we propose a fuzzy regression model with fuzzy covariate for imprecise binary based response. We apply Diamond's least squares method to estimate our model's parameters. A numerical example in a real clinical study about the effect of beloved person's voice on the pain reduction of removal chest tube of patients with open heart surgery is investigated by the proposed model. The obtained model is evaluated by the mean of a goodness-of-fit index.

T5a-4 17:25-17:40

Predictive modeling with robust regression of compositional data in manufacturing

Valentin Todorov, David Kepplinger and Shyam Upadhyaya

United Nations Industrial Development Organization (UNIDO), Vienna University of Technology, Austria

The industrial development affects people's lives in various ways. The level of industrialization, often measured by the manufacturing value added (MVA) per capita, is highly correlated with many social indicators, including the Human Development Index (HDI). The higher a country's industrial development, the more resources are available for human development. The achievements in the three basic dimensions of human development—a long and healthy life, access to knowledge, and a decent standard of living are aggregated into the HDI that provides a frame of reference for both social and economic development. The relation between the level of industrialization and the HDI as presented in Figure 1, gives a basic overview, but to support policy-making and to gain a deeper understanding of the relation and its mechanics, a more detailed analysis is needed. One very important question that can help reveal some particulars is how the size of different sectors of the manufacturing industry influences the wellbeing of population. To answer this substantial question, the manufacturing industry is divided according to the technology intensity in the sector into the three groups: low technology, medium-low technology manufacturing (referred to as medium-technology), and medium-high and high technology manufacturing (referred to as high-technology). Then the influence of the value added in these groups relative to the total manufacturing value added on social indicators related to education, health, and poverty, is analyzed.

Thursday, 5 November

T5b / Rm #502 / Intelligent Systems for Automation and Logistics

16:40-18:00 Chairs : Yong-Tae Kim, Hankyong National University, Korea

Yong-Jun Lee, Mokpo National University, Korea

T5b-1 16:40-16:55

Path Planning Method for Multiple Transportation Robots Using QR Code Map

Nguyen Thanh Truc, Eun-Hey Sun, Young-Min Kim and Yong-Tae Kim

Hankyong National University, Republic of Korea

In this paper, a path planning method for multiple transportation robots using QR code map is proposed. Our working environment is a grid map and a QR code was attached on each coordinate. Line tracking method was applied to move from a QR code to another one. By reading data of a QR Code, the robot can know its current position, and orientation in the global frame, also the direction to neighbor QR Codes can be obtained. The method is simulated in the dynamic environment with moving obstacles. The proposed planning method shows a high searching speed as well as high accuracy when the robot navigates from the current position to goal position.

T5b-2 16:55-17:10

Design of a Levitation Controller for MIMO Maglev System

Tran Huu Luat and Yong-Tae Kim

Hankyong national University, Republic of Korea

The MIMO magnetic levitation(Maglev) system is an inherently unstable system and contains 6-DOF. In this

paper, we research the maglev system with 3-DOF. We propose a design method of the MIMO maglev controller based on SISO maglev control technology to correct the suspension and compensate the effect of rotational motions. A force loop controller is designed in front of each control channel of an electromagnet for the stability improvement. Finally, the controller technology is evaluated by the simulation and real experiments on Maglev levitation.

T5b-3 17:10-17:25

Fuzzy Control for Walking Balance of the Biped Robot Using ZMP

Tran Huu Luat and Yong-Tae Kim

Hankyong national University, Republic of Korea

In the paper, the fuzzy control for biped robot is provided to maintain the balance of dynamic walking. We designed a FSR sensors circuits to collect data from sensor for tracking the zero moment point (ZMP) trajectories. Determining the ZMP reference through center of mass (COM) by using Jacobi coordinates and appreciating the ZMP data produces a suitable angle of ankle joint and hip joint from fuzzy controller when robot walking has risk of falling. We design a FSR interface to conventionally observe the ZMP trajectories. The experimental results for stability of dynamic walking are presented to verify the proposed method.

T5b-4 17:25-17:40

Design of TLBO-based Optimal Fuzzy PID Controller for Magnetic Levitation System

Jae Hoon Cho and Yong-Tae Kim

Hankyong National University, Republic of Korea

This paper proposes an optimum design method using Teaching-Learning-based Optimization(TLBO) for the fuzzy PID controller of magnetic levitation-based Rail-Guided Vehicle(RGV). Since an attraction type levitation system is intrinsically unstable, it is difficult to completely satisfy the desired performance through the methods designed by conventional controllers. In the paper, the fuzzy PID controller with fixed parameters is applied and then the optimum parameters of fuzzy PID controller are selected by Teaching-Learning optimization. For the fitness function of Teaching-Learning optimization, the performance index of PID controller is used. To verify the performance of the proposed method, we use a Maglev model and compare the proposed method with the performance of PID controller. The simulation results show that the proposed method is more effective than conventional PID controller.

Thursday, 5 November

T5c / Rm #503 / Emerging Pattern Classification Techniques

16:40-18:00 Chairs : Seong G. Kong, Sejong University, Korea

Hakil Kim, Inha University, Korea

T5c-1 16:40-16:55

Classification of Color Imagination in Electroencephalogram using Emotiv Epoc

Je-hun Yu, Seung-Min Park, Kwang-Eun Ko, and Kwee-Bo Sim

Chung-Ang University, Republic of Korea

In this paper, we proposed the method that classify Electroencephalography (EEG) from color imagination data using the Emotiv Epoc headset. For EEG measurement, event-related potential (ERP) method based on Brain-computer interface (BCI) systems was used in experiment. The experiment gaze at a nonflicker visual stimuli with colors such as red, green, blue, white and yellow and then proceed color imagination. In order to

concentrate on LED light, all experiment proceeded in dim room. And an experiment device is made using Arduino and LED with the purpose of leading color imagination. As a result, we can obtain signification EEG response of thinking of color. And the EEG response is classified using classification algorithm. This paper can assist paralyzed individuals and old people.

T5c-2 16:55-17:10

Camera Pose Estimation using Vertical Line Average Filter for On-Road Lane Detection

Hakil Kim, Inha University, Republic of Korea

This paper proposes a dynamic camera pose estimation method for a vision camera mounted on an intelligent vehicle for lane keeping assistance or around view monitoring, where Inverse Perspective Mapping plays a major role for generating a top-view image from an input image using camera's 3D pose angles (yaw, pitch, roll) as extrinsic parameters. The extrinsic parameters are considered to be fixed and given upon the camera's installation, which are apt to vary due to vehicle's vibration or user's camera manipulation. In order to estimate the camera's pose angles, the proposed method utilizes the parallel characteristics of a pair of traffic lanes detected by a vertical line average filter from a sequence of road images acquired by the camera while the vehicle is driving. The method assumes that the road is straight and has no slope during the pose estimation.

The accuracy of the pose angles estimated by the proposed method is measured in the virtual 3D driving environment simulated by PreScan®, 3D driving simulation software, and the results show that the estimated angle deviation is always within 1 degree. This method has been applied to an automatic lane detection module and tested in real driving environment, and the results demonstrate that the average detection rate is above 85% in varying weather conditions such as clear, cloudy, rainy, backlight, and even night-time environment, while reducing the overall lane detection processing time.

T5c-3 17:10-17:25

Refining a subset confidence of SVM for improved detection of occluded pedestrians

Daehun Kim, Jaeyong Ju, Bonhwa Ku, Sebastian Scherer and Hanseok Ko

Korea University, Republic of Korea

Carnegie Mellon University, United States

This paper proposes an efficient pedestrian detector using subset models and sigmoid fitting method in order to make better performance of occlusion problem without learning by occluded database. We define subset models for the partial occlusion problem and then compute the confidence scores of subset models using SVM classifier and sigmoid fitting for normalization each models. Experimental results on three data sets, Caltech DB, PETS2007 DB and our DB, demonstrate that our proposed method is superior to conventional method.

T5c-4 17:25-17:40

Object Tracking with Intensity and Edge in Thermal Vision

Shoumik Roychoudhury and Seong G. Kong

Sejong University, Republic of Korea

This paper presents human object tracking in thermal infrared (IR) vision using the mean-shift algorithm with a combined intensity histogram and the edge information. Thermal IR sensors, which measure the heat energy emitted from an object, are less sensitive to illumination variations that often cause difficulties in object tracking in the visible spectrum. In thermal IR vision, intensity histogram may not provide sufficient information for object representation due to a high contrast between the object and the background. The

proposed scheme uses a combination of intensity and edge information in the mean-shift algorithm to obtain an effective object representation for tracking in thermal vision. Human objects are detected using the Adaboost algorithm. A mobile robot platform equipped with a thermal IR camera successfully track human objects using the proposed object tracking scheme.

Thursday, 5 November

T5d / Rm #504 / Bio and Brain Computing

16:40-18:00 Chairs : **Takahiro Yamanoi, Hokkai-Gakuen University, Japan**
 Tomohiro Yoshikawa, Nagoya University, Japan

T5d-1 16:40-16:55

Brain Computer Interface by use of EEGs on Recalling of Playing Cards Images

Takahiro Yamanoi, Hisashi Toyoshima, Suguru N. Kudo, Shin-ichi Ohnishi, Toshimasa Yamazaki,
and Michio Sugeno

Hokkai-Gakuen University, Kwansai Gakuin University, Japan

Japan Technical Software, European Center for Soft Computing, Kyushu Institute of Technology,
Japan

In order to develop a brain computer interface (BCI), some of the present authors have investigated the brain activity during human recognition of characters and symbols representing directional meaning. Subjects were asked to read them silently. Electroencephalograms (EEGs) were averaged for each stimulus type, and event related potentials (ERPs) were obtained. The equivalent current dipole source localization (ECDL) method has been applied to these ERPs. In both cases, ECDs were localized to areas related to the working memory for spatial perception, i. e. the right upper or the right middle frontal areas. And the opposite directional arrows had opposite dipoles in these areas. Taking into account these facts, the present authors recorded EEGs from subjects looking and recalling thirteen types of playing card images (from Ace to King) presented on a CRT. The authors investigated a single trial EEGs of the subject precisely after the latency at 400 ms, and determined effective sampling latencies for the discriminant analysis to thirteen types of images. They sampled EEG data at latencies from 400 ms to 900 ms at 25 ms intervals by the four channels such as Fp2, F4, C4 and F8. Results of the discriminant analysis with jack knife (cross validation) method for four type objective varieties, the discriminant rates for two subjects were more than 95 %. We could control a micro robot with thirteen commands.

T5d-2 16:55-17:10

Verification of Preprocessing by ICA on EEGs for Spatiotemporal Localization of Brain Activity

Takahiro Yamanoi, Yoshinori Tanaka, Hisashi Toyoshima and Toshimasa Yamazaki

Hokkai-Gakuen University, Kyushu Institute of Technology, Japan

Japan Technical Software, Japan

The authors measured electroencephalograms (EEGs) from subjects when recalling images. Each image presented consisted of four types of line drawings of body parts. During these experiments, the electrodes were fixed on the scalp of the subjects. However, recorded EEGs had multiple components, including muscle and brain potentials. Recently, independent component analysis (ICA) has been used for EEG analysis. ICA is a technical method for solving the so-called "cocktail party problem". We applied ICA to single-trial EEGs for preprocessing to obtain actual brain activity, and then attempted to estimate spatiotemporal brain activity using equivalent current dipole source localization (ECDL). Our results were almost identical with previous

results using ECDL analysis on Event Related Potentials (ERPs). In this paper, we present experiments suggesting that ICA is effective as a preprocessing method for estimation of spatiotemporal brain activity using the ECDL and three-dipole model.

T5d-3 17:10-17:25

Brain activation difference of social learning and individual learning by planning game

Keita Mitani and Yukinobu Hoshino

Kochi University of Technology, Japan

In this study, our purpose is to verify of difference between the social learning and the individual learning from fMRI analysis. Experiment task is focused "Tower of Hanoi" for the execution function analysis. Seven participants belonged to the social learning group, the individual learning group or the non learning group. Task contents of all groups were same, but learning contents of between tasks were different. As the task detail, participants performed to solve the Tower of Hanoi (3 problem, each 40 second) 5 times. From the fMRI analysis results, the difference in brain activation transition was observed between three groups.

T5d-4 17:25-17:40

A Relationship between Difficulty of Tasks and Age in Peak Latency of P300

Kentaro Takakura, Tomohiro Yoshikawa, and Takeshi Furuhashi

Nagoya University, Japan

Previous studies reported that the peak latency of P300 in healthy adults becomes longer with aging and it also depends on the difficulty of tasks. Thus we study the relation between the peak latency of P300 and the difficulty of tasks and age of subjects by two types of experiments. One is a visual sight stimulation task that has one target stimuli and one or two non-target stimuli. The other is a visual sight stimulation task that has one target circle stimuli with variable diameter and one non-target circle stimuli with invariable diameter. The results of these experiments showed that the relation between the difficulty of tasks and the peak latency of P300 changed with aging.

Thursday, 5 November

T5e / Rm #505 / Soft Intelligent SoC

16:40-18:00 Chairs : Yukinobu Hoshino, Kochi University of Technology, Japan

Keon Myung Lee, Chungbuk Nat'l University, Korea

T5e-1 16:40-16:55

Development of Downsized fNIRS System for BCI

Masayuki Kubo, Yukinobu Hoshino

Kochi University of Technology, Japan

This research targets for developing of downsized fNIRS system for BCI. Although our laboratory used to experiment using fNIRS (Hitachi Medical Systems: ETG-7100) until now, downsized fNIRS system like wearable appliance adapt to BCI in case of daily life. Previous studies developed some scale-down fNIRS which one is to detect hemodynamics on only frontal lobe, another is still too large to use as BCI [1] [2]. And so this research will suppose fNIRS system aimed at BCI. In this paper, fNIRS system will be described, and then experimental measurement with Biological Tissue-Equivalent Phantom (Phantom) and frontal lobe of human was conducted. Finally, consequence and next task will be introduced.

T5e-2 16:55-17:10

A Validation of Feature Encoding based on Fuzzy Codebook with Online Classifier

Yuki Shinomiya and Yukinobu Hoshino

Kochi University of Technology, Japan

For image recognition, codebook approach is generally used for the image representation. In this approach, the codebook, which is visual vocabulary, are generated for each local feature framework. The multiple local feature frameworks has been used for the large-scale image recognition. Hence the codebook is required that is a small memory footprint. Image representation based on compact codebook by using fuzzy clustering has been presented, but it has a high computational complexity. This paper presents a reducing computational complexity in the image representation step, and experimental results of online classier.

T5e-3 17:10-17:25

Design and Verification of Image Processing Filters on FPGA

Masahiro Shimasaki and Yukinobu Hoshino

Kochi University of Technology, Japan

Importance of defect inspection in the Factory Automation is growing in visual inspection of industrial products. But it is difficult for humans to find small defects. Therefore, defect inspection that using camera is necessary. Flexibility, high-speed processing and low power consumption are required in the market of embedded systems in the Factory Automation. Additionally, real-time image processing is also needed. This paper shows the hard-ware design of image processing filter using FPGA and the result of experiments. The experimental results show a possibility that the image processing system realizes real-time image processing. FPGA's parallel processing capability and pipeline operations can improve the speed of image processing.

T5e-4 17:25-17:40

Development of human detection system by BRIEF

Yuto Yasuoka, Yuki Shinomiya, and Yukinobu Hoshino

Kochi University of Technology, Japan

The request of human detection for the safety and security is increasing gradually in recent years. So this study proposes the method of human detection at the real time by using pipeline processing system of FPGA. In this proposal method, detection of characteristic used the grid dividing. Dividing areas the local feature descriptor are by Binary robust Independent Elementary Features (BRIEF) and the identification system is used the neural network. For learning process are used Particle Swarm Optimization (PSO). In this paper, we describe proposal method and experiment the simulation of human detection for the safety and security. So this study is considered to propose this method of human detection as the real time system by using the pipeline processing of FPGA. In proposal method, BRIEF and the neural network are ready to work on FPGA. The learning process works on the offline only. In this paper, we de-cribe all proposal method and experiment the simulation.

T5e-5 17:40-17:55

An Enhancement of Parallel Coordinate Categorical Data Visualization

Ahreum Kang, Yong Ki Kim, Keon Myung Lee

Chungbuk National University, Korea

Large amount of data, especially with high dimensionality, is over-whelming the human perception capabilities. Various visualization methods have been developed for helping understand and analyze such data, yet few methods have been developed for categorical data. This paper presents an en-hanced parallel coordinate visualization method for categorical data.

Thursday, 5 November

T5f / Rm #506 / Novel Media in Ubiquitous VR

16:40-18:00 Chairs : Youngho Lee, Mokpo National University, Korea

Hyoseok Yoon, Korea Electronics Technology Institute, Korea

T5f-1 16:40-16:55

Development of EEG Encryption Scheme for User Authentication Using Chaos Maps

Jung-Sook Kim, Kimpo University, Republic of Korea

The developed security scheme for user authentication, which uses both a password and the various devices, is always open by malicious user. In order to solve that problem, the biometric authentication systems are introduced but they have a problem which is the secondary damage to the user. So, the authentication methods using EEG (Electroencephalography) signals were developed. EEG is one of the physiological unique characteristics of an individual. However, if user sends EEG signals to authentication system using network then the malicious user could capture the EEG signals easily. After that, the malicious user could access the authentication system using the captured EEG signals. Also, the size of EEG signals is big. And an encryption scheme is necessary. In this paper, we proposed an efficient encryption scheme using chaos map and substitution on the EEG signals for user authentication in realtime.

T5f-2 16:55-17:10

Design of a Core Platform for Future Immersive Virtual Training

Choonsung Shin, KETI, Republic of Korea

Recently Immersive Virtual Training (IVT) that allows trainees to obtain and experience and knowledge via modeling and simulation from physical world has been a great attention from researchers and industries. As IVT is able to provide trainees with interactive training in a simulated environment similar to real world, it is based on virtual reality and immersive interaction devices. Therefore IVT systems are widely applied to medical/surgery training, combat training, flight training, equipment operation and maintenance, etc. As the costs for building IVT systems is continuously decreasing and the quality of IVT systems has been improving, the need for IVT systems definitely widely spreads to industry, entertainment, education, etc.

T5f-3 16:55-17:10

Opportunities and Challenges for Smartwatch-Centric Unobtrusive Quantified-Self

Hyoseok Yoon

Korea Electronics Technology Institute, Republic of Korea

The advent of wearable devices presents new opportunities as well as technical and social challenges for users interacting in ubiquitous virtual reality. Currently, dozens of smartwatches are available on consumer electronics markets to follow and repeat success story of its renown ancestor, smartphones. Smartphones successfully penetrated into people's daily lives and became the ubiquitous and friendly companion to assist people in communication, information searching and entertainment. Nowadays, smartphones are actively used as a tool for quantified-self where the user's personal big data generated in the smartphone is captured to better understand the user better. We envision that techniques and approaches for quantified-self can be improved and catalyzed by the use of smartwatches in practice. In this paper, we present foreseeable opportunities and challenges of smartwatch-centric quantified-self.

T5f-4 17:25-17:40

Histogram Equalization of AR Coloring Book
Hadong Kim and Youngho Lee
Mokpo National University, Republic of Korea

Currently there are many applications in the area of augmented reality. The AR coloring book is one of interesting applications. Our previous AR coloring book has a blurring problem on its texture. In this paper, we apply histogram equalization to the blurred texture for enhancing color. With an experiment result, we show that the proposed approach enhances textures.

Friday, 6 November

F1a / Rm #501 / Neural Networks & its Applications

09:30-11:00 Chairs : **Kwee-Bo Sim, Chung-Ang University, Korea**
 Masafumi Hagiwara, Keio University, Japan

F1a-1 09:30-09:45

Early detection of Heart Diseases using ANN (Time and Cost Efficient)

Chandraveer Singh Rathore, Aynur Unal, Shivaen Katial, Antimdev Mishra, Saurabh Juneja and Jay Rajasekera

Ansal University, Gurgaon, India

Founder of DIGITAL MONOZUKURI, USA

International University of Japan

Artificial Neural Networks (ANN) have the ability to exploit the resistance for imprecision and ambiguity in real-world- problems, and their robustness and uniformity; ANN and their techniques have become increasingly important for modelling and development in many areas of science and engineering. This paper presents an analytical overview of the most popular ANNs. After an overview of ANN, the paper discusses global expansion for ANN training. The paper then discusses the techniques and means for detecting heart diseases at an early stage at almost negligible costs and lesser time.

F1a-2 09:45-10:00

Motion based Intention Recognition System using Boost Clustering Convolutional Neural Network

Kwang-Eun Ko and Kwee-Bo Sim

Chung-Ang University, Republic of Korea

This paper is concerned with an approach of motion based intention recognition in human-computer interaction system. When the system observes an intended motion from demonstrator, the system has to autonomously segment the intention level motion into the cluster group of the consequent primitive motor plan. We employed a convolutional neural network which is getting the spotlight in the machine learning field. The convolutional neural network approach is combined with recurrent network for autonomous segmentation of the sequential primitive motions.

F1a-3 10:00-10:15

A Learning Method for Echo State Networks Using RBM

Yu Yamagishi, Masahiko Osawa and Masafumi Hagiwara

Keio University, Japan

The Echo State Network (ESN) is a simple recurrent neural network which learns time series data with a dynamic layer called "reservoir." Weights between the input layer and the reservoir and among the reservoir are randomly determined. In this paper, we propose a novel method to determine these weights utilizing the

superior learning ability of Restricted Boltzmann Machine (RBM). First, the RBM with partial feedback is trained to learn the data of adjacent two time frames. After learning, these weights are used in an ESN. We performed two different types of experiments to evaluate the proposed method. The results show the effectiveness of the proposed method. Also, one of the results indicates that this learning method is applicable to the Incremental Learning ESN-RBM (IL-ESN-RBM), which we proposed in our former paper as an artificial neural network model for memorizing time series data.

F1a-4 10:15-10:30

Natural Language Neural Network Introduced Association Layer and Inhibitory Layer

Masahiro Yamamoto and Masafumi Hagiwara

Keio University, Japan

This paper proposes a novel neural network to process natural language. In the conventional neural network to process natural language, the association between two words is hard. Furthermore, there are only excitability neurons in the network. Therefore, in the application to question-answering, the action potential of the neurons which does not relate to the question tends to be high. The proposed network is newly introduced two layers. First one is an association layer based on the co-occurrence frequency database. Owing to this layer, the association between two words can be easily realized. Second one is the inhibitory layer. This layer is composed of the inhibitory neurons which inhibit action potential of neurons. In the application to a question-answering, these neurons can inhibit the action potential of neurons which does not relate to the question sentence. In the experiment about question-answering, we have obtained good results such that MRR is 0.60.

F1a-5 10:30-10:45

Analyses of Learning Characteristics of RBMs and an Automatic Method for Deciding the Number of Hidden Units

Masahiko Osawa and Masafumi Hagiwara

Keio University, Japan

Deep Learning has attracted much attention. While deep learning has strong ability to learn and wide versatility, it has some shortcomings. One of them is hardness to determine the parameters. In this paper, in order to cope with the shortcoming, first we analyze the learning characteristics of Bernoulli-Bernoulli type Restricted Boltzmann Machines (RBMs) which are models to treat binary data in both visible layer and hidden layer using computer experiments. In these computer experiments, we found six valuable findings. Then, using two important findings, we propose an automatic method for deciding the number of hidden units. First one is that reduction of cross entropy is almost linear with the number of hidden units under certain conditions. Another one is that the range in which slope of the cross entropy is almost zero exists if the data set with small variance is used. The proposed method is constructed with two phases corresponded to these findings. First it goes through the area without conspicuous slope of cross entropy. Second it predicts the slope and decides the number of hidden units which may be able to achieve to desired cross entropy. It can estimate the proper number of hidden units for RBMs. We carried out computer experiments to evaluate the proposed estimation method. It was confirmed that the estimated numbers of hidden units are accurate, especially with small variance.

F1a-6 10:45-11:00

A study on automatic ship berthing for multi ports basing on artificial neural network

Van Suong Nguyen and Nam-Kyun Im

Mokpo maritime university, Republic of Korea

The ANNs (Artificial Neural Networks) has been known as one of most effective theory for automatic berthing control of ship because they have the learning ability and mimic action of human's brain in performing stages of berthing procedure. So far, there are many different structures of ANNs which has applied to this problem, however, these controllers can only adopted to control ship in one port where teaching data are taken out formerly. It means that, the ANNs controller must be trained again when ship arrives to new ports, it causes time consuming and expensive computation in controller. In this research, a novel ANNs is proposed, which can adapt to different coordinate axes of port's geometry. On adding to structure of ANNs two new inputs such as relative bearing angle and distance from ship to berth's pier which are regarded as virtual coordinate axes, these inputs can use for multi ports adaptively without considering geometrical feature of ports. ANNs-controller are trained by teaching data at an original port and back-propagation technique after that the ship can be automatically controlled into berth in both the original port and other ports where input conditions are same as ones in original port. Numerical simulation is carried out to verify the effectiveness of the proposal algorithm, results showed that good performance of proposed controller.

Friday, 6 November

F1b / Rm #502 / Data Mining & its Applications

09:30-11:00 Chairs : Jee-Hyong Lee, Sungkyunkwan University, Korea

Kenji Nakamura, Osaka University of Economics, Japan

F1b-1 09:30-09:45

Research Concerning Estimating Occupations of Users Using Posting Time to Microblogs

Ryo Kato, Kenji Nakamura and Shigenori Tanaka

Kansai University, Osaka University, Japan

Research is being conducted on technology to get users' reactions to specific topics in microblogs. It is necessary to know the users' characteristics in order to effectively utilize microblogs as social sensors. However, it is hard to detect the users' characteristics, because it often happens that user attributes are not open to the public in microblogs. For this reason, research on estimating user attributes in microblogs has been drawing attention. However, existing methods, which merely focus on the contents of microblogs, do not take advantage of the characteristics of microblogs that transmit messages in real time in estimating users' attributes. This research proposes a method for classifying the users according to the number of posts per unit time and estimating the occupation attributes by the posted contents, lifestyles and time zones of postings.

F1b-2 09:45-10:00

Efficient POI Extraction Method

Yeong Ju Kim, Yeon-Ji Park, Yun-Jeong Jang, Gyeong-A No, Min-A Kim and Min-A Jeong

Mokpo National University, China

In this paper, we propose a more efficient mixed POI extraction method, which will better suit users' needs. We extended DBSCAN, a clustering algorithm for spatial data, to improve this POI extraction process. In our proposed mixed POI extraction method, the first step is to extract users who go through a designated point. The second step is extracting SP using only a user's location information from their G.P.S. data. Finally, we can extract POI using the SP. In experimental studies, our method has a faster processing speed than conventional methods because we can extract SP from the data that suits a user's need during the user

extracting step. This method allows us to extract customized user POI without input additional attribute values.

F1b-3 10:00-10:15

Rough set approaches dealing with missing decision values

Thin Cao Duc1, Koichi Yamada, Muneyuki Unehara, Izumi Suzuki and Van Nguyen Do

Nagaoka University of Technology, Japan

KDDI R&D Laboratories, Inc, Japan

This study discovers the knowledge acquisition from an information system in which some condition as well as decision values are missing. By recognizing the necessity of utilizing objects with missing decision data, this paper proposes an α -generalized decision approach to handle the case. Assuming that the domain of decision values is defined, we first construct the notion of α -generalized decision in order to filter potential values under the control of a threshold. A set's approximations and its properties are then constructed and proved based on this notion. Lastly, the paper introduces a new method to generate reducts in an incomplete decision system.

F1b-4 10:15-10:30

Cross-domain Sentiment Polarity Classification by Latent Subject Learning

Hyunho Kim and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

Sentiment classification aims to automatically predict sentiment polarity (e.g., positive or negative) of user generated sentiment data (e.g., reviews, blogs). Since those user generated sentiment data can span many domains, traditional machine learning methods require labeled data for each domain to learn classifiers for new domains. It is known as a very expensive and difficult task to give labels to every domains. In this paper, we propose a novel method, called Latent Subject Learning (LSL). LSL learns a classification model from a labeled source domain, then it can be directly applied to predict unlabeled data from a target domain with the help of shared features discovered from both of the source and the target domains. Those shared features also help to map domain dependent features of source and target domains. We conduct experiments on a benchmark using Amazon review data. Experiment results show that our proposed LSL outperforms the baseline methods.

Friday, 6 November

F1c / Rm #503 / Artificial Intelligence & Knowledge Engineering

09:30-11:00 Chairs : **Dae-Won Kim, Chung-Ang University, Korea**

Tomoharu Nakashima, Osaka Prefecture University, Japan

F1c-1 09:30-09:45

Play Maze Games Based on Shared-control by Error-related Brainwave Potentials

Geng-Wei Yeh and Von-Wun Soo

National Tsing Hua University, Taiwan

We design a shared control system to help players to play maze games based on EEG error-related potentials. The EEG signals of game players are acquired using an off-the-shelf EEG headset NeuroskyTM and EmotivTM and we developed signal analysis methods to detect the error-related potentials as correct, error, or detour classes. The shared control system guides the player who visualizes the cursor movement toward a goal location in a Maze game without hands. We implemented the shared control heuristics by integrating with an

A* heuristic search algorithm and evaluated the effectiveness of the shared control system. It turns out that game players played with shared control system improve about 50% on average in comparison to the systems that blindly used trial-and-error strategy in terms of number of steps to move the cursor successfully from an initial location to a goal location in mazes.

F1c-2 09:45-10:00

Game's Strategies Identification for Adaptable Gaming Artificial Intelligence

Benoit Vallade, Alexandre David and Tomoharu Nakashima

Osaka Prefecture University, Japan

This paper presents a method to identify the specific set of strategies of a video game. General gaming research focuses on the development of adaptable artificial intelligences. Such artificial intelligences have the potential to be usable on different kinds of games without any modification in their source code. Some of those adaptable artificial intelligences are transparent to the games' specificities (objectives, strategies, maps, game-play ...). It is however possible to base such an artificial intelligence on the opposite concept. This means moving from the adaptability by transparency to the adaptability by learning of the game's characteristics. This paper focuses on the learning of the game's strategies. It describes a procedure which allows the artificial intelligence to discover and learn the set of strategies of a game using its in-game related data. The appreciable experiment's results showed the validity of our approach.

F1c-3 10:00-10:15

Weather Map Prediction with DNN-based Feature Extraction

Hye Woo Lee and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

Accurate weather map prediction is an essential for weather forecasting because weather map is a major means to analyze weather phenomena. Machine learning techniques are one of alternatives for the weather map prediction, because they can extract patterns from data. But, the weather maps have high dimension and complexity, the machine learning techniques are hard to give the sufficient prediction performance. For overcoming it, we utilize Deep Neural Network (DNN), because the Deep Neural Network has effectiveness of treating high dimensional and complex data. In this paper, we show that it is effective to utilize Deep Neural Network base weather map prediction model. The model carries out predicting weather map after 6 hours from a specific point of time. We will show the difference in results with the prediction results between the case of baseline and the various weather map prediction models.

F1c-4 10:15-10:30

Development of Expert Systems for Information Security Active Audit

Lyazzat Atymtayeva, Kazakh-British Technical University, Kazakhstan

To ensure a good level of security any organization should conduct regular audits of information security. This process is highly expensive in terms of time, cost, and human resources. Automating the audit process through the development of the software can be a good alternative that will reduce costs, speed up the process of audit and improve quality by compliance it with international security standards. In the questions of building expert systems there are a lot of issues concerning creation of knowledge base, generation of recommendations, forming rules, and etc. This paper is devoted to some issues of the building of expert systems for audit of information security on the base of relative ontology and architecture. Some examples of generation of recommendations are considered in terms of active audit of information security in the organizations.

F1c-5 10:30-10:45

Topic-focused Multi-Document Summarization based on Genetic Algorithm

Dahae Kim, Taemin Jo and Jee-Hyong Lee

Sungkyungwan University, Republic of Korea

Multi-document summarization is to create compressed summaries from a document set. When generating summaries, we used to extract the salient sentences from the document set. In order to extract salient sentences, multi-document summarization has been researched with the various strategies. In general, individual documents in a document set have own sub-topics. Considering this point, we need to prevent that summaries is biased to the specific topic. In this paper, we propose a Topic-focused Multi-document Summarization method based on genetic algorithm. With genetic algorithm, we can consider sub-topics of each document harmoniously as well as relevance with the main topic of a document set. We obtain the features from the LDA model, Tex-tRank. The experiment on DUC 2002 dataset shows that our method outperforms the baseline in terms of generating topic-focused summaries.

Friday, 6 November

F1d / Rm #504 / Big Data Analysis & Learning System

09:30-11:00 Chairs : Jee-Hyong Lee, Sungkyunkwan University, Korea

Katsutoshi Hirayama, Kobe University, Japan

F1d-1 09:30-09:45

Dynamic Noise Reduction Method based on Content-Rating Distribution for Recommender System

Be-Deu-Ro Kim, Noo-ri Kim, and Jee-Hyong Lee

Sungkyunkwan university, Republic of Korea

Due to the expansion of the Internet and the increasing number of digital contents, users have difficulty to find proper contents. To solve this problem, recommender systems are studied actively. However, it has a problem that the reliability of recommendation can be decreased due to intentional or malicious evaluations of some users. In this study, we eliminate noisy ratings and improve the reliability of recommender systems by considering various valuation standard. First, we normalize the raw data of users' ratings and remove noisy data which is far from the average of ratings. Second, we consider the difference between rating time and current time. Third, we add users' reliability as the valuation standard. As a result, we improve the data reliability and the performance of recommender systems.

F1d-2 09:45-10:00

Study of performer of Promotion adopting hit phenomenon analysis based on the post on the Web using the Twitter

Kawahata Yasuko, The University of Tokyo, Japan

A mathematical theory for social events is presented based on a previously developed mathematical model of hit phenomena in entertainment as a stochastic process of interactions of human dynamics. The model uses only the time distribution of advertisement budget as input, and word-of-mouth represented by posts on social network systems is used as data to compare with the calculated results. The unit of time is 1 h in contrast to the one day time unit used in previous calculations with the mathematical model theory of hit phenomena. The calculations of intention of people in Japanese society for the release information of a new compact disk single for a famous musician agree very well with the Twitter posting distribution during the burst phenomena

time period. This confirms that the mathematical theory for hit phenomena is also accurate on the 1 h time scale.

F1d-3 10:00-10:15

Music recommendation system using Kansei agent and music fluctuation properties

Masayoshi Inoue, Hiroshi Takenouchi and Masataka Tokumaru

Graduate School of Kansai University, Kansai University, Japan

Fukuoka Institute of Technology, Japan

In this study, a music recommendation system that uses Kansei agents and music fluctuation properties is proposed. The objective is to search for music that matches users' preferences. Previous systems with comparable objectives did not adequately account for personal preferences in the recommendations that were returned. Kansei agents are Kansei model and characterized by a three-layered neural network. The neural network inputs correspond to user stimulus, and the output corresponds to the emotional response of the user because of the stimulus. Music fluctuation properties are dened as inputs in the neural networks of the Kansei agents. The proposed system returns recommendation based on personal subjectivity. The simulation that was conducted as a part of the study validated the effectiveness of the proposed system (i.e., the Kansei agents learned the users' Kansei to an acceptable level of accuracy).

F1d-4 10:15-10:30

Image Impression Estimation without Image Processing

Nguyen Thi Thu An and Masafumi Hagiwara

Keio University, Japan

This paper aims at proposing a new system to estimate the impression for an image . The proposed system uses human annotated tags of images instead of using image processing technique. The semantic association strengths between adjectives and topic image tags are computed by pointwise mutual information (PMI) and the pattern frequencies using a machine learning approach. To select the output, we use a rank aggregation method, Borda's method, to generate an acceptable ranking for a given set of rankings and the top n_a adjectives (in this paper n_a is 5) are chosen according to the estimated values. The main contribution of this method is to design an effective method for estimating the association of the impression adjectives with images. We evaluated our approach using two tasks: the first one is the quality of association measurement and the second one is the efficiency of the proposed method. The evaluation for association classification on 5,000 pairs of words shows that the average accuracy is 82.0 %. And for the performance of the proposed method, we carried out subjective experiments and obtained fairly good results.

F1d-5 10:45-11:00

Skill-Based Dynamic Team Formation Problem

Tenda Okimoto, Maxime Clementy, Katsutoshi Hirayama and Katsumi Inoue

Kobe University, Japan

The Graduate University for Advanced Studies, National Institute of Informatics, Japan

A skill-based team formation (TF^{SB}) is one of the important issues in multi-agent systems. A TF^{SB} is the problem of selecting a group of agents, where each agent has a set of skills; the aim is to accomplish a given mission (a set of tasks), where each task is made precise by a skill necessary for managing it. Most researches have focused on static TF^{SB} problems. However, many real world problems are dynamic, i.e., problems change at runtime. In this paper, the focus is laid on the Dynamic Skill-Based Team Formation (DTF^{SB}) problem where the mission changes dynamically. A formal framework for DTF^{SB} is defined, the

decision and optimization problems for DTF^{SB} are pointed out, and their computational complexities are identified. Furthermore, an algorithm for solving a DTF^{SB} problem is presented and evaluated on a number of benchmarks.

Friday, 6 November

F1e / Rm #505 / Information Fusion & Decision Making

09:30-11:00 Chairs : Taekyun Kim, Kwangwoon University, Korea

Jung-sik Jeong, Mokpo National Maritime University, Korea

F1e-1 09:30-09:45

Consideration of Ingredient Purchases Using the Healthy Eating Habits Support System

Yuta Hayashi, Ryouta Oku, Hiroshi Takenouchi and Masataka Tokumaru

Kansai University, Japan

Fukuoka Institute of Technology, Japan

In this study, we proposed a Healthy Eating Habits Support System (HEHSS) to evaluate the purchase of ingredients. Planning daily meals can be considered as a burden because of the need to satisfy requirements with respect to nutritional value and taste. To address this problem, we developed the HEHSS to consider a user's taste and health. However, when people plan meals, they also take financial constraints and the availability of surplus ingredients into consideration. In addition, it is common to manage nutrition over a long term period. Therefore, the proposed system recommends meals that consider all these factors, including nutrition, a user's taste, the availability of surplus ingredients, and the user's monthly budget. We confirmed the system reliability under the simulated scenarios described in the study.

F1e-2 09:45-10:00

Intuitionistic Fuzzy Evaluations for Analysis of a Student's Knowledge of Mathematics in the e-Learning University

Taekyun Kim, Krassimir Atanassov, Evdokia Sotirova, Assen Zlatarov, Lee-Chae Jang

Kwangwoon University, Konkuk University, Republic of Korea

Bulgarian Academy of Sciences, Bulgaria

The theory of intuitionistic fuzzy sets is used here for assessment of the students' knowledge of mathematics. The presented method gives the possibility for algorithmization of the process of forming the students' evaluations.

F1e-3 10:00-10:15

Heterogeneous Information Network based TV Program Recommendation

Muhammad Umar Chaudhry, Sungtak Oh, Noo-ri Kim, and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

With the continuous increase in the population of TV channels, the choice is becoming more and more difficult for the viewers to find their favorite TV programs. There is an immense need of a TV recommender system. However, the task is not trivial. Each TV program is broadcasted at a particular time and is associated with a specific TV channel. Various recommendation methods have been proposed, but a few in TV domain. Most of the earlier proposed techniques considered only a single relationship category. In this paper, we study the TV Program recommendation problem considering the heterogeneous information network environment. We propose to extract the heterogeneous relationship information between the target viewer and

the different TV programs following different meta-paths, and try to deliver good quality recommendation using the implicit feedback history data of the viewer. Our experiment on real-world data shows the effectiveness of our proposed method.

F1e-4 10:15-10:30

Personalized TV Channel Recommendation Considering Viewer's Time Dependent Propensity Using Constrained Optimization Technique

Sungtak Oh and Jee-Hyong Lee

Sungkyunkwan university, Republic of Korea

With the increasing number of TV channels, TV recommender systems have been developed. As a viewer's preferred TV channel may be different according to the time, the TV recommender system should consider a viewer's temporal context when it tries to recommend. However, much of the past time aware methods has not focused on the fact that each viewer has a different watching habit depending on the time. For example, one viewer watches the same TV channel almost all the time and another viewer watches different TV channels as the time context changes. To solve this problem, we propose a novel TV channel recommendation method considering viewers watching patterns depending on different types of timeslots. To be specific, our method uses various time-aware preference models with different time contextual factors. Also, we utilize a constrained optimization to combine each time-aware preference model into one model. After merging viewers' time dependent propensities, top-k TV channels are recommended. Evaluation results with real-world dataset show that the proposed method produces higher performance than other common recommendation methods.

F1e-5 10:30-10:45

The YouTube Video Recommendation by Considering Subscription Information

Hanbyul Bang, HyeWoo Lee and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

With the increasing popularity of Social-Network Service (SNS), especially video-sharing SNS, YouTube has been beloved by many users. Users enjoy uploading videos on YouTube and communicate to each other with YouTube videos. However, recently with the outpouring of videos, a recommendation of proper YouTube videos to users has become necessary. In this paper, we propose a new YouTube video recommendation method that exploits not only user-video relations but also user-user relations with a collective matrix factorization technique. We use likelist, comment, upload information as user-video relations and use subscription information as user-user relations. Also, we show that this method very effectively works through experiments on the YouTube dataset.

F1e-6 10:45-11:00

A Study on Integration System of Maritime Safety Information for Safe Navigation

Doyeon Kim, Gyei-kark Park, Jung-sik Jeong and Kil-yong Kim

GMT Co., Ltd, Republic of Korea

Mokpo National Maritime University, Republic of Korea

The recent rise in maritime traffic volume has increased the frequency of marine accidents. The bridge of a ship is equipped many devices to support safe navigation. However, information, provided from many devices, tend to cause the officers to be in difficulty of deciding the importance and the priority of information. Therefore, it is keenly necessary to define which information be the most important for safe navigation and to present that information for the use of watch officers. The goal of this research is to design and implement the integration system with various marine safety information in ships.

Friday, 6 November

F1f / Rm#506 / Invited Talk 4

F1f-1 09:30-10:00 chair : Young-Chul Bae, Chonnam National University, Korea

“Elucidation of Brain Activities by Electroencephalograms”

Takahiro Yamanoi, Professor, Hokkai-Gakuen University, Japan

Friday, 6 November

F2f / Rm#506 / Invited Talk 5

F2f-1 11:20-11:50 chair : Takahiro Yamanoi, Hokkai-Gakuen University, Japan

“The Future is Coming: Intelligent Systems from the Media”

Sungshin Kim , Professor, Pusan National University, Korea

Friday, 6 November

F2p / 1st Floor / Poster Session

**11:20-12:30 Chairs : Myung Geun Chun, Chungbuk Nat'l Univ., Korea
Chang-Ho Hyun, Kongju National University, Korea**

F2p-1

Auto-focusing for TFT-LCD Inspection using Image Processing

Sa-Mun Kim, Ho-Hun Lee, Dae-Jong Lee and Myung-Geun Chun

Chungbuk National University, Republic of Korea

In this paper, we proposed an effective and rapid auto-focusing algorithm and also realized a real time auto-focusing system for TFT LCD defect detection. For these, two step auto-focusing technique was proposed for inspecting TFT LCD patterns. In the first stage, an optimal auto-focusing model by using the least square error method is constructed. And in the second stage, auto-focusing is performed by comparing focusing value calculated for input images with optimal focusing model. From various experimental results, we confirmed that the developed auto-focusing scheme makes it possible to perform in real-time with higher accuracy for TFT LCD inspection.

F2p-2

Detection of Human Intention by Classifying EMG Signals Obtained from a Forearm

Young Jae Kim and Seul Jung

Chungnam National University, Republic of Korea

This paper presents the detection of biological signals from human skin by electromyography(EMG) sensors. To capture the EMG signals, hardware has been implemented for filtering and amplification. To detect human intention, signals are classified as 4 categories by moving a hand. EMG signals of four different hand movements are captured from two channels attached on the skin. Each signal is filtered and analyzed. To distinguish EMG signals, the dynamic time warping method is used for classification into four patterns. The average success rate of pattern recognition is about 90%.

F2p-3

Control of Segway-type Mobile Robot based on Simple-structured Fuzzy Logic Systems

Hyun-Ho Yoo and Byung-Jae Choi

Daegu University, Republic of Korea

In this paper, we propose the design of some fuzzy logic control systems for the control of the Segway-type mobile robot, which is a kind of invert-ed pendulum system. We first designed two conventional fuzzy logic control systems for position and balance control of the Segway-type mobile robot. And then, we design another two fuzzy logic control systems with a single input variable for position and balance control of the Segway-type mobile robot. Finally, we present simulation results.

F2p-4

Sound Source based Human-Following of Mobile Robot using NSDs in a Networked Intelligent Space

Taeseok Jin, Dongseo University, Republic of Korea

The robots that will be needed in the near future are human-friendly robots that are able to coexist with humans and support humans effectively. To realize this, humans and robots need to be in close proximity to each other as much as possible. Moreover, it is necessary for their interactions to occur naturally. It is desirable for a robot to carry out human following, as one of the human-affinitive movements. The human-following robot requires several techniques: the recognition of the walking human, the feature extraction and soundbased detection and tracking, and the trajectory generation for following a human stably. This research addresses sound source based human tracking problems for autonomous cleaning mobile robot in a networked sensor space. To solve the problem, the difference among the traveling times of the sound source to each of three microphones has been used to calculate the distance and orientation of the sound source from the cleaning mobile robot, which carries the microphone array. The cross-correlation between two signals has been applied for detecting the time difference between two signals, which provides reliable and precise value of the time difference compared to the conventional methods. To generate the tracking direction to the sound source, fuzzy rules are applied and the results are used to control the cleaning mobile robot in a real-time. Finally the experiment results show that the proposed algorithm works well, even though the mobile robot knows little about the environment.

F2p-5

A Design of Information Replaying System Related to A Person of Interest Based on Multi-view

Kwang-Yong Kim, Yoo-Kyeong Kim, Gi-Mun Um and Kee-Seong Cho

Electronics and Telecommunications Research Institute, Republic of Korea

Many TV viewers want to watch their interesting object from their wanted viewing angle when they watch sports or soap opera on TV in recent years. Thus, we need a service which provides with video and information associated with viewer's interesting object which is shot from various angles of multiple cameras. We will define it the personalized object based broadcasting contents service. An interesting object also means any man who the viewer wants to watch. Especially, the broadcasting contents provider needs the system which can generate the meta data associated with viewer's interesting object on videos of the multi camera and can retrieve and extract the information associated with it. To meet this need, we have developed the meta data creation and retrieval system on movement objects taken from multiple cameras for this service.

F2p-6

Monitoring of renewable energy sources in RK: technological preconditions, architecture of system and market volume

Ravil I. Muhamedyev, I. Alihodzhaev, A. Ishmanov and J.Muhamedijeva

IITU, Kazakhstan

The work devoted to the problem of development of system to monitoring of renewable energy sources in RK. Wireless sensor networks, inter-machine communication system (Machine-to-Machine - M2M) and broadband networks based on new communication protocols that provide high speed and reliability of inter-machine connections will become the technological basis for big scale monitoring. Combining such disparate technologies within smart grids and using GIS for visualization presents strong interest for researchers both in terms of system architecture, economic indicators and security. Paper focused on the discussion of the elements of new technologies that could be used to develop system of monitoring renewable sources. The architecture principles and technologies that could be used in the realization such system are discussed. We made attempt to estimate volume of market that could appear as result of implementation of the system. We also briefly considered some examples of monitoring systems and technology aspects that lies at the basis of such systems.

F2p-7

Therapeutic Motion Study of a Cat Robot Based on Field Test for Autistic Children

Jin Kyu Lee, Bo-Hee Lee, Ja-Young Kwon, Keum-hi Mun and Jin-Soun Jung

University, Republic of Korea

In this paper, action patterns of a cat robot based on field test are suggested in order to assist in the treatment of Autistic children. Emotion expression using facial operation, eye-contacting, and reaction against user's touch are implemented using sensors in the robot to induce the interaction with Autistic Spectrum Disorders children. They can learn social activities through such action practice under the certain situations. During the robot action, robot plays the sound of human voice or cat sound with eyebrows, eyelids, and upper and lower lips to raise vividness with cat robot. The suggested actions are verified with robot experiment and be applied on the field test after exterior and skin design.

F2p-8

A Study on Mechanical Structure of Cat Robot Taking into the Characteristics of Autistic Spectrum Disorders

Jun Hyuck park, Bo-Hee Lee, Ja Young-Kwon, Keum-hi Mun, Jin-Soun Jung

Semyung University, Republic of Korea

Since autistic children having instantaneous reaction capacity is usually significantly lower than children of the same age, it is necessary to strengthen the joint portion of a cat robot. Moreover, in order to solve the attention lack that is a representative feature of autistic children, it is required to improve the concentration by putting expression in the face of the cat robot. Focusing on this point, it will be inclined to verify the face of the expression as well as firm the part of the skeleton go through joint experiments with autistic children where they obsess to something or express interest. In this paper, the mechanical structure considered the test field situation is suggested and the proper structure to the problem is followed.

F2p-9

Analysis of the Relationship between Joint Research and Convergence in Major Research Organizations

Dae-hyun Jeong, Suhyeon Yoo, Daeseop Kim, Jongseok Kang, Kyuhong Lee and Hyun-kyoo Choi

KISTI, Republic of Korea

This study was conducted to figure out the status, measure the degree of convergence of joint research by industrial entities, universities, and research institutes, and derive policy suggestions. For this purpose, a joint research network was implemented using the paper information released by industrial, academic, and institute organizations in Daejeon for the past four years and the convergence indices of the organizations were measured using the subject categories of the papers. The result of this study indicated that the research outcomes from universities and institutes are not spreading to companies and the convergence of studies in industrial entities was low. Therefore, policies to stimulate the spread of knowledge created in universities and institutes to business entities.

F2p-10

Simultaneous Estimation of Hodgkin-Huxley Neuronal Dynamics and Network Connectivity Based on Bayesian Statistics

Shinichi Kataoka and Toshiaki Omori

Kobe University, Japan

Nonlinear dynamics in brain plays an important role in advanced information processing of human, and has been studied extensively in order to understand how the brain works. We propose a Bayesian statistical method for estimating the network of neural systems governing brain dynamics based on the observed data. Based on electrical circuit model called Hodgkin-Huxley model, we derive a state-space model of neural systems consisting of Hodgkin-Huxley neurons. We employ statistical methods for the derived state-space model including the particle filter to estimate neuron model and network connectivity, simultaneously. Finally, we evaluate the validity of the proposed method using simulated data.

F2p-11

Statistical Estimation of Neural System Using Calcium Imaging

Hiroaki Inoue and Toshiaki Omori

Kobe University, Japan

We propose a statistical method to estimate dynamics in a neural system with multiple neurons. We formulate the generalized state-space model based on the generative process of the observable data provided by calcium imaging. In the proposed method, the latent variables representing the state of neurons, parameters of neuron units and network connectivity are simultaneously estimated by employing particle filter and expectation-maximization algorithm. We apply the proposed method to simulated data to verify the effectiveness of the proposed method.

F2p-12

Approximation-free control for Segway with unknown control coefficients

Byung Woo Kim and Bong Seok Park

Chosun National University, Kongju National University, Republic of Korea

In this paper, we propose an approximation-free control for Segway with unknown control coefficient. To deal with time-varying unknown control coefficient, we employ the Nussbaum gain technique. For the approximation-free control, we use the prescribed performance function which can adjust the transient and steady-state response. Finally, we provide the simulation results to demonstrate the effectiveness of the proposed control scheme.

F2p-13

Development of an Android robot EveR-3 for Performances

D.W. Choi, D. W. Lee, D. Y. Lee, and B. K. Ahn

Korea Institute of Industrial Technology, Republic of Korea

In this paper, we present an android robot EveR-3 for entertainment and its activities as a robot actress. EveR-3 is developed as an entertainment robot so, it has human like body, face can express emotion and it can lip-sync for dialogue. The face can make emotional expressions for acting by 23 motors inside. The body is made from human shape and it has total 55 DOFs so, it can imitate human acting. EveR-3 has a dialogue engine to talk so, it can say the lines. EveR-3 is the second robot actor in the world and the first robot actor in paid performance. It can make a role as an actor in several plays and entered to other field like fashion show as a model.

F2p-14

Rule Manager of the Active Rule-based Mobile Agent Middleware System

Yonsik Lee and Eun Hong Cheon

Kunsan National University, Woosuk University, Republic of Korea

The active rule system is a key element of the Rule-based Mobile Agent Middleware System for activeness and autonomy of the sensor network. The rule manager, which is the main components of active rule based mobile agent framework and active rule system for consumer oriented control, performs the general role which is related to such control and management of execution process between each of the elements involved in the registration, delete, and activate the rules. In this paper, we present a detailed design and implementation around the role and function of the rule manager. In addition, through the migration and rule execution of the rule based mobile agent and the operation of the active rule system by an external event, it shows the adaptability and applicability to dynamic environmental changes using by an active rule system in sensor networks.

F2p-15

Domain Decomposition Method for Finite Element Analysis Using Fuzzy Theory

Joon Seong Lee, Kyonggi University, Republic of Korea

This paper describes an application of domain decomposition method for finite element analysis which is required to structural analysis. Node is generated if its distance from existing node points is similar to the node spacing function at the point. The node spacing function is well controlled by the fuzzy knowledge processing. The Voronoi diagram method is introduced as a basic tool for element generation. Domain decomposition method using automatic mesh generation system holds great benefits for 3D analyses. As a parallel numerical algorithm for the finite element analyses, domain decomposition method was combined with an iterative solver, i.e. the conjugate gradient (CG) method where a whole analysis domain is fictitiously divided into a number of subdomains without overlapping. Practical performance of the present system are demonstrated through several examples.

F2p-16

Parking Violations Recognition using Computer Vision

A-Ram Kim, Hyung-Woong Jang and Sang-Yong Rhee

Kyungnam University, Republic of Korea

In this study, we propose a method to regulate parking violations using computer vision technology. A still color image of the parked vehicle is obtained by a camera mounted on enforcement vehicles. The acquired image is preprocessed through a morphology algorithm, binarization. Vehicle's shadows are detected from the

binarized image, lanes are detected by using the information yellow parking lines are drawn on the road. Whether or not parking is illegal is judged by the conformity of lanes and vehicle's shadow.

F2p-17

Design of a Transparent Tablet Computer

Jong M. Choi and Hyungryul Kim

Mokpo National University, Republic of Korea

Even though the conceptual design of crystal see-through smart devices have been well known, but only few prototype devices have been implemented. The crystal see-through devices have some merits such as aesthetic view and functional features by transparency. In this paper, we propose a transparent tablet computer which consists of a transparent display, a mini computer, and a camera. The transparent tablet will be a good platform for augmented reality applications, because users can see the real world with virtual objects through the device's display.

F2p-18

Forecasting of Time Series' Groups with Application of Fuzzy c-Mean Algorithm and Forecasting Models on the Base of Strictly Binary Trees and Modified Clonal Selection Algorithm

Nadezhda Astakhova, Liliya Demidova, Evgeny Nikulchev and Evgeny Pluzhnik

Ryazan State Radio Engineering University, Russian Federation

Moscow Technological Institute, Russian Federation

The paper is focused on the forecasting method for time series groups with the use of algorithms for cluster analysis. FCM-algorithm is suggested to be a basic one for clustering. The coordinates of the centers of clusters have been put in correspondence with summarizing time series data . the centroids of the clusters. A description of time series, the centroids of the clusters, is implemented with the use of forecasting models. They are based on strict binary trees and a modified clonal selection algorithm. With the help of such forecasting models, the possibility of forming analytic dependences is shown. It is suggested to use a common forecasting model, which is constructed for time series - the centroid of the cluster, in forecasting the private (individual) time series in the cluster. The promising application of the suggested method for grouped time series forecasting is demonstrated.

F2p-19

Objects' hyperspectral features' identification on the base of fuzzy linear regression and fuzzy similarity measures

Liliya Demidova and Sergey Trukhanov

Moscow Technological Institute, Russian Federation

Ryazan State Radio Engineering University, Russian Federation

The classification process support algorithms of shooting hyperspectral data, realizing objects' identification of the Earth's surface by means of their hyperspectral features' analysis, received from the processed space images with application of various similarity measures, are considered. Identification algorithms on the base of Euclidean distance similarity measure, angular similarity measure and fuzzy similarity measure are considered. The use expediency of fuzzy linear regression in the algorithm of objects' hyperspectral features' identification is shown. Results of hyperspectral information processing with using of the offered algorithms are presented.

F2p-20

SVM-classifier Development with Use of Fuzzy Clustering Algorithms' Ensemble on the Base of

Clusters' Tags' Vectors' Similarity Matrixes

Liliya Demidova and Yulia Sokolova

Moscow Technological Institute, Russian Federation

Ryazan State Radio Engineering University, Russian Federation

The objects' classification problem with application of clustering algorithms is considered. The SVM-algorithm using expediency for specification of classification decision, received with application of clustering algorithms, is shown. The ways of training set formation for the SVM-algorithm, realizing various versions of classification decisions' accounting, received with application of clustering algorithms, are offered. Use possibility of fuzzy clustering algorithms' ensemble on the base of clusters' tags' vectors' similarity matrixes for the training and testing sets' forming is shown.

F2p-21

Implementation of Distributed Coordinators for Cooperative Multiple Robot Systems Based on Hierarchical Modular Task Decomposition

Gen;ichi Yasuda, Nagasaki Institute of Applied Science, Japan

A distributed simulation and control method for industrial multiple robot systems based on the discrete event net models is proposed. Extended Petri nets are adopted as an effective tool to describe, design and control cooperative behavior of multiple robots. Based on hierarchical net decomposition, conceptual and detailed Petri net models are assigned to the upper level and the lower level controllers, respectively. For the lower level control, individual net models of robots and machines are executed on separate local controllers. The unified net representation for the hierarchical coordination of cooperative control is also proposed. Overall hierarchical and distributed control software is implemented and executed on a general hierarchical and distributed control architecture corresponding to the hardware structure of industrial multiple robot systems. The upper level system controller and lower level local controllers are concurrently executed, communicating events information (enabled transitions) with each other, so that the cooperative robotic tasks are successfully performed.

F2p-22

Quad Rotor Control Using Fuzzy Inference System

Eunseok Jang, Eun Kyeong Kim, Hyunhak Cho and Sungshin Kim

Pusan National University, Republic of Korea

This article introduces a driving control and a group control of quad rotors. The quad rotor is an under-actuated system with 4 inputs and 6 degrees of freedom; the position and orientation of the quad rotor are controlled by modulating 4-rotors attached at frame of X-form. Recently, an interest in a group control of the autonomous guided vehicle on the ground is growing, which can perform nearly impossible operation by one vehicle. Examples of nearly impossible operation are transportations cargo which is heavier and greater than the vehicle. To solve the mentioned problems, the system needs a group control or a vehicle bigger than cargo. The group control of two vehicles is efficient about aforementioned tasks. So this paper explains a control using Fuzzy Inference System, and the speed control of a quad rotor is implemented using dynamics of the quad rotor at a monitoring system. The monitoring system performs path planning and the speed control of quad rotors through communication with quad rotors. The performance of the proposed method is verified by simulation.

F2p-23

Visualizing States of Time Series by Supervised Gaussian Process Dynamical Models

Nobuhiko Yamaguchi, Saga University, Japan

Gaussian process dynamical models (GPDM) is a nonlinear dimensionality reduction technique for time series that provides a probabilistic representation of time series in terms of Gaussian process priors. In this paper, we study an extension of GPDM to visualize states of time series. Conventional GPDM is unsupervised, and therefore when labels of data are available, it is not possible to use this information. To overcome the problem, we propose a supervised GPDM (S-GPDM) which utilizes both data and their corresponding labels. In the experiments, we demonstrate that the S-GPDM can locate related motion data closer together than conventional GPDM.

F2p-24

Object classification boosted with visual attention region

Seongmin Kang and Heungwoo Han

Samsung Electronics, Co. Ltd., Republic of Korea

We propose novel prediction approach based on visual attention region for deep convolutional neural network. We introduce concept called “visual attention region” and “visual attention map”: visual attention region represent part of the object region used to distinguish from other object class and visual attention map means map holding attention intensity value for input image. We use output feature maps from last convolution layer to get visual attention map. We compared 4 different methods to get visual attention map from input image: max, sum, max aggregation, and max cluster. Visual attention regions are segmented from visual attention map. And each visual attention region is cropped for inference. Using this approach, it can produce more concrete performance for images with complex background or multi object. We achieved 16% improvement compared to state-of-the-art approach with 34 % less predictions. Reducing the number of predictions from 10 to 2~3, we outperform 10 crop approach by 25%.

F2p-25

Classification pipeline for multi label image

Seong Hoon Kim, HeungWoo Han and SeongMin Kang

Samsung Electronics, Republic of Korea

We propose novel prediction approach based on visual attention region for deep convolutional neural network. We introduce concept called “visual attention region” and “visual attention map”: visual attention region represent part of the object region used to distinguish from other object class and visual attention map means map holding attention intensity value for input image. We use output feature maps from last convolution layer to get visual attention map. We compared 4 different methods to get visual attention map from input image: max, sum, max aggregation, and max cluster. Visual attention regions are segmented from visual attention map. And each visual attention region is cropped for inference. Using this approach, it can produce more concrete performance for images with complex background or multi object. We achieved 16% im-provement compared to state-of-the-art approach with 34 % less predictions. Reducing the number of predictions from 10 to 2~3, we outperform 10 crop approach by 25%.

F2p-26

Edge Fields for Robust Object Proposal

Junseok Kwon, Andrii Grygoriev, Yusun Lim, Youngki Hong, and Hansung Lee

Samsung Electronics, Republic of Korea

In this paper, we present a novel object proposal approach that can accurately detect and localize objects in an image. Our method searches for objects with the assumption that an object can be represented by a closed boundary. To search for closed boundaries in an image, the method employs edge features with the proposed

Edge Fields (EFs) technique. With the EFs, our method can extract high quality of edges and can obtain good boundaries from the image. EFs consists of blurring and thresholding, in which blurring helps extract high quality of edges and thresholding prevents the method from losing image details during the blurring process. Experimental results demonstrate that our method is competitive with the state-of-the-art object proposal methods on the PASCAL VOC 2007 dataset.

F2p-27

Dynamic Models to Learn Physiological Response to Multimedia Stimuli

Patrick Mokodir Emaase, Seoul National University, Republic of Korea

We suggest dynamic models to learn and predict physiological responses of video-watching people who are exposed to multimodal stimuli, i.e. visual, aural, text, and haptic. Sliding-window-based time-series regression methods are considered as basic dynamic models and tested with audio-based arousal prediction case. We set the Mean Affective Profile (MAP) as the common arousal response indicator of people and did prediction experiment using a database of multimodal response to movies, CogDIEM. Experimental results show that systematic prediction of physiological response may be possible. Lag-based time series regression approach shows significantly better performances than sliding-window-based approach.

F2p-28

Scene-invariant Crowd Density Estimation with Aggregated Features

Jiyeoup Jeong, Jongwon Choi and Jin Young Choi

Seoul National University, Republic of Korea

Crowd density estimation is one of the challenging issues in computer vision area due to occlusion, various surveillance environment conditions like illumination, and diversity of the crowd density. To resolve these problems, a regression-based approach has been proposed, showing the state-of-the-arts results in the public data sets. However, the regression-based approach is hard to be applied to actual surveillance scene because users should train the regression model before they use. Annotating each pedestrians about a thousand frame is a laborious work for the training. In order to overcome this difficulty, we propose a scene-invariant crowd density estimation algorithm based on the regression. We get a low counting error in both the trained and the untrained scene by using the aggregated features and estimating geometric distortion for correction. Experimental results show that the proposed method outperforms state-of-the-arts in the dataset including various scenes.

F2p-29

Example-based Denoising for Detail Texture

Jongwon Choi and Jin Young Choi

Seoul National University, Republic of Korea

When the detail textures are weaker than the noises of image, the previous denoising algorithms wrongly separate the textures as a noise layer. Thus, the denoised result image loses the detail textures of the original image and the region of the texture becomes homogeneous. The removal of the textures is happened because the previous denoising algorithms separate a noise layer from noisy image based on a local similarity. To address the problem, we introduce an example-based denoising algorithm for preserving the detail textures. The algorithm removes the image noises without a removal of the detail textures by utilizing the texture information of a reference image. In addition, we propose a clustering-based optimization framework, which makes it possible to automatically detect a region of the removed textures. The proposed algorithm is demonstrated by real-world images, resulting in the denoised image where the detail textures are preserved

unlike the previous state-of-the-art algorithms.

F2p-30

Multi-Document Summarization Using Graph-Based Ranking Algorithm and Semantic Features

Jina Kim and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

This paper proposes a method for extractive multi-document summarization using semantic roles and semantic term weighting. We introduce an algorithm for extracting salient semantic roles to enhance graph-based ranking model for multi-document summarization. We parse the sentences to get semantic roles and then extract key roles which have higher term scores. We incorporate these selected features into the graph-based ranking model. The summary is generated in order of the saliency scores of each sentence. The results of experiment demonstrate higher ROUGE scores than several baselines and the semantic roles are useful features for multi-document summarization.

F2p-31

Prototypes Reduction based on Boundary Area for Nearest Neighbor Classifiers

Seok-Beom Roh, Jihong Wang, Yong Soo Kim and Tae-Chon Ahn

Wonkwang University, Daejeon University, Republic of Korea

In the design of prototype-based classifiers, it becomes important to reduce the number of prototypes without lowering the classification ability. Various methods to reduce the number of prototypes and in this way alleviate computational burden have been studied. In this paper, we introduce a new method for generating prototypes assuming that the prototypes positioned near the boundary of a region of any class are important in improving the classification abilities of nearest neighbor classifiers. The design procedure is illustrated with the aid of numeric examples that provide a thorough insight into the effectiveness of the proposed method.

F2p-32

Model of the determination of a normal word form for the Kazakh language

Fedotov A.M, Tussupov J.A., Sambetbayeva M.A., A.S. Yerimbetova

Institute of Computational Technologies of the Siberian Branch of the RAS, Russia

L.N.Gumilyov Eurasian National University, Kazakhstan

In this paper we considered models and existing algorithms of the word normalization of natural languages. The study described algorithms for the automatic word basis for some natural languages and possible synthesis of a normal form of the word for the Kazakh language.

The rules are developed for the normalization of the words for the Kazakh language and the algorithm for the processing of both dictionary words and words, which are not in the dictionary, including non-existing words. The thesaurus of scientific and technical terms on information technologies in the Kazakh language is created and the system of normalization is realized for it, proving the operability of the developed algorithm.

F2p-33

Distributed Stochastic Search Algorithm for n-Ship Collision Avoidance

Donggyun KIM, Katsutoshi HIRAYAMA, and Tenda OKIMOTO

Kobe University, Japan

Ship collision accident has a great effect on our life, economy and environment. To prevent ship collision, several methods are suggested, such as COLREGs, fuzzy theory, ant colony and genetic algorithm. These suggested ways, however, are hard to apply to multiple-ship situations. Because a ship estimates target ship's

movement on the basis of information only collected by home ship. To know intention of target ship is critical. Since changing ship's course needs to take lots of time, space and energy. To do that, we suggested the Distributed Tabu Search Algorithm(DTSA) to prevent collision in multiple-ship situations. We applied Tabu Search to prevent Quasi-Local Minima. And the number of candidate courses is increased to search wider space. Consequently, the number of collisions is reduced. A ship can search various solutions to avoid collision between ships. DTSA works well in multiple-ship situations. To search new course, however, a ship has to exchange the messages with neighboring ship twice, such as ok? and improvement messages. These messages are needed to notify target ship of its position information and to choose the right for selecting next-intended course among ships. Moreover, only a few ships can have a right to choose next-intended course to prevent infinite loop. As a result, the number of messages will be increased. It may cause problems, such as communication quality and the safety of navigation. There is a need to reduce the number of messages. Therefore, we propose the Distributed Stochastic Search Algorithm(DSSA) for n-Ship Collision Avoidance to reduce the number of messages. In DSSA, to search next-intended course, a ship sends a message to target ship if the position information changed. In some cases, it is unnecessary for communication. Also, multiple ships can choose next-intended course at the same time. Therefore, the number of messages can be quite reduced. We conducted experiments to know the performance of DSSA by compared to DTSA. The results for DSSA showed that not only the number of messages but also the number of collisions are reduced dramatically.

Friday, 6 November

F3a / Rm #501 / Neural Networks, Fuzzy, and Genetic/Evolutionary Algorithms

**14:00-15:30 Chairs : Seok Jong LEE, Chungbuk National University, Korea
Masataka Tokumaru, Kansai University, Japan**

F3a-1 14:00-14:15

Self-Organizing Neural Grove: Neural Network Ensembles Based on Pruned Self-Generating Neural Trees

Hirotaka Inoue, National Institute of Technology, Kure College, Japan

Recently, multiple classifier systems have been used for practical applications to improve classification accuracy. Self-generating neural networks (SGNN) are one of the most suitable base-classifiers for multiple classifier systems because of their simple settings and fast learning ability. However, the computation cost of the multiple classifier system based on SGNN increases in proportion to the numbers of SGNN. In this paper, we propose a novel pruning method for efficient classification and we call this model a self-organizing neural grove (SONG). Experiments have been conducted to compare the SONG with bagging and the SONG with boosting, and support vector machine (SVM). The results show that the SONG can improve its classification accuracy as well as reducing the computation cost.

F3a-2 14:15-14:30

Neural Network-Based Bayesian Optimization for Efficient Search of Organic Molecules

Sangwoong Yoon, Hanock Kwak, Cheolho Han, Munbo Shim, and Byoung-Tak Zhang
Seoul National University, Republic of Korea

Samsung Electronics, Republic of Korea

Screening is a typical approach for discovering novel molecules, but requires a tremendous amount of resources. Given a certain criterion for a desired molecule, the search task can be cast into an optimization

problem, where the domain is a set of candidate molecules and the function being optimized is a molecular property. However, the optimization is very difficult, because evaluation of a chemical property is very expensive and the derivative is unknown. Unlike other optimization techniques, Bayesian optimization works well even in such adversarial situations, and can be applicable to the problem. In this paper, we implement a neural network-based Bayesian optimization algorithm that can efficiently search a molecule with the desired electronic property. Our model is able to find the optimal molecule only with a small number of function evaluation. With our results, we claim that the search of molecule can be significantly accelerated by exploiting Bayesian optimization.

F3a-3 14:30-14:45

Automatic Summarization with Multi-objective Evolutionary Computation

Yukari Ogura and Ichiro Kobayashi

Ochanomizu University, Japan

The automatic summarization techniques have been required due to increasing the amount of electronic texts. With this background, many summarization methods based on important sentence extraction, called extractive summarization, have been proposed. In extractive summarization, generating a summary is regarded as solving a problem of the combination of important sentences. The candidate solution is evaluated based on the measures for various factors { for example, information coverage, avoiding redundancy and coherence in a generated summary, etc, which are usually in trade-off relation. In generating a summary, we solve the optimization problem under the constraint on a given summary length, taking account of those factors. Additionally, finding optimal solution efficiently is another hard problem to solve. Many summarization studies, which solve the optimization problem, employ the method with explicit solution techniques, whereas in this study we attempt to adopt evolutionary computation to obtain a solution in efficient time - we especially employ a multi-objective genetic algorithm called NSGA-II for satisfying the requirements of multiple factors represented as fitness functions. We conduct experiments on generating summaries with DUC2004 dataset and evaluate the results with ROUGE. Through the experiments, we have confirmed that using multiple fitness functions is better than using mono fitness function for generating a summary.

F3a-4 14:45-15:00

Intuitionistic Fuzzy Topologies Induced by Intuitionistic Fuzzy Approximation Spaces

Sang Min Yun and Seok Jong Lee

Chungbuk National University, Republic of Korea

In this paper, we obtain some basic results of intuitionistic fuzzy topological spaces induced by given intuitionistic fuzzy approximation spaces. In addition, we introduce the concept of pseudo-constant intuitionistic fuzzy relation, and obtain topological structures of an intuitionistic fuzzy approximation space by using them.

F3a-5 15:00-15:15

Membership Function Optimization of Kansei Retrieval Agents with Fuzzy Reasoning

Hiroshi Takenouchi and Masataka Tokumaru

Fukuoka Institute of technology, Japan

We propose a Kansei Retrieval Agent (KRA) model with fuzzy reasoning as the basis for a Kansei retrieval system. In our system, the KRA learns a user's preferences based on his/her evaluation of items from a large database. The system uses fuzzy reasoning for KRA model to express user's preferences by if-then rules and obtain the user's preferences with linguistic information. The proposed method optimizes membership functions

parameters, center values and kurtosis of fuzzy reasoning, using a user's evaluation of various items by genetic algorithm (GA). We performed a numerical simulation to demonstrate the effectiveness of the proposed method. The results showed that the proposed method was effective in learning a user's evaluation criteria.

F3a-6 15:15-15:30

An Integrated Fuzzy Trust Prediction Approach in Product Design and Engineering

A. Azadeh, Sh. Sadri, M.Saberi, E. Change, O. Khadeer Hussain and N.Pourmohammad Zia

University of Tehran, University of Tafresh, Curtin University of Technology, Iran

Product design and engineering is a basic phase in developing new commodity which considers the economic and technological aspects of new product. In proposed study "Trust" concept is identified as an effective factor on new product lifecycle and the trustworthiness of that is predicted based on some historical data. This article addresses a simulation structure to simulate all possible trust modes between two agents over time and implement four prediction methods to forecast the trust value of new item. The time horizon is considered to be middle-term horizon. Regards to this, 108 scenarios are proposed according to three categories: high trust, medium trust, low trust. Here, four prediction techniques; Conventional Time series, artificial neural networks (ANN) and Adaptive Neuro-Fuzzy Inference System (ANFIS); are recommended and compared. By comparing MAPEs for all prediction methods the best method of prediction is identified.

Friday, 6 November

F3b / Rm #502 / Machine Learning

14:00-15:30 Chairs : **Byoung-Tak Zhang, Seoul National University, Korea**

Von-Wun Soo, National Tsing Hua University, Taiwan

F3b-1 14:00-14:15

Learning Common Sense Associations Based on a Bipartite Network Using Matrix Factorization

Tzu-Chun Chen and Von-Wun Soo

National Tsing Hua University, Taiwan

We propose a computational model to learn the common sense association between a pair of concept classes based on a bipartite network and matrix factorization methods. We view the concept-pair association as a bipartite network so that the association mappings can be projected back as similarity constraints. We impose the additional similarity and regularity constraints on the optimization objectives so that a mapping matrix in the matrix factorization can be found to best fit the observation data. We evaluate the performance using the common sense association problems between location and activities in story generation. We extract 139 locations and 436 activities and 667 location-activity pairs from ConceptNet and conduct 10-fold cross-validation experiments. The prediction of location-activity associations can achieve precision up to 0.81 and F-score 0.50 respectively even the given observation data is sparse.

F3b-2 14:15-14:30

Multi-Document Summarization Using Graph-Based Ranking Algorithm and Semantic Features

Jina Kim and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

This paper proposes a method for extractive multi-document summarization using semantic roles and semantic term weighting. We introduce an algorithm for extracting salient semantic roles to enhance graph-based ranking model for multi-document summarization. We parse the sentence to get semantic roles and transform

the roles into a vector which represents sentence. We incorporate these semantic features into the graph-based ranking model. The summary is generated in order of the salient scores of each sentence. The results of experiment demonstrate higher ROUGE scores than baseline which use sentence units as a vector and the semantic roles are useful features for multi-document summarization.

F3b-3 14:30-14:45

Automatic Classification of Blog Posts Considering the Various Topics in Categories Using LDA

Suah Kim, Sungtak Oh and Jee-Hyong Lee

Sungkyunkwan University, Republic of Korea

Many blog sites provide blog posts classified according to predefined categories, because the classified posts are useful to obtain information for users. However, blog posts are difficult to be effectively classified because they have a large number of words and posts within a category may have various sub-topics. So, we need to choose proper feature words which help accurately classify documents into categories. Previous document classification work has tried to determine feature words assuming that a category had a topic. They did not consider sub-topics in categories. In this study, we extract sub-topics within categories by using the LDA, and propose a method of determining important feature words for categories considering their sub-topics. To evaluate the effectiveness of our proposed model, experiments are conducted using the SVM and the Naive Bayes. The experimental results show the classification performance is improved when using the proposed methods.

F3b-4 14:45-15:00

An Adaptive Computational Discourse System based on Data-driven Learning Algorithm

Seungwon Lee, Jaedong Hwang, Eunsol Kim, and Byoungtak Zhang

University of Michigan-Ann Arbor, Republic of Korea

This paper suggests a system which takes the role of cafe clerks and communicates with customers. The automatic dialog system is based on an algorithm of machine learning to estimate the intention of customers' talks which are entered into the system as texts and generate appropriate clerks' replies. Since the system learns characteristics of dialogues in the cafe from a corpus collected from real cafes, it is able to communicate with people naturally in cafe situations and it is also applicable to other circumstances.

The suggested system consists of four modules: a module which extracts information such as the menu from an input sentence, one which inserts the extracted information into an output sentence, one which guesses the intention of entered customers' request and one which produces an output based on the estimated customers' intention and the collected conversation corpus.

The modules which obtain additional information from the input and place it into the output are implemented to use the prior information like the menu because this study limits the experiment to conditions in the cafe. The others are designed on the basis of the Hidden Markov Model and a method of filtering and prediction.

To do the experiment, we recorded approximately 130 dialogues of ordering situations in a cafe and 12 dialogues each from another cafe and a bus terminal. Through processes of converting conversations into text and tagging the intention of each talk, the collected conversations were used for learning both the intention estimating module, a next sentence generating module and testing their performances.

Two types of the performance tests were conducted to evaluate the accuracy of the algorithm to estimate customers' intention and suitability of the generated clerk's words. 10-fold cross validation with 130 ordering dialogues were used for the accuracy evaluation of the intention estimation; the data set was divided into 10 subsets randomly, and 9 subsets were used for the module's learning while one subset was utilized for the test. The averaged accuracy showed that the module is able to guess the intention of the input sentence with

91 percent accuracy. Meanwhile, the naturalness of generated sentences was tested with a 7-point scale. The surveyors rated each sentence with 5.18 points and each dialogue (one set of conversation) with 4.47 points on average. Additionally, the system which used 130 dialogues for training was applied to cases of dialogues from another cafe and a bus terminal, and it showed the possibility of application in conditions other than a cafe by gaining 5.88 points for each sentence and 5.95 points for each dialogue on average in the situation of the bus terminal whose scores were higher than that of other cafe; 5.32 points for each sentence and 4.45 for each dialogue.

F3b-5 15:00-15:15

Vietnamese Word Clustering Method based Wikipedia and Its Sliding-Window Selection for Vietnamese Document Classification

Minh Tuan Pham and Thi Le Quyen Nguyen

The University of Danang, Viet Nam

Nowadays, within the development of information technology rapid development, the automatic document classification is an urgent problem. Many machine learning methods such as decision trees, artificial neural networks and support vector machines are applied to classify English documents with high efficiency. However, these methods are difficult to apply to classify Vietnamese documents because Vietnamese has many synonyms but being performed by different ways. This paper proposes a Vietnamese word clustering methods based on frequency appearing together on a Vietnamese Wikipedia page, paragraph and sentence to shorten the length of feature vector of the document. This paper also proposes methods using cluster analysis based on graph clustering dendrogram. The experimental results show that the proposed method has the correct clustering of the synonyms and the words with a common theme. It also shows that the Vietnamese document classification based on clustering result is better than conventional methods and Vietnamese document classification based on clustering result of using the paragraphs is the best ways among three proposed ways.

F3b-6 15:15-15:30

A study of efficient reinforcement learning using the relative angle of two objects

Moriaki Onishi and Takeshi Shibuya

University of Tsukuba, Japan

This study develops method of behavior acquisition by reinforcement learning. However conventional reinforcement learning algorithms require huge time because behavior to avoid obstacles for each direction must be learned. This paper proposes a new reinforcement learning algorithm which can effectively update action-value function focusing relative angle.

Friday, 6 November

F3c / Rm #503 / Vision and Sensors & Applications I

14:00-15:30 Chairs : Kyung Seok Byun, Mokpo National University, Korea

Jangmyung Lee, Pusan National University, Korea

F3c-1 14:00-14:15

Improved Measurement of Intensity for Reflective light in Optical Sensor

Youngchul Bae, Chonnam National University, Republic of Korea

The difficult reason to measure error in optical sensor such as laser range finder is that we have to compensate the difference of phase delay after we measure the intensity of reflective light. However, it is

hard to measure exact intensity of radiation because optical modulated waves are different to each other. In this paper, in order to solve these problems, we propose a novel measurement method of the output direct current (DC) voltage proportional to intensity of radiation in received circuit of APD. Thus, we implement measuring circuit that is able to measure exact reflective light. By using proposed method, we can measure the intensity of reflective light with real time and high precision.

F3c-2 14:15-14:30

Action Recognition and Possession-way of Smartphones

Young-Seob Jeong, KAIST, Republic of Korea

Action recognition is attracting many researchers because it can be used for many applications. Most of studies related to action recognition are not practical because they require the users to use the wearable sensors. To address this issue, there are some studies of action recognition using the smartphones, as the users carry smartphones by themselves. Unfortunately, these studies are also not practical because they assume that the users possess or carry the smartphones in a certain way (e.g., by hand). In this paper, we investigate the relationship the action recognition and possession-way recognition using smartphones. With experimental results with our generated dataset, we show that it is the best to recognize the actions and possession-ways concurrently.

F3c-3 14:30-14:45

Applications for Acquiring Location Information Using GPS Sensor in Smart Phone

Haruka Inoue, Satoshi Kubota, Ryuichi Imai and Shigenori Tanaka

Kansai University, Tokyo City University, Japan

It is important to grasp human activities in making urban plans or disaster prevention plans. Expectations are growing that the use of GPS sensor and activity recognition API equipped in a smart phone makes it possible to acquire location information with additional information on a user's mode of transportation. However, since GPS sensors are different from model to model, if the developer develops an application without understanding its characteristics, correct data may not be acquired depending on the model. In this research, with the objective of finding characteristics of GPS sensors and activity recognition API equipped in smart phones for developers of applications for location information services, we analyzed their survey data through experiments. In the analysis we added conditions for acquiring location information for each means of transportation, proposed a method for notifying location information at regular intervals, and summarized discussions on acquisition of location information in developing applications.

F3c-4 14:45-15:00

Sensitivity and Stiffness Measurement of Torque Sensor for Joint of Robot Manipulator

Hong-Xia Zhang and Kyung-Seok Byun²

Mokpo National University, Republic of Korea

The torque sensor for the joint of a robot manipulator is used to measure the joint torque. In the previous research, the sensitivity and the stiffness of the torque sensors have tradeoff characteristics. To increase the sensitivity of the sensor the stiffness has to be sacrificed. In this paper, sensitivity and stiffness of torque sensor are measured.

F3c-5 15:00-15:15

Robust object tracking algorithm using stereo camera

Hyunuk Ha, Haneul Yoon, Hoang Nhat Minh and Jangmyung Lee

Pusan National University, Republic of Korea

This paper proposes a visual servoing algorithm for the object tracking by a mobile robot with the stereo camera. The mobile robot performs an object recognition and object tracking using the SIFT and CAMSHIFT algorithm for the visual servoing. The CAMSHIFT algorithm has been used to obtain the three-dimensional position and orientation of the mobile robot. With the visual servoing, a stable balance control has been realized by a control system which calculates a desired angle of the center of gravity whose location depends on variations of link rotation angles of the manipulator. To demonstrate the control performance of the visual servoing, real experiments are performed using the mobile manipulator system developed for this research.

F3c-6 15:15-15:30

Performance Analysis of Online Weighted Multiple Instance Learning for Single Face Tracking at Outdoor Environment

Suryo Adhi Wibowo, Eun Kyeong Kim, Eunseok Jang, and Sungshin Kim

Pusan National University, Republic of Korea

It is rarely that researcher used face from toddler or child as an object for face tracking. Since they have a random behavior, it could make tracking method failed. In this paper, we will analyze online weighted multiple instance learning (WMIL) as a method for single face tracking with face from toddler or child as an object for face tracking in the outdoor environment. We used this method for tracking method because it will model the object as an adaptive appearance model. This approach is better than the object modelled by the histogram. We analyzed parameters from online WMIL such as window size for searching the target, number of rectangles, and learning rate. Our simulation results show that the combination parameter which has large impact for making precision tracking are searching window size, learning rate, and number of rectangles are 25, 0.70, and 6, respectively.

Friday, 6 November

F3d / Rm #504 / Vision and Sensors & Applications II

14:00-15:30 Chairs : Euntai Kim, Yonsei University, Korea

Junseok Kwon, Samsung Electronics, Korea

F3d-1 14:00-14:15

Fast generic object detection and localization on the basis of superpixel approach

Andrii Grygoriev, Hansung Lee, Junseok Kwon, Yusun Lim and Youngki Hong

Samsung Electronics, Co. Ltd., Ukraine

This paper describes an efficient generic object detection and localization (GODL) based superpixel approach. To increase the computational speed of the algorithm, we proposed a superpixel segmentation method which allows fast approximation of superpixel segmentation. Our GODL technique is an ensemble of two object proposal algorithms following after the proposed super-pixel segmentation stage. In experiments, the proposed approach could achieve both of high recall rates and speed at the same time.

F3d-2 14:15-14:30

Generic Object Detection and Localization Combining Saliency and Edge Visual Cues

Hansung Lee, Andrii Grygoriev, Yusun Lim, Youngki Hong and Junseok Kwon

Samsung Electronics, Co. Ltd., Republic of Korea

This paper proposes the generic object detection and localization approach, which alleviates some drawbacks

associated with saliency and edge visual cue based generic object detection. The proposed approach consists of two object proposal generation functions, i.e., saliency and edge based object proposal generation, and one scoring function, i.e., objectness measurement, which computes the value of how likely a proposal window covers an object of any category. The proposed method arranges the proposal windows with respect to the score values of objectness measuring and prunes the similar proposal windows. By compensating the weak points of each method, it is able to accurately generate small number of object proposals which contains almost objects in an image. Experiments show that the proposed method achieves best performance at higher IoU thresholds ($\text{IoU} \geq 0.8$). We propose a novel performance measurement, viz., weighted average recall, to estimate the recall and accuracy of object proposal at the same time. The proposed methods lead to a significant improvement in the generic object detection results in terms of weighted average recall over BING, Edge Boxes, and Objectness approach.

F3d-3 14:30-14:45

Illustration of an approach based on influence scores for detecting a change point

Kuniyoshi Hayashi and Koji Kurihara

Okayama University, Japan

A technique for detecting change points in the population properties of data has begun to attract increasing attention. This technique has been applied to areas as disparate as the early illness detection, the barrier prevention in security networks, and the fashion trend predictions. In classical statistics, which assume that the target data population parameters are fixed, outliers are detected by identifying observations that have characteristics different from those of the existing data. Optimal weights are then assigned to these influential outliers to obtain correct results and generate accurate predictions. However, when the population parameters of the target data change in a time dependent way, we must first precisely estimate the population parameters of the target data at each time point before analysis and predictive models can be derived from the estimated population parameters. We previously proposed a method for detecting the change point based on influence

functions and investigated its performance using limited numerical simulations. In this paper, we present the diagnostics results of a number of examples based on a real dataset, confirming the ability of our method to detect a change point in real data.

F3d-4 14:45-15:00

Novel Intersection Recognition Approach for Advanced Driver Assistance System Using Multi-Layer Laser Scanner

Jhonghyun An, Baehoon Choi and Euntae Kim

University, Republic of Korea

Recognizing the types of intersections is crucial for autonomous driving systems in urban environments for localization or path planning. In this paper, we propose a novel intersection recognition approach. We propose a two-step approach. In the first step, the SLOGM (Static Local Coordinate Occupancy Grid Map) is created without moving objects. We propose an algorithm for moving-object detection, followed by an algorithm for SLOGM. In the next step, novel intersection recognition approach. It compiles a database which includes the shape of SLOGMs according to each type of intersections. And then, it calculates the similarities between databased SLOGMs and current SLOGMs. Finally, the highest scored type of intersections is chosen as current type of intersections. In order to achieve this, a 2D laser scanner and camera must be equipped in vehicle.

F3d-5 15:00-15:15

An Efficient Searchable Encryption Scheme using Multi-Indices in Cloud Computing Environments
Junho Jeong and Young Sik Hong
Dongguk University, Republic of Korea

A Searchable Encryption System enables the clients to search encrypted keywords without compromising the security of the original data. Also, malicious users are able to take advantage of the Searchable Encryption Systems. At the same time, however, they can impose overloads to the system using a Brute force attack. As a result, it could be exposed through retrieving the critical information such as keys and generating huge amount of false queries. Therefore, we propose a novel Searchable Encryption Scheme based on multiindices by Bloom filter to deal with Brute force attacks efficiently.

Friday, 6 November

F3e / Rm #505 / Intelligent Robotics

14:00-15:30 Chairs : **Seul Jung, Chungnam National University, Korea**
 Masafumi Hagiwara, Keio University, Japan

F3e-1 14:00-14:15

Human Detection by Autonomous Rover for Anti-Theft Surveillance Using Image Processing
Abhishek Jain, Sachin Gaur, and Antimdev Mishra
Ansal Institute of Technology, India

Human Face detection has been proven one of the most interesting topics in research in the past few decades. It holds great importance in the field of Information and Communication. It is rapidly entering in all the sectors and aspects of our life. This paper is primarily focused on the human face detection by a rover using image processing in MATLAB. The rover detects the human presence face image by using the image processing in the MATLAB using viola-jones algorithm and generates the image and then send it to the remote observer through a server generated email with the attached image.

F3e-2 14:15-14:30

Rotation Vector Method for Localization of an Underwater Robot
Nak Yong Ko, Seokki Jung, and Youngchul Bae
Chosun University, Chonnam National, Republic of Korea

This paper describes a method for estimation of attitude of an underwater vehicle. The method uses an attitude heading and reference system (AHRS) and a Doppler velocity log (DVL) for measurement. The measurements of acceleration and magnetic field are transformed to rotation vectors and combined together. Then the combined rotation vector is transformed to difference in Euler angles between the measured attitude and the predicted one. The difference is used to correct the predicted attitude. The method is tested using real test data and compared with the methods that calculate angular difference directly without transformation to rotation vector. The comparison verifies the improvement by the proposed method over the previous methods.

F3e-3 14:30-14:45

Balancing Control of a Mobile Manipulator by an Acceleration-based Disturbance Observer
Yeong-Geol and Seul Jung
Chungnam National University, Republic of Korea

This paper presents the balancing control performance of a mobile manipulator built in the laboratory as a

service robot called KOBOKER. The robot has two wheels as a mobile base and two arms with 6 degrees-of-freedom each. For the balancing control performance, two wheels are controlled. An acceleration-based disturbance observer (AbDOB) is used to control the balance of the robot. Experimental studies are conducted to compare the balancing control performances between a PID control method and an acceleration-based disturbance observer.

F3e-4 14:45-15:00

Fuzzy Compensator Design for a Single-wheel Robot based on Static Instability

S. D. Lee and S. Jung

Chungnam National University, Republic of Korea

In this paper, the gyroscopic instability of a monocycle-like single-wheel robot is analyzed by means of the inverted stick model with vertical oscillation. To analyze the instability problem of the system, its dynamic model is described as a Mathieu's equation-like equation. We found that the instability characteristics are strongly dependent on the states of the gimbal system of the robot system. A fuzzy logic control method is employed to compensate for the instability. Inputs to the fuzzy logic are a rate angle and an angle of the lateral motion of the robot system. The performance of the proposed compensator is verified by simulation studies.

F3e-5 15:00-15:15

An Emotion Transition Model Using Fuzzy Inference

Natsuko Kato, and Masafumi Hagiwara

Keio University, Japan

This paper proposes an emotion transition model considering internal emotion and external input. The proposed model has internal emotion values representing each intensity of multiple emotions as internal states. Each intensity of emotions estimated from the input texts is given as the external input. These values of intensity are used as antecedent part, and emotion transition is estimated by fuzzy inference. The proposed model can treat the same external inputs differently considering the internal states: It can express emotion transition more naturally. According to subjective evaluation experiments, high correlation between the proposed model and humans is obtained.

F3e-6 15:15-15:30

Mobile Robot Indoor Localization Using SC-ICP of the Algorithm Based on LRF Sensor

yoseop Hwang, Wang Zhitao and Jangmyung Lee

Pusan National University, Republic of Korea

In this paper, we proposed a 3D map building method using Surface combination of the ICP algorithm. The environment information can't be well measured because of the vary speed and robot's kinematic features while the mobile robot is moving. According to this point, we proposed the SC-ICP algorithm which combined environmental continuous competence and features together to solve this problem. And through the experiment, we verified the performance of the algorithm.

Friday, 6 November

F3f / Rm #506 / Invited Talk 6

F3f-1 14:00-14:30 chair : Jin Hee Yoon, Sejong University, South Korea

"R for Data Science"

Dr. Valentin Todorov, United Nations Industrial Development Organization (UNIDO), Austria

Friday, 6 November

F4pn / Rm 1st Floor / Plenary Lecture-3

15:40-16:30 Chairs : Young-Jae Ryoo, Mokpo National University, Korea

"Machine Learning for Robots: Perception, Planning and Motor Control"

Daniel Lee, Professor, University of Pennsylvania, U.S.

Friday, 6 November

F5a / Rm #501 / Rough Set and Granular Computing: Theoretical Aspects and Applications

16:40-18:00 Chairs : Yasuo Kudo, Muroran Institute of Technology, Japan

Masahiro Inuiguchi, Osaka University, Japan

F5a-1 16:40-16:55

On Representation Ability of Interrelated Attributes in Rough Set-based Interrelationship Mining

Yasuo Kudo and Tetsuya Murai

Muroran Institute of Technology, Japan

Hokkaido University, Japan

The interrelationship mining, proposed by the authors, aims at treating hidden characteristics in a given information table based on comparisons of attribute values between different values. The main idea of the interrelationship mining is to explicitly describe such interrelationships between different attributes by introducing new attributes called interrelated attributes. In this paper, we discuss representation ability of the interrelated attributes.

F5a-2 16:55-17:10

Modification of the covering-based collaborative filtering model to alleviate the new user cold-start problem

Zhipeng Zhang, Yasuo Kudo and Tetsuya Murai

Muroran Institute of Technology, Japan

Hokkaido University, Japan

Recommender system analyzes the personal behavior of users to obtain their preferences and recommend the productions that users may have interests. The new user cold-start issue is an extremely difficult problem faced by recommender system in operation. Covering-based collaborative filtering (CBCF) is a useful model we have proposed in the previous work, which could make satisfactory recommendations for an active user, however, such model cannot select neighbors available based on the insufficient rating data for a new user. In this paper, we improve the CBCF model to solve the new user cold-start problem. Query options of a new user are utilized to generate the decision class, we define the covering degree as the similarity measure to select neighbors, and covering reduction is applied to remove redundant neighbors. Experimental results suggest that our improved CBCF model could select neighbors for a new user effectively. Furthermore, our model could present good values for the metrics of accuracy and coverage simultaneously.

F5a-3 17:10-17:25

Modified Interval Weight Estimation Methods for Interval AHP and their Comparisons

Shigeaki Innan, and Masahiro Inuiguchi

Osaka University, Japan

Interval AHP estimating interval weights has been proposed, from the viewpoint that the vagueness of decision maker's evaluation causes the inconsistency of a pairwise comparison matrix. In this paper, we demonstrate the insufficiency of the conventional interval weight estimation method and propose several modified estimation methods which reflect vagueness of decision maker's evaluation more properly. In those proposed methods, interval weights are estimated easily by solving linear programming problems. Numerical experiments are conducted to compare estimation methods from the viewpoints of the accuracy in estimating interval weights and of dominance relations between alternatives. Through the experiments, the advantages of modified estimations over the conventional one are demonstrated. Furthermore, we investigate the best estimation method among them.

F5a-4 17:25-17:40

Robust Localization for Elderly Patients Monitoring System of Nursing Home using RSSI

Lyniun Huang and Youngchul Bae

Chonnam National University, Republic of Korea

Node localization technology has been supported in WSN. In recent years, the research for node localization problem is getting more extensive according to the progress of IOT technologies. Generally nodes are divided into two kinds of beacon or access point node which are known node and unknown node.

Node localization is based on few access point (AP) nodes that have position information because it is fixed, and a beacon node has unknown position information because it is moving. In order to determine the unknown node position, we have to use two or three APs that have certain positioning information.

In this paper, we propose robust ranging method to apply in elderly patients monitoring system of nursing home by using RSSI. We show the result of measured point by applying trilateral technique, and also represent the result of error distance between ideal point and measured point.

F5a-5 17:40-17:55

TOA Trilateration Algorithm Based on Comparison of Intersection Distances

Sajina Pradhan and Suk-seung Hwang

Chosun University, Republic of Korea

The location detection technology (LDT), which has various applications, is one of the core techniques in the mobile communication system. The time-of-arrival (TOA) trilateration method, which is the representative algorithm for LDT, estimates the location of a mobile station (MS) using three circles based on the distances between MS and three base stations (BS) and the coordinates of their locations. However, there may be a serious estimation error, when radiuses of circles are increased and then they do not meet at a point. The solutions for reducing the estimation position error in a main case of meeting three circles with the extended radius are recently provided as the shortest distance algorithm and the line intersection algorithm. In general, they have good performance for the location estimation, but they may have serious errors in some cases. In this paper, we propose the efficient location estimation algorithm for the specific case with two large circles and one relative small circle. In this case, a small circle is located in the area of the two large circles and there are total six intersections based on the three extended circles. Also, a small circle has four intersections with two large circles. The proposed approach compares four distances based on four neighboring intersections and selects the shortest one. Finally, it determines the average coordinate of two intersections corresponding the shortest distance as the location of MS. The location estimating performance of the proposed algorithm is

illustrated by the computer simulation example.

Friday, 6 November

F5b / Rm #502 / Computational Intelligence

16:40-18:00 Chairs : Pok-Son, Kim, Kookmin University, Korea

Sang-Eon Han, Chonbuk National University, Korea

F5b-1 16:40-16:55

Application of Soft Computing techniques in a Central Air Conditioning System

Herbert R N Costa and Alessandro La Neve

Centro Universitário da FEI, Brazil

This paper presents the application of soft computing techniques to a central air conditioning system aimed at efficient energy consumption. The current buildings have automation systems that provide information about the lighting, electrical system, air conditioning system etc. We studied the air conditioning system, in particular with a view to efficient energy consumption. The air conditioning system had priority in this study because its energy consumption is high. Our primary goal in this study is the application of Neuro-Fuzzy System techniques, Decision Tree - CART Algorithm, Fuzzy Decision Tree . FID 3.4 Algorithm in the air conditioning system. The results of the applications were compared with the application of PID controllers, and fuzzy control system for a central air conditioning system.

F5b-2 16:55-17:10

Utility of the properties L_C and L_S for digital products

Sang-Eon Han, Chonbuk National University, Republic of Korea

The present paper studies various properties of a digital product with a C-compatible adjacency (or the L_C -property in [21]) which is different from a normal adjacency in [11] (or an S-compatible adjacency in [27] and the L_S -property in [21]) which can contribute to the study of product properties of digital spaces (or digital images). Furthermore, to study an automorphism group of a Cartesian product of two digital coverings which do not satisfy a radius 2 local isomorphism, which remains open, the paper uses some properties of an ultra regular covering in [24]. By using this approach, we can substantially classify digital products with C-compatible adjacencies. In particular, using a C-compatible adjacency (or the L_C -property), we address a product problem of a digital isomorphism. Finally, the present paper makes the result in [7] advanced in terms of the notion of a C-compatible adjacency of a digital product. This approach can contribute to a certain areas in computer science such as image processing, computer graphics, mathematical morphology and so on.

F5b-3 17:10-17:25

A Complexity Analysis of the SymMerge Algorithm on the Foundation of Decomposition Trees

Pok-Son Kim, Kookmin University, Republic of Korea

The SymMerge algorithm is based on a simple strategy of symmetric comparisons. The computational process of the SymMerge algorithm can be represented by a binary tree, where each node of the binary tree corresponds to the merging of some pair of sequences. We will give an analysis of computational complexity of SymMerge based on these binary trees.

If each node of such a binary tree corresponds to the merging of two non-empty sequences, then the binary tree has $2m - 1$ nodes (merging pairs) at most, where m represents the size of the shorter input sequence.

Based on this property we show that the complexity for two special cases of the SymMerge algorithm has the upper bounds $2m \log((m+n)=m) \cdot \log(m+n) + 4m \cdot 3$ regarding the number of comparisons.

F5b-4 17:25-17:40

Attitude stabilization of a quadrotor UAV using fuzzy H_∞ controller

Han Sol Kim, Jin Bae Park, Sung Kwan Kim and Young Hoon Joo

Yonsei University, Kunsan University, Republic of Korea

This paper proposes a design procedure for attitude stabilization of a quadrotor UAV using fuzzy H_∞ controller. The nonlinear dynamic equation of the quadrotor is represented as the T-S fuzzy model. A sufficient condition guaranteeing asymptotic stability and the H_∞ performance is derived based on an linear matrix inequality (LMI). Moreover, the fuzzy controller used in this paper employs different membership function from that of the fuzzy model. By doing so, the design flexibility is enhanced. Finally, the effectiveness of the proposed method is demonstrated through the numerical example.

Friday, 6 November

F5c / Rm #503 / HCI (Human-Computer Interaction)

16:40-18:00 Chairs : Takehisa Onisawa, University of Tsukuba, Japan

Masafumi Hagiwara, Keio University, Japan.

F5c-1 16:40-16:55

Healthcare system that suggests personalized exercises and meals

Ayu Hoshino, Hiroshi Takenouchi and Masataka Tokumaru

Kansai University, Japan

Fukuoka Institute of Technology, Japan

In this paper, we propose a healthcare system suggesting exercises and meals that are matched to an individual user. In Japan, the risk of lifestyle-related diseases has recently increased, and many are interested in improving their health. In particular, it is important to reduce the incidence of obesity that is considered to be the main cause of various lifestyle-related diseases. In this study, we focus on exercise and meal choice as a form of healthcare. We simulated creating personalized exercise menus using the tabu search and genetic algorithm search functions to create optimized and minimally overlapping exercise combinations for individual users. Therefore, the best search performance was obtained on using the genetic algorithm.

F5c-2 16:55-17:10

A Method for Visualization of Area Characteristics by Twitter Analysis

Yasuaki Hiranuma and Maki Sakamoto

The University of Electro-Communications, Japan

Various studies have focused on area characteristics. Although area characteristics has been analyzed by statistical data, very little attention has been paid to emotions, interests or personality of people in the areas. This study focuses on area characteristics reflecting emotions, interests or personality of people in those areas. In order to grasp such area characteristics, we analyzed microblog text posted at each area. Recently, microblog text with geotag has attracted attention as text reflecting affective aspects of people in the areas. On the other hand, the area characteristics such as temperature or population is frequently visualized by colors. This study uses colors to visualize area characteristics extracted from microblog texts. We visualize area characteristics by colors using the method authors proposed to estimate colors associated with texts. As a

result, we have deduced affective area characteristics by color and similarity of each area by color.

F5c-3 17:10-17:25

A Support System for Creating Picture Books with Onomatopoeia Respecting Children's Preference
Ryuichi Doizaki, Manami Honda and Maki Sakamoto
The University of Electro-Communications, Japan
Nico Children Clinic, Japan

We focus on sound symbolic words "onomatopoeia" (i.e., imitative or mimetic words such as "huwa-huwa" expressing a soft image) by which Japanese frequently express their intuitive or ambiguous image unable to be expressed by the general vocabulary. Onomatopoeic words are used abundantly in speech by and toward young children in Japanese, although use of these words is by no means limited to children's language. In order to grasp the type of onomatopoeia children prefer to, we conducted a psychological experiment. As a result of the experiment, we found that infants tend to prefer short onomatopoeic expressions without repetitions. On the basis of the preference of infants, we constructed a system which generates onomatopoeia that children prefer, and inserts it into a sentence inputted by users. Our system is expected to enable non-Japanese users to create picture books with onomatopoeia children prefer to.

F5c-4 17:25-17:40

Finding the Photo in Private Database Using the Result of Internet Image Retrieval
Yusuke OGIWARA, Tomonori HASHIYAMA and Shun'ichi TANO
The University of Electro-Communications, TOKYO, Japan

Recently, using wearable devices and digital cameras, it is very easy to record everyday things in multimedia data, such as sound, photo or video. For users who have such huge data in private, it is not easy to find out particular data which user wants. Under such circumstances, the users usually try to find them with any meta-information like recording date of the location, for example. However, as the amount of data is getting larger and larger day by day, the users suffer from a big burden to reach the specific data. At present, we don't have useful search engine for private database yet. On the other hand, we have powerful engines to search the huge amount of data spread in the internet database. In this paper, we propose an image retrieval system for private database using the results of internet image search engine. First, users try to find similar images with text-query through internet search engine. Users find images that have similar color profile, resemble layout, etc., to the aimed image among the search result. Using the similarity between retrieved data and private database, it is possible to bridge the images between internet and private database.

F5c-5 17:40-17:55

Generation of Anthropomorphic Image Reflecting Facial Expression
Takehisa Onisawa and Hongzhe Han
University of Tsukuba, Japan

In this paper, we propose a new anthropomorphic image generation method to express emotions in non-human object character images. Object images are divided into 3 categories. One is an object that has not any parts compared to human facial features. Another is an object that has parts compared to human facial features. The other is an object that has some parts compared to some of human facial features. The inputted image of an object is transformed into line-drawing. The obtained lines are redrawn fitting to human facial expression according to an inputted emotion word and object image category, and then, anthropomorphic images are drawn. Some candidates of anthropomorphic images are presented to a user. If a user is not satisfied with the presented images, a user can modify them. The modification procedures are repeated until a user is satisfied

with presented images. Through the subjective evaluation experiment and objective evaluation experiment, the effectiveness of the present-ed method is verified.

Friday, 6 November

F5d / Rm #504 / Rehabilitation and Therapeutic Robot

16:40-18:00 Chairs : **Bo-Hee Lee, Semyung University, Korea**
 Jeakweon Han, Hanyang University, Korea

F5d-1 16:40-16:55

Design of Control Algorithm of an Electric Wheelchair on the Slope Terrain

Jung Shik Kong, Induk University, Republic of Korea

In this paper, an electric wheelchair control algorithm on the slope terrain is suggested. According to Korea demographics, the population using wheelchair has been growing rapidly. However most of wheelchairs are not provided a system that ensures the safety on the slope terrain. So we propose the control algorithm of the electric wheelchair that can move safer and similar to the plains. The posture of the wheelchair are recognized in accordance with users input and angular velocity of each wheel without any position sensors.

F5d-2 16:55-17:10

Study on the Emotional Expression Using Modular Robot

kie sam An, Nik mohamad alif and Bo-Hee Lee

Semyung university, Republic of Korea

A modular robot that has combination and separation structure is suggested. It is designed and fabricated to be capable of not only doing several motions but also stimulating emotion of human. It has unique docking mechanism and separation method and also deploys the visual and auditory factors in the unit modular cell. Using those elements, we can express some emotional expression in the treatment field for the mentally handicapped. In this paper all the design details of modular robot and its emotion expression is suggested and discussed.

F5d-3 17:10-17:25

Study on cat robot application used in the treatment of Autism Spectrum Disorders. Ju-Young

Jang, Bo-Hee Lee, Ja-Young Kwon , Keum-hi Mun , Jin-Soun Jung

Semyung university, Republic of Korea

This study dealt with language therapy and play therapy using a cat robot to children on the Autistic Spectrum Disorders and verified the effects of such therapy. Two version of cat character robots so called SERO(Semyung Robot) I and II are suggested. First SERO I is designed to apply on the field test and get some feedback from the experiment. The improved robot design with compensation is followed, and conducted the second field test. Through twice field test, we verified the effectiveness in the treatment of ASD children.

F5d-4 17:25-17:40

Development of the Notification Device Capable of Preventing the Death of Elderly

Jong-Tae Kim, Jung-Shik Kong and Jin-Geol Kim

Inha University, Republic of Korea

Induk University, Republic of Korea

This paper deals with the notification device capable of preventing the death of elderly based on the pulse and SpO₂ sensors. Nowadays, the population of the elderly people are growing rapidly. Especially, the problem of the senior citizen who lives alone is magnified as the important social issue. At that time, bio-signal terminal can help senior to escape the emergency situation. In this paper, we develop the emergency alarm device included pulse and SpO₂ sensors to measure the bio-signal of the elderly in real time. To measure the bio-signal accurately, we apply the optimal sensor data by using simulator.

F5d-5 17:40-17:50

The Bipedal Walking Method for a Full-sized Humanoid Robot, CHARLI

Jeakweon Han, Michael A Hopkins, Dennis W. Hong

Hanyang University, Republic of Korea

Virginia Tech, USA

UCLA, USA

This research effort aims to develop a full-sized humanoid robots, and to research a simple but reliable bipedal walking method. Although various humanoid robots have successfully demonstrated their capabilities, bipedal walking methods are still one of the main technical challenges that robotics researchers are attempting to solve. It is still challenging because most bipedal walking methods, including ZMP (Zero Moment Point) require not only fast sensor feedback, but also fast and precise control of actuators. For this reason, only a small number of research groups have the ability to create full-sized humanoid robots that can walk and run. Therefore, this research focuses on both developing a simple but reliable bipedal walking method and building a full-sized humanoid robot, CHARLI. This paper shows the efficient way to build and to utilize the a full-sized humanoid robot

F5d-6 17:50-18:00

Towards a Hierarchical Neuromuscular Control Model with Re ex-based Spinal Control

Seungmoon Song, Carnegie Mellon University, United States

Humans can generate diverse locomotion behaviors through the hierarchical control of the supraspinal and the spinal systems, where the spinal control is often assumed to consist of central pattern generators and reflexes. It has been demonstrated through simulation that human walking and running can be generated with control models where the central pattern generator is controlled in a hierarchical structure. However, no reflex control model in such framework has been proposed. Here we propose that locomotion behaviors can be controlled by a hierarchical control structure where the supraspinal system modulates reflexes with simple signals. We demonstrate in physics simulation that a simple neuromuscular model with a hierarchical reflex control can regulate running speed and height on unknown terrains with height differences of ± 10 cm.

Friday, 6 November

F5e / Rm #505 / KITECH Project Symposium

16:40-18:00 Chairs : **Sung-Ho Lee, KITECH, Korea**

Dae-Yeong Im, KITECH, Korea

F5e-1 16:40-16:55

Design of Wireless Power Transfer Systems for Automated Guided Vehicle Battery Chargers

Kwang-Kyo Oh, Dae-Yeong Im, Myung-Bok Kim, and Sung-Ho Lee

Korea Institute of Industrial Technology, Republic of Korea

In this note, we consider the design of wireless power transfer systems for the battery charging of automated guided vehicles (AGVs). As AGVs often use batteries, which need to be charged or changed periodically, battery management schemes could significantly affect the benefits and performance of AGVs. Motivated by this, we present design considerations for wireless power transfer systems that can be used for the battery charging of AGVs. Accordingly, we propose a step-by-step design procedure and validate the proposed procedure.

F5e-2 16:55-17:10

Designed of Drive System for Greenhouse Unmanned Vehicle

Bongwoo Kwak, Youngkuk Choi, Dae-Yeong Im, and Myungbok Kim

Korea Institute of Industrial Technology, Republic of Korea

As rural areas have been experiencing lack of workforce and aging rapidly in recent years, problems such as lack of labor and rising labor cost are increasingly emerging. To deal with these problems, developed countries are actively engaging in technology development of robots and automated system. This thesis aims to propose the design of unmanned operating system of unmanned vehicles for controlled horticulture. It designed magnetic-based unmanned vehicles and 2-channel operating drive system. It also applied intelligent control algorithm to verify controlling features and effectiveness of the operating system.

F5e-3 17:10-17:25

Design of Optimized Mechanism for Agricultural AGV (Automated Guided Vehicle)

Myeonghwan Hwang, Sungjun Park, Hyun Rok Cha, Dae-Yeong Im, Donghyun Kim, Seungjin Yang, Taehyeok Park, Eui-Sun Kim and Eun Gong Ahn

Chonnam National University, Shin Gyeong University, Republic of Korea

Korea Institute of Industrial Technology, Republic of Korea

Georgia Institute of Technology, USA

This article suggests the design of driverless agricultural vehicle mechanism using a magnetic field based system. Suggested designs include: 1) a vehicle frame and chassis applicable to glass and vinyl greenhouse environments, 2) a multi-purpose and component changeable AGV vehicle in sliding format. Four wheel and two wheel type magnetic field based vehicle mechanisms were designed using our suggested methods.

F5e-4 17:25-17:40

Design of AGV (Automated Guided Vehicle) for Greenhouse

Dae-Yeong Im, Sung-Ho Lee, Hyun-Rok Cha, Myung-bok Kim, and Kwang-kyo Oh

Chonnam National University, Shin Gyeong University, Republic of Korea

This paper proposes the design of AGV (Automated Guided Vehicle) for greenhouse environments. AGV is consisted of vehicle chassis, drive system, and control system. It applies magnetic based unmanned driving mode for its driving method. In the future, AGV will be developed using current design.

F5e-5 17:40-17:55

Design and Analysis of Permanent Magnet Synchronous Motor for Automated Guided Vehicle

Jeong-Man Kim, Dae-Young Im, Kyu-Seok Lee and Sung-Ho Lee

Chonnam National University, Shin Gyeong University, Republic of Korea

This paper presents the design and analysis of permanent magnet synchronous motor for automated guided vehicle. First of all, we discuss the design procedure of PMSM for traction machines of AGV application.

Next, we perform initial design and electromagnetic analysis of PMSM. Based on this result, the design optimization of magnet shape is presented with respect to PM offset and magnet width in order to reduce cogging torque. Finally, the validity of designed PMSM that satisfies the required specifications is confirmed by dynamic analysis.

Friday, 6 November

F5f / Rm #506 / Advancement of Intelligent System & Cool Systems

16:40-18:00 Chairs : Keitaro Naruse, University of Aizu, Japan

Yuichi Yaguchi, University of Aizu, Japan

F5f-1 16:40-16:55

Drive scenery estimation using image features extracted from roadmap and satellite images

Kenta Oku, Ryosuke Yamanishi, Kohei Matsumura, and Kyoji Kawagoe

Ritsumeikan University, Japan

We aim to develop a scenery-aware route recommender system. For this purpose, we need road network data attached with drive scenery tags, such as mountainous, seaside, and country scenery. However, commercially available road network data and the OpenStreetMap give no tags related to drive scenery. One of the ways to automatically attach drive scenery tags to routes is to infer the scenery of the location by analyzing images taken by an on-vehicle camera with a GPS. However, there is a variety of noise that affects the inference accuracy, such as slight tilts of the camera, differences in camera models, and brightness variations caused by weather and time of day. The most essential problem is that data comprehensiveness is low because of the high cost of collecting scenery images by physically driving to all locations. Therefore, we focus on roadmap and satellite images, which look at the locations from the sky. Based on the distribution of image features extracted from roadmap and satellite images, we set up and examine hypotheses related to image features that are effective for estimating the drive scenery. We also created a training model that includes these features, and evaluated its accuracy for estimating the drive scenery using test data. The experimental results suggest that the image features from the roadmap and satellite images improve the accuracy of drive scenery estimation.

F5f-2 16:55-17:10

A Coarse-to-Fine Strategy for Full Pixel Image-Matching in High-Resolution Images

Yuichi Yaguchi, Yuta Hiroto, Takaaki Mamiya, and Ryuichi Oka

University of AIZU, Japan

Image registration is a key issue in many computer vision problems such as object recognition and 3D shape reconstruction by structure from motion, where there is a need to identify many precise trajectories in a set of pictures. Two-dimensional continuous dynamic programming (2DCDP) is a full pixel image-matching technique for obtaining a large set of corresponding points. In this paper, we improve the 2DCDP algorithm to enable its application to larger images, where the conventional method would involve excessive memory requirements. First, we reduce pixels to a suitable size to enable coarse matching. Second, we obtain corresponding blocks in the original images from the results of the coarse matching. Finally, we extract the actual corresponding points in the original images to apply to each segmented subimage. From our experimental results, the proposed method is more effective for extracting precisely corresponding points than previous methods.

F5f-3 17:10-17:25

Normalization and matching routine for comparison of native speaker and non-native speaker tongue

trajectories.

Shusuke Moriya, Yuichi Yaguchi, and Ian Wilson

University of AIZU, Japan

The main purpose of this research is to specify articulation difference between native and non-native speakers by digitizing tongue motions and analyzing the difference between utterances. Differences in tongue motion directly influence speaker's pronunciation, therefore it may be possible to improve non-native speaker's efficiency of pronunciation practice with the relevant feedback and visualization. It is necessary for comparison of native and non-native speakers' tongue motions to that end, however, normalization is absolutely necessary to remove the influence of anything except tongue motion before comparison, because every person has a unique shape and size. In this paper, we use coronal cross section of the tongue taken by ultrasound scanner to carry out the following: first record the ultrasound of speaker's tongue motion using the corpus "The Boy Who Cried Wolf." Then, sample tongue motion by using a histogram of oriented gradients and Karhunen-Loeve expansion. Next, apply eight prepared normalizations to tongue motions. Finally, compare each tongue motion per frame via dynamic time warping. The experimental result allowed us to compare with speaker's tongue motions in sentences which were recorded in different environments or by different speakers and to point out non-native speaker's speaking errors.