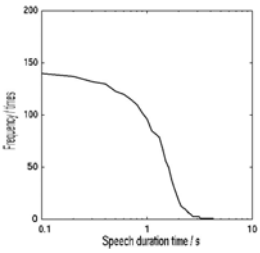
Session: OS1
System sensing and control I
OS1-1 Analysis of speech signal based on frequency distribution and intonation

Naoya Ohta and Akio Nozawa
(Meisei University, Japan)

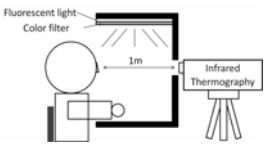
In this study, the atmosphere as a communication mode of human was defined by time information of speech. The objective of this study was the development of quantitative measurement technique of the atmosphere as KANSEI in a group. The communication mode of the group was indexed by using a time frequency distribution analysis on conversation voice. In particular, a speech duration time was focused. And the correlation between the time series of the speech duration time and a communication modality was evaluated. Consequently, the difference of the communication mode between man and woman was seen in the speech duration time. And a difference of the characteristics of speech was found in the duration time and the frequency. A discriminant of both sexes was obtained based on characteristics of the speech of frequency and the duration time.



OS1-2 Color influences on human being evaluated with nasal skin temperature

Tota Mizuno, Naoki Nakategawa, and Yuichiro Kume
(Tokyo Polytechnic University, Japan)

Since colors affect human conditions physiologically and mentally, various studies about the color influences have been conducted. Most of the studies have been focused on psychological aspects. In this study, we investigate the color influences physiologically by use of infrared thermography. With this technique, subjects wear no devices, and objective values are expected to be obtained to evaluate the color influences. Nasal skin temperatures were measured by infrared thermography under yellow, red and blue illuminations. As a result, significant temperature change was observed under red illumination.



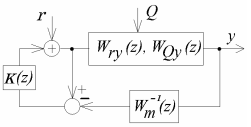
OS1-3 Air speed control of airship-type fish robot

Kunihiko Sato and Masafumi Uchida
(The University of Electro-Communications, Japan)

This paper deals with progress in movement performance and air speed control of the Balloon Fish Robot (BER). The BFR is an airship type fish robot gets impelling force by vibration of the first joint and the second joint. This movement is generally called fish's wriggling motion. The movement of the BFR that moves a three dimensional space is due to the actuator that the BFR has. We consider impellent of the BFR and measured the impellent of the BFR with a force sensor. The purpose of the research is to build the motion equation of the BFR, compare with a real machine movement, and to control the air speed of the BFR.

OS1-4 Regulated plus and minus power supply using approximate 2DOF robust digital control

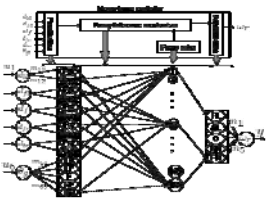
Atsushi Saitoh, Yusuke Tsuruhori, Yoshihiro Ohta, Kohji Higuchi, and Kazushi Nakano
(The University of Electro-Communications, Japan)



A plus and minus switching power supplies are needed for many applications, for example audio power supply. Since the output voltage changes of such power amplifiers which are loads are large, the power supply voltages are changed largely. Usually, in order to suppress the change, a capacitor with large capacity is used at the output end. If the capacities are made small, the power supplies can be compacted. In this paper, it is shown that the capacities can be made small using a robust digital control using an approximate 2DOF. The derived controller is actually implemented on a DSP. It is demonstrated from experiments that the power supplies can be compacted by the robust controller.

OS1-5 Angle-based neuro-fuzzy navigation for autonomous mobile robots

Shu Hosokawa, Joji Kato, Kazushi Nakano, and Kazunori Sakurama
(The University of Electro-Communications, Japan)



This paper presents a neuro-fuzzy navigation method for mobile robots based on local sensors mounted on the robot. This method is not sensitive to sensor noise, and is able to automatically adjust the internal parameters given by the teacher signal. However, most of previous studies dealt with two-wheel driven robots have focused on the acceleration control of their wheels. For this reason, it is difficult to generate teacher signals for robots with many actuators such as omnidirectional mobile robots. In this paper, we propose a method of neuro-fuzzy navigation based on control of rotation speed of the robots. We demonstrate the validity of our proposed method through simulations and experiments.

Session: OS2
System sensing and control II

OS2-1 Quantitative evaluation of body-sway caused by tactile apparent movement

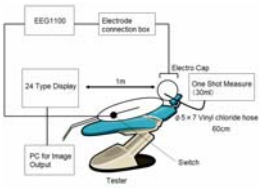
Kennichi Mogi and Masafumi Uchida
(The University of Electro-Communications, Japan)

The recognition of tactile apparent movement is normally a subjective sense. If we apply tactile apparent movement to engineering system, a quantitative evaluation is necessary. In previous study, we found the body-sway caused by tactile apparent movement in a fixed experimental condition. However, characteristic of body-sway was not fully investigated. In this study, we aimed to investigate the body-sway caused by tactile apparent movement in a fixed experimental condition. For the purpose, we focused on biological information and body-sway, compared the recognized trial with non-recognized trial. Our findings will be conducive to better performance of the system that using tactile apparent movement.

OS2-2 A visual-taste interference model and the EEG measurement

Hisaya Tanaka and Yuichi Sato
(Kogakuin University, Japan)

The taste cognition is interfered by interfering with the visual information. However, the mechanism has not been clarified. We assumed the interference model in the process of the taste and the visual information. And, the model was tested by the frequency analysis on EEG and the button response time. The tasks were the matched/miss-matched between the taste and the visual information of orange or apple juice. There were a change in the α wave that originated in the visual processing of a juice package and a change in the β wave that originated in the taste processing. There was the possibility with the parallel processing mechanism in the visual-taste interference since the button reaction time.



OS2-3 Dynamic analysis of dorsal thermal image

Akio Nozawa and Yuya Takei
(Meisei University, Japan)

A dynamic analysis was subjected to thermal images of dorsal of the foot in this study. Psychophysiological effects of a facial massage by aesthetician was evaluated. First, psychophysiological effects of facial massage were assessed on proprietary stress test. Physiological indices measured were alpha-wave power spectrum, dorsal skin temperature variations and high frequency component of heart rate variability. STAI, POMS (Brief Form) and amount of sensory awareness was administered to evaluate for psychological status. The aspects of the amount of sensory awareness were comfortable, awakening and effect of massage. Secondary, we assessed stress response on thermal image of dorsal of foot. Thermal image of dorsal of foot was measured by infrared thermography device.

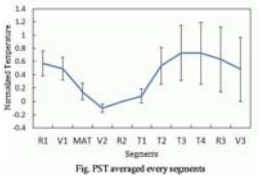
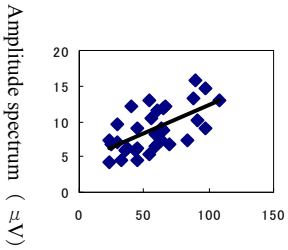


Fig. PST averaged every segments

OS2-4 Feature extraction of human face image for preference database

Yu Tachikawa and Akio Nozawa
(Meisei University, Japan)

In this study, aimed for a palatableness judgment for the face image of the person by the single trial ERP. Cognitive task imposed on subjects with human faces. At the time of the image presentation of the key push it down, and impose a problem the time response time (RT). 200ms to 400ms after image presentation time of peak positive potentials appear focused ± 100ms. Calculated from the maximum amplitude ± 100ms latency and area of potential. P300 is analyzed to extract frequency components, 1.28 seconds for ERP 2-3Hz amplitude spectra obtained.1 Analyzed EEG frequency components appear to recognize the human face image and asked the potential spectrum. Spectral correlation potential in the area and potential. Correlated with latency and RT. Single-trial ERP waveforms were extracted correctly.



Session: OS3
Control and automata I
OS3-1 Observer-based guaranteed cost control

Erwin Susanto, Mitsuaki Ishitobi, and Sadaaki Kunimatsu
(Kumamoto University, Japan)

This paper presents a design scheme of a minimal order observer-based guaranteed cost controller for uncertain linear systems. The perturbations are assumed to be described by structural uncertainties. An iterative linear matrix inequality (ILMI) approach is used to design the observer-based controller since the problems contain inverse relations. We modify the algorithm of Matsunaga et al by optimizing a sufficiently large initial guaranteed cost. This method can be implemented by LMI control toolbox of Matlab. Finally, a numerical example is given to illustrate the effectiveness of the proposed method.

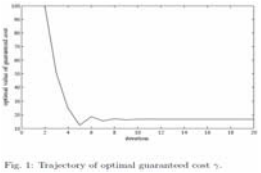
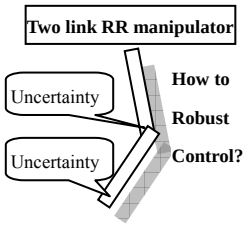


Fig. 1: Trajectory of optimal guaranteed cost γ_i.

OS3-2 Observer based control of a manipulator system with structured uncertainty

Chikara Aikawa, Nobuya Takahashi, Osamu Sato, and Michio Kono
(University of Miyazaki, Japan)

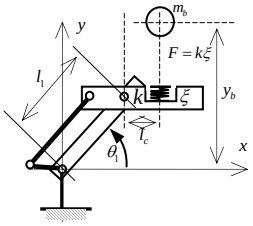
In this paper, we show an uncertain model of two link RR manipulator with uncertainties in two rotational angle of each joint, and also shown the extended system of uncertainty in an output matrix. For this system, we apply guaranteed cost control based on the linear upper bound. Parameter tuning of γ_i in linear upper bound is effective to design the feedback gain which have appropriate characteristics. In the numerical simulation, we show advantage that the state observer is effective to reduce the influence of signal noise in state vector.



OS3-3 Analysis of manipulator in consideration of collision between link and object

Asaji Sato[1], Osamu Sato[2], Nobuya Takahashi[2], and Masahiro Yokomichi[2]
([1]Miyakonojo National College of Technology, Japan)
([2]University of Miyazaki, Japan)

In this paper, equations of motion of a manipulator are derived in consideration of characteristics of driving source. Considering the collision between the link and object, and considering the active motion to absorb kinetic energy of the object, trajectories for saving energy are calculated by iterative dynamic programming. And, the dynamic characteristics of manipulator controlled based on the trajectory for saving energy are analyzed theoretically and investigated experimentally.



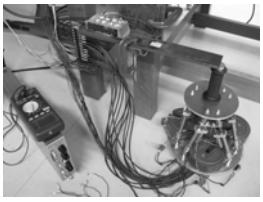
OS3-4 Motion control of 2 DOF orthogonal robots with adaptive control

Kazuma Funahashi, Feifei Zhang, and Masanori Ito
(Tokyo University of Marine Science and Technology, Japan)

This study is concerned that motion control for 2 DOF orthogonal robot that is crossed two industrial linear robots with adaptive control.
It is well know that an adaptive control possess good performance to the system where its dynamics is variable or unknown, because it always measures inputs and outputs, and adjust control signal with estimating system dynamics on real time.
We confirmed the performance of this control by using experimental system constructed with orthogonal two axis robots, one is about 1m length and other is about 0.5m length. The system parameters are changed with changing carrying weights.
Exactly motion control needs high sampling and control, and it is a week point for adaptive control. In our system, however, the results showed all the required performance are satisfied, and the adaptive control is thought to be also useful for such kind of difficult target as high-speed robot.

OS3-5 Development of 6-DOF force feedback system for rehabilitation of wrist paralysis

Yasunobu Hitaka[1], Yoshito Tanaka[2], Yutaka Tanaka[3], and Tomonori Kato[2]
([1]Kitakyushu National College of Technology, Japan)
([2]Fukuoka Institute of Technology, Japan)
([3]Hosei University, Japan)



The increasing number of paralyzed persons and a shortage of the physical therapist is becoming an increasing problem, focusing attention on rehabilitation support. Noting the increase in wrist paralysis, we are developing corresponding rehabilitation support. Our basic approach centers on force feedback system based on the parallel 6-degree-of-freedom (DOF) Stewart platform. In this paper, we focus on the calculating six cylinder forces which are component forces of a desired output force of the parallel mechanism. Also we focus on drawing a 3D computer graphic (CG) model which shows synchronized movement with the parallel mechanism in virtual space. This part plays a role as a monitor of the system. In this paper, we show the synchronized motion of 3D-CG with the parallel mechanism and experimental force control results.

Session: OS4
Intelligent Control
OS4-1 Feedback stabilization of linear systems with distributed input time-delay by backstepping method

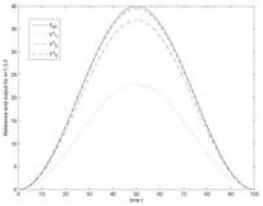
Chaohua Jia
(Beihang University, China)

The stabilization problem of a linear time-invariant system with lumped and distributed delays in the control will be investigated by the backstepping method. A transformation is introduced firstly to reduce the system with distributed input delay into a system with lumped input delay. The transformation kernel can be expressed explicitly through solving a Cauchy problem of ODEs. Then the backstepping arguments can be applied to work out a feedback control for the original system, where the key point is to model the lumped delay by a first-order hyperbolic partial differential equation.

OS4-2 Discrete-time iterative learning control for relative degree systems: a 2-D approach

Deyuan Meng and Yingmin Jia
(Beihang University, China)

This paper is devoted to the two-dimensional (2-D) design problem that arises from discrete-time iterative learning control (ILC). For linear time-invariant (LTI) systems with well-defined relative degree, a unified ILC algorithm is considered which provides wider freedom for the updating law formation. It demonstrates that an appropriately defined variable, together with the tracking error, can be employed to establish the Roesser systems based 2-D description of the ILC process. This enables both asymptotic stability and monotonic convergence of the relative degree ILC systems to be achieved. In particular, conditions for the monotonic convergence are described in terms of linear matrix inequalities (LMIs), which directly give formulas for the updating law design.

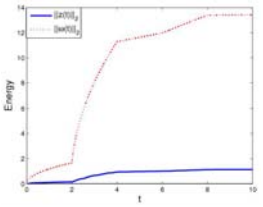


OS4-3 Distributed robust consensus control of uncertain multi-agent systems

Yang Liu and Yingmin Jia
(Beihang University, China)

This paper is devoted to the robust consensus control of multi-agent systems with model parameter uncertainties and external disturbances for networks with switching topology. In particular, a sufficient condition for the consensus performance with a given $H\infty$ disturbance attenuation level is established for the multi-agent system governed by general linear differential equations, and meanwhile the unknown feedback matrix of the proposed distributed state feedback protocol is determined. The condition is given in terms of linear matrix inequalities (LMIs) and can be easily verified. A numerical example is included to validate the theoretical results.

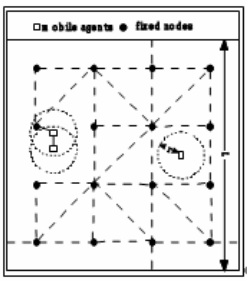
Robust $H\infty$ consensus performance



OS4-4 Switching synchronization in a heterogeneous agent network

Lei Wang, Yang Liu, and Qi-ye Zhang
(Beihang University, China)

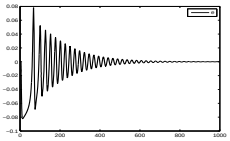
Motivated by the fact that many real-world networks exhibit a mixture feature of time-invariant and time-varying topologies, we propose a heterogeneous agent network as a simple representation. The presented network consists of two types of nodes: fixed agents and mobile agents, where the connections between fixed agents are constant, while the mobile agents, abstracted as random walkers in plane, interact with the neighboring agents. Under the assumption of fast-switching constraint, we further explore synchronized behavior in the heterogeneous network. The theoretical and numerical results show that the mobile agent density determines synchronization of the considered heterogeneous network. In particular, compared with the network constructed by the fixed agents, synchronizability is enhanced and a global synchronization appears by introducing a proper mobile agent density.



OS4-5 Model matching adaptive control of time delay systems with unknown relative degree

Haixia Su and Yingmin Jia
(Beihang University, China)

This paper considers the adaptive control problem of time delay systems with unknown relative degree based on model matching technique. For single-input single-output (SISO) systems, the only known knowledge of the relative degree is the upper bound of it. An adaptive control scheme is designed so that all signals in the close-loop systems are bounded and the tacking error can converge to zero. A simulation example is included to illustrate the proposed adaptive control scheme.



Session: OS5
Advanced vehicle control

OS5-1 Robust active suspension control of vehicles with measurement noises

Katsuhiro Okumura[1], Hideki Wada[2], Yuichiro Taira[3], and Masahiro Oya[4]
([1]Fukuoka Industrial Technology Center, Japan)
([2]Shin-Nippon Nondestructive Inspection, Japan)
([3]National Fisheries University, Japan)
([4]Kyushu Institute of Technology, Japan)

In this paper, we propose a robust ride comfort control scheme for vehicles without using measurements of tire deflections. To realize good ride comfort without using measurements of the tire deflections, we use an estimator for derivatives of the tire deflections and accelerations of road disturbances. Using the estimates, we can design a combined ideal vehicle. Then, a tracking controller is designed so that the real vehicle can track the motion of the combined ideal vehicle. Moreover, by carrying out numerical simulations, the influence of measurement disturbances on control performance will be investigated. As a result, it is shown that the proposed ride comfort control scheme is effective even in the presence of measurement disturbances.

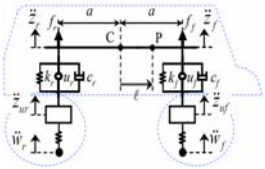
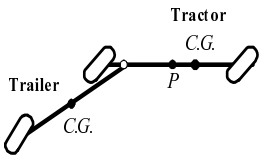


Fig. Two wheels model

OS5-2 A method to improve stability of adaptive steering driver-vehicle systems

Shingo Tamaru, Jinxin Zhuo, Qiang Wang, and Masahiro Oya
(Kyushu Institute of Technology, Japan)

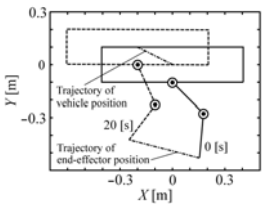
If the behavior of a combined vehicle tracks an ideal vehicle model, the good handling property can be maintained for large variation of the dynamics of combined vehicles. Based on the notion, we have developed an adaptive steering controller achieving good tracking performance. However, we have designed the ideal vehicle model in disregard of the variations of the driver properties. For the variations of the driver properties, if an adequate ideal vehicle model can be designed, the better handling stability of the adaptive driver-combined-vehicles system can be realized. In this paper, we propose a method to design an ideal vehicle model adequate for the variations of the driver properties. Finally, it is shown by carrying out numerical simulations that the designed ideal vehicle model is very effective.



OS5-3 Robust controller for underwater vehicle-manipulator systems including thruster dynamics

Yuichiro Taira[1], Junpei Sugino[2], Natsuki Takagi[3], and Masahiro Oya[2]
([1]National Fisheries University, Japan)
([2]Kyushu Institute of Technology, Japan)
([3]Miyakonojo National College of Technology, Japan)

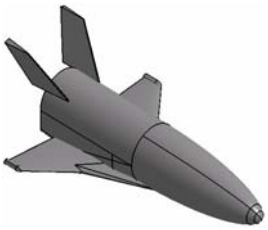
This paper deals with a control scheme for underwater vehicle-manipulator systems with the dynamics of thrusters in the presence of uncertainties in system parameters. We have developed an adaptive controller that overcomes thruster nonlinearities, which cause an uncontrollable system. However, the structure of the adaptive controller is very complex due to the regressors of dynamic system models and parameter estimators. In this paper we develop a robust controller whose structure is much simpler than that of the adaptive controller.



OS5-4 Digital adaptive control of a winged rocket applicable to abort flight

Tomoaki Shimozawa and Shinichi Sagara
(Kyushu Institute of Technology, Japan)

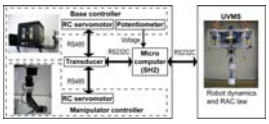
Since spaceplanes have wide range flight conditions, the values of parameters of the dynamic equation are not constant. Then some adaptive control methods for the spaceplanes have been proposed and digital control systems are suited for digital computers. But the control performance decreases when the nonlinearity strengthens though a linear adaptive control has an excellent performance when the nonlinearity of the controlled system can be disregarded. In this presentation, we apply a digital adaptive feedback linearization control method with time-scale separation to a winged rocket in the abort flight, and simulations to validate the effectiveness of the control systems.



OS5-5 A master-slave control system for semi-autonomous underwater vehicle manipulator system

Kana Kawano, Tomoaki Shimozawa, and Shinichi Sagara
(Kyushu Institute of Technology, Japan)

Underwater Vehicle-Manipulator Systems (UVMS) are expected to make important roles in ocean exploration. It is considered that UVMSs will be operated by automatic and manual control. We have proposed an automatic control method. In this paper, we propose a master-slave system for UVMS. The effectiveness of the proposed master-slave control systems is demonstrated by using a floating underwater robot with 2-link manipulator.



Session: OS6
AI-based systems for human awareness promotion
OS6-1 A Survey of AI-based systems for human awareness promotion in meta-cognition

Kiyota Hashimoto[1], Kazuhisa Seta[1], Hiroshi Tsuji[1], and Kazuhiro Takeuchi[2]
([1]Osaka Prefecture University, Japan)
([2]Osaka Electro-Communication University, Japan)

More and more AI-based systems are being developed and used for human awareness promotion. Human awareness promotion is important in various fields like those of learning and problem-solving where participants are expected to be aware of the changing contextual information of themselves and the environments around them to perform better. For a better computational supports of such promotions, AI-based approaches with particular reference to the mechanism of human meta-cognition seem to be plausible. In this paper, as an introduction to the session dedicated to this issue, we give an extensive survey on existing approaches for human awareness promotion.

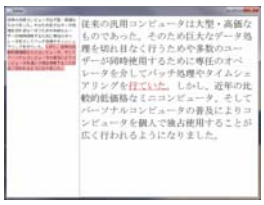
OS6-2 A Multilingual Problem-Based Learning environment for awareness promotion

Ryousuke Taguchi[1], Katsuko T. Nakahira[1], Hideyuki Kanematsu[2], and Yoshimi Fukumura[1]
([1]Nagaoka University of Technology, Japan)
([2]Suzuka National College of Technology, Japan)

Traditionally, Problem Based Learning (PBL) has attracted attention as a method for training in engineering design skills. However, PBL is constrained in that students have to gather in one location, so cooperation between several institutions is difficult. Constructing a multilingual PBL environment in a virtual space on the Web (*Second Life*) is one solution to this problem. In this paper, a summary is provided of one such multilingual PBL that has been constructed.

OS6-3 An effective visualization of style inconsistencies for interactive text editing

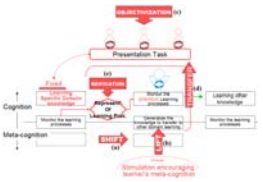
Kazuki Shimamura[1], Kazuhiro Takeuchi[1], and Kiyota Hashimoto[2]
([1]Osaka Electro-Communication University, Japan)
([2]Osaka Prefecture University, Japan)



Any authors, particularly learners, have much difficulty choosing the proper style for their particular writing and detecting style inconsistencies. We propose a new system that allows users to revise documents through human-system interaction. Although many techniques for text writing have been proposed, most of the works focused mainly on automated techniques that detect human errors in texts. In contrast to those works, our study focuses on the visualization of multi-level style inconsistencies in texts to promote authors' awareness. In order to evaluate and visualize the differences in styles, we propose a model to compute the style similarity between a part and some genres.
The similarity function that we propose is based on a model in which sentences are regarded as sequences of functional expressions. Applying the function, we develop a tryout system that shows which parts are inconsistent with the other parts from various viewpoints. Through interactions between users and the system, the user can repeat revising the text until the text maintains consistencies in various levels. Much has to be done towards a practically effective system, but our system helps to point out undesirable text should be conscious of stylistic differences in writing text.

OS6-4 An intelligent meta-learning support system through presentation

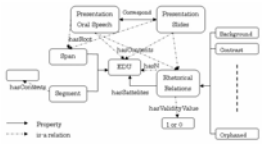
Kazuhisa Seta
(Osaka Prefecture University, Japan)



Meta-cognition plays an important role in acquiring and transferring expertise. Although we recognize the necessity of building a learning scheme for developing meta-cognitive skills, little knowledge for it has been acquired. We try to accumulate knowledge of meta-learning support system development in presentation based meta-learning scheme. Many researchers try to develop meta-learning support systems but their design principles are not necessarily described explicitly. Consequently, the know-how of developing meta-learning support system cannot be accumulated. Therefore, we adopt design model based approach to confront the problem. In our learning scheme, we provide a presentation task in specific learning area to a learner, who thinks he/she had already learned that specific topic. In this learning scheme, we intend to give the learner a chance to reflect his/her own learning processes. In this paper, we propose a question generation function to encourage learners' reflection for meta-learning based on a design model.

OS6-5 A task ontology construction for presentation skills

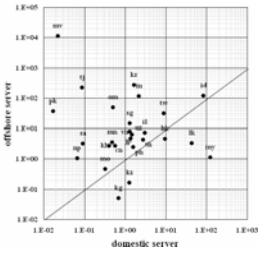
Kiyota Hashimoto[1] and Kazuhiro Takeuchi[2]
([1]Osaka Prefecture University, Japan)
([2]Osaka Electro-Communication University, Japan)



Presentation is an integrated art of communication in which both linguistic and paralinguistic skills are employed, and deliberate preparation is necessary. We're developing a comprehensive learner support system for to help learn presentation skills. This paper reports our development of task ontology for presentation skills as one of the foundational components of our system,. It consists of three sub-ontologies: presentation strategy ontology, rhetorical structure ontology, and lexical ontology. They are used for background inferences and evaluations of learners' presentations. With a prototypical application of them shows the employment of task ontologies is effective for intelligenent learning support systems.

OS6-6 Country domain governance: An analysis by datamining of country domains

Katsuko T. Nakahira, Hiroyuki Namba, Minehiro Takeshita, Shigeaki Kodama, and Yoshiki Mikami
(Nagaoka University of Technology, Japan)

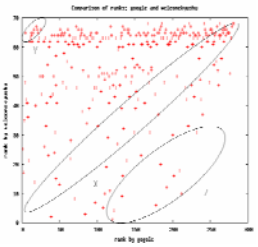


The Internet is now worldwidely used as a communication infrastructure. But the Internet is not equally developed among countries and serious 'digital divide' problem occurs. We have done a datamining on ccTLDs and have an analysis on the data. It is estimated to be in the order of tens of billions of pages. So we decided to focus our efforts on only country domains in Asia. We have researched language distributions of web pages of 34 Asian countries. Note that China, Korea and Japan are not included because of its huge size. As you notice, local languages have a majority share only in a limited number of country domains, namely Turkey, Israel, Iran and a few Arabic speaking countries in the Middle East, Thailand, Indonesia and Vietnam.

OS6-7 Extraction and comparison of tourism information on the web

Xiaobin Wu, Sachio Hirokawa, Chengjiu Yin, Tetsuya Nakatoh, and Yoshiyuki Tabata
(Kyushu University, Japan)

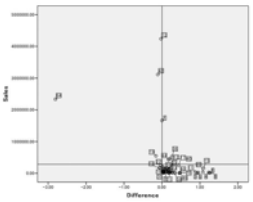
The number of tourists to Japan from foreign countries is drastically increased in recent years. However, there is a scene where the traveler is made uneasy by differences between the word, the custom and the culture in traveling abroad. We are aiming at the construction the horizontal search engine intended for tourism information in the Kyushu region as a test case of a special vertical search engine. As the first step for these the research, we extracted 312 events from a public tourism portal site and compared the ranking of each event in the site with that in the general search engine. We analyzed the correlation of the rankings and confirmed a weak correlation. In addition, it was also confirmed that there was a large gap for the events with strong regionality.



Session: OS7
Advanced technologies and Management skills
OS7-1 An analysis of firm' capacity in Mazda's Keiretsu

R. Takida[1], T. Ito[1], S. Matsuno[1], K. Voges[2], Y. Ishida[3], and M. Sakamoto[4]
([1]Ube National College of Technology, Yamaguchi, Japan)
([2]University of Canterbury, New Zealand)
([3]Toyohashi University of Technology, Japan)
([4]University of Miyazaki, Japan)

Capacity is defined as the power resulting from the specific position in network organizations in this paper. Thus, it becomes one of the important issues to measure firm's capacity. In this paper, we review the relevant studies of network organizations, and focus our study on Yokokai, the Mazda's Keiretsu. We propose a new approach to calculate firm's capacity. The capacity is divided into two categories, take-in capacity and take-out capacity in this paper. The relationship between the two capacities is called capacity difference. The relationship between capacity difference and corporate performance has been analyzed in order to discover the determinants of corporate performance in network organizations. Therefore, this paper provides a new perspective to find the determinants of the successful corporate management.



OS7-2 An analysis of structure importance in Mazda's Keiretsu

S. Tagawa[1], R. Takida[1], T. Ito[1], R. Mehta[2], H. Hasama[3], and M. Sakamoto[4]
([1]Ube National College of Technology, Japan)
([2]New Jersey Institute of Technology, USA)
([3]Fukuoka Institute of Technology, Japan)
([4]University of Miyazaki, Japan)

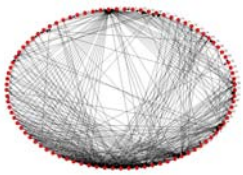
Centrality is one of the effective indices to measure organizational structure. Freeman once proposed a set of centrality indices including degree, closeness, and betweenness. However, Ito discussed the implications of centrality, and found that differences exist even when the centrality is same. In this paper, the authors collected the data of transactions and cross shareholdings from Mazda's Keiretsu Yokokai, and calculated the structural importance based on the new method, so-called SNW model. Furthermore, the authors discussed the implication based on the results of correlation coefficient between the SNW results and corporate performance such as sales and profits. This paper provides a new perspective to discover the structural importance of the network organizations.

Network of cross shareholdings of Mazda in 2004

OS7-3 A centrality analysis between transactions and cross shareholdings in Mazda's Keiretsu

E. Niki[1], R. Takida[1], T. Ito[1], R. Mehta[2], L. P. NG[3], and M. Sakamoto[4]
([1]Ube National College of Technology, Japan)
([2]New Jersey Institute of Technology, USA)
([3]Hoecheong Industries (Holding) Co., Ltd, China)
([4]University of Miyazaki, Japan)

Firm's relationship is one of the important issues in the field of corporate management. The authors review network literature related with the automotive industry, and focus their study on the firm's relationship in the Keiretsu of Mazda, Yokokai, in this paper. The authors collected the data of transactions, cross shareholdings, and sales from all firms in Yokokai, and calculated the centrality index based on graph theory in order to discover the rational relationship between transactions and sales m and between cross shareholdings and sales. Generally centrality index are calculated based upon degree, betweenness and closeness indicators. Certain correlation between transactions and sales, and between cross shareholdings and sales have been found. Implications of these findings are discussed. This paper provides a new perspective to find the determinants of the successful corporate management.



Network of transactions in Mazda in 2004

OS7-4 Bottom-up pyramid cellular acceptors with four-dimensional layers

Yasuo Uchida[1], Takao Ito[1], Makoto Sakamoto[2], Takashi Ide[2], Kazuyuki Uchida[2], Ryoju Katamune[2], Hiroshi Furutani[2], Michio Kono[2], Satoshi Ikeda[2], and Tsunehiro Yoshinaga[3]
([1]Ube National College of Technology, Japan)
([2]University of Miyazaki, Japan)
([3]Tokuyama College of Technology, Japan)

In 1967, M.Blum and C.Hewitt rst proposed two-dimentional automata as a computaional model of two-dimentional pattern processing. Since then, many researchers in this eld have been investigating many properties of two- or three-dimensional automata. In 1997, C.R.Dyer and A.Rosenfeld introduced an acceptor on a two-dimensional pattern (or tape), called the pyramid cellular acceptor, and demonstrated that many useful recognition tasks are executed by pyramid cellular acceptors in time proportional to the logarithm of the diameter of the input. They also introduced a bottom-up pyramid cellular acceptor which is a restricted version of the pyramid cellular acceptor, and proposed some interesting open problems about bottom-up pyramid cellular acceptors. On the other hand, we think that the study of four- dimensional automata has been meaningful as the computational model of four-dimensional information processing such as computer animation, moving picture processing, and so forth. In this paper, we investigate about bottom-up pyramid cellular acceptors with four-dimensional layers, and show their some accepting powers.

OS7-5 Cooperating systems of four-dimensional finite automata

Yasuo Uchida[1], Takao Ito[1], Makoto Sakamoto[2], Kazuyuki Uchida[2], Takashi Ide[2], Ryoju Katamune[2], Hiroshi Furutani[2], Michio Kono[2], and Tsunehiro Yoshinaga[3]
([1]Ube National College of Technology, Japan)
([2]University of Miyazaki, Japan)
([3]Tokuyama College of Technology, Japan)

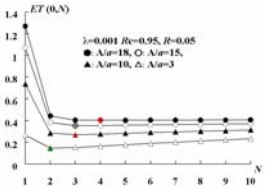
This paper introduces a cooperating system of four-dimensional finite automata as one model of four-dimensional automata. A cooperating system of four-dimensional finite automata consists of a finite number of four-dimensional finite automata and a four-dimensional input tape where these finite automata work independently (in parallel). Those finite automata whose input heads scan the same cell of the input tape can communicate with each other, that is, every finite automaton is allowed to know the internal states of other finite automata on the same cell it is scanning at the moment. In this paper, we mainly investigate several accepting powers of a cooperating system of seven-way four-dimensional finite automata. The seven-way four-dimensional finite automaton is a four-dimensional finite automaton whose input head can move east, west, south, north, up, down, or in the future,but not in the past on a four-dimensional input tape.

Session: OS8
Structural change detection for ongoing time series

OS8-1 DP method for structural change detection as optimal stopping ---- verification and extension ---

Tetsuo Hattori[1], Katsunori Takeda[1], Hiromichi Kawano[2], and Tetsuya Izumi[3]
([1]Kagawa University, Japan)
([2]NTT Advanced Technology, Japan)
([3]Micro Technica Co., Ltd., Japan)

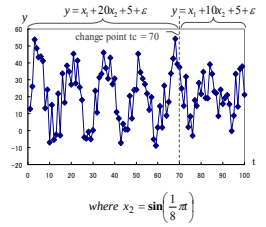
Previously, we have formulated the structural change detection method in time series as an Optimal Stopping Problem with an action cost, using the concept of DP (Dynamic Programming). Then we have proved a theorem that the solution satisfies an inequality. In this paper, we verify the solution by numerical computation and gives the extension of the method by clarifying the notions of estimated structural change point and detection time point that the structure has changed so far. Moreover, we show some experimental results.



OS8-2 Change detection experimentation for multiple regression using ESPRT ---- one variation is periodic function ---

Katsunori Takeda[1], Tetsuo Hattori[1], Hiromichi Kawano[2], and Tetsuya Izumi[3]
([1]Kagawa University, Japan)
([2]NTT Advanced Technology, Japan)
([3]Micro Technica Co., Ltd., Japan)

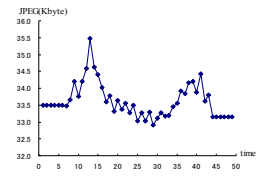
We have previously proposed the application of sequential probability ratio test (SPRT) to the structural change detection of ongoing time series data. Moreover, we have also proposed the extended method of SPRT (ESPRT). In this paper, we show the performance of ESPRT and Chow Test in experimentation of time series data generated by multiple regression model in the case where one explanatory variation is periodic function (sine function).



OS8-3 Continuous change point detection for time series images using ESPRT

Katsunori Takeda[1], Tetsuo Hattori[1], Hiromichi Kawano[2], Tetsuya Izumi[3], and Shinichi Masuda[4]
([1]Kagawa University, Japan)
([2]NTT Advanced Technology, Japan)
([3]Micro Technica Co., Ltd., Japan)
([4]C Micro Co., Ltd., Japan)

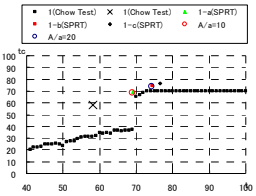
In order to continuously detect the change point in ongoing time series data, we propose a method using extended SPRT (ESPRT). That is, it is a repetition of three stages, where the first stage is prediction model construction, and change point detection as the second stage, and reconstruction of prediction model as the third stage. In this paper, we show experimental results by applying the method to time series data of image storage, where the images are transmitted as compressed data (i.e. JPEG file) from remote monitoring camera systems.



OS8-4 DP method for structural change detection as optimal stopping ---- experimentation in multiple regression model ---

Hiromichi Kawano[1], Tetsuo Hattori[2], Katsunori Takeda[2], and Tetsuya Izumi[3]
([1]NTT Advanced Technology, Japan)
([2]Kagawa University, Japan)
([3]Micro Technica Co., Ltd., Japan)

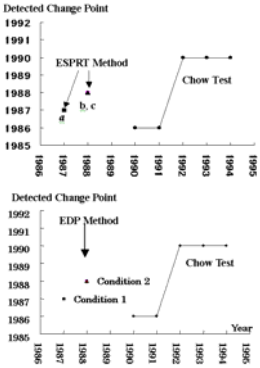
If a model begins to fail to prediction of the time series, we have to detect such a structural change (i.e., disparity between the prediction model and the data) quickly and correctly, and to renew the prediction model after the change detection as soon as possible. In this paper, we formulate the structural change detection of time series as an optimal stopping problem, using Dynamic Programming (DP). Moreover, we present experimental results of the change point detection in multiple regression modeled time series data, comparing with SPRT and Chow Test.



OS8-5 Comparison of change detection methods for ongoing time series data ---- extended SPRT, Chow Test, extended DP ----

Hiromichi Kawano[1], Tetsuo Hattori[2], Katsunori Takeda[2], and Tetsuya Izumi[3]
([1]NTT Advanced Technology, Japan)
([2]Kagawa University, Japan)
([3]Micro Technica Co., Ltd., Japan)

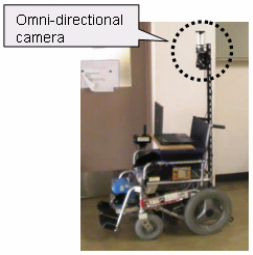
For change point detection of time series data, we have already proposed an application of Sequential Probabilistic Ratio Test (SPRT). In addition, we have proposed a Dynamic Programming (DP) method as well, for the case where we have not only to detect the change point, but also to take into account an action cost after the detection. In this paper, we show the effectiveness and differences of the two extended methods (ESPRT and EDP) in comparison with the well-known Chow Test, by experimental results.



Session: OS9
Computer vision and sound analysis
OS9-1 Outdoor autonomous navigation using SURF features

M. Tabuse[1], T. Kitaoka[1], and D. Nakai[2]
([1]Kyoto Prefectural University, Japan)
([2]Kyoto Prefectural Subaru High School, Japan)

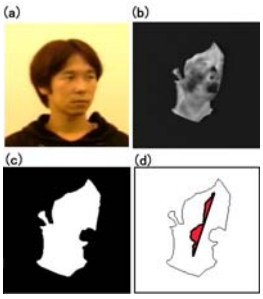
In this paper, we propose SURF feature based approach for outdoor autonomous navigation. In this approach, we capture environmental images by using omni-directional camera and extract features of these images by using SURF. We treat these features as landmarks and estimate robot self-location and direction of motion. SURF features are invariant under scale change and rotation and robust under image noise, change in light condition and change viewpoint. Therefore, SURF features are appropriate ones for robot self-location estimation and navigation.



OS9-2 Facial expression recognition of a speaker using front-view face judgment, vowel judgment and thermal image processing

T. Fujimura[1], Y. Yoshitomi[2], T. Asada[2], and M. Tabuse[2]
([1]Works Applications Co. Ltd., Japan)
([2]Kyoto Prefectural University, Japan)

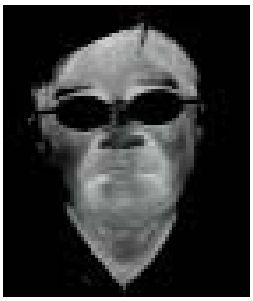
For facial expression recognition, we previously selected three images: (i) just before speaking, and speaking (ii) the first vowel and (iii) the last vowel in an utterance. As a pre-processing module, we added a judgment function to discriminate a front-view face for facial expression recognition. The mean judgment accuracy of the front-view face was 99.3% for six subjects who changed their face direction freely. Using the proposed method, the facial expressions of six subjects were discriminable with 87.7% accuracy when he or she exhibited one of the intentional facial expressions of "angry," "happy," "neutral," "sad," and "surprised." Figure shows images expressing the face rotation; (a) visible image, (b) thermal image, (c) binary image, (d) schematic diagram for the parameter *rotate*.



OS9-3 Facial expression recognition of a speaker using vowel judgment and thermal image processing

Y. Yoshitomi[1], T. Asada[1], K. Shimada[2], and M. Tabuse[1]
([1]Kyoto Prefectural University, Japan)
([2]Nova System Co., Ltd., Japan)

We previously developed a method for the facial expression recognition of a speaker. For facial expression recognition, we previously selected three images: (i) just before speaking, and speaking (ii) the first vowel and (iii) the last vowel in an utterance. We applied our method to subjects who spoke 25 kinds of Japanese first names, which provided all combinations of the first and last vowels, after preparing the training data for all combinations of the first and last vowels. The facial expressions of subjects were discriminable with good accuracy when the subjects exhibited one of the intentional facial expressions of "angry," "happy," "neutral," "sad," and "surprised." In the experiment, the mean accuracy of the speech recognition of vowels by Julius was higher than 80%. Figure shows a thermal image in speaking the first vowel /e/ in an utterance of "keisuke" with exhibiting the intentional facial expression of "happy."



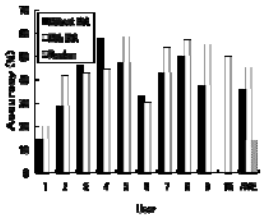
OS9-4 A human-machine cooperative system for generating sign language animation using thermal image processing, fuzzy algorithm, and simulated annealing

T. Asada and Y. Yoshitomi
(Kyoto Prefectural University, Japan)

We have proposed an approach aimed at sign language animation by skin region detection on an infrared image. In the system implemented the proposed method, a 3D CG model corresponding to a characteristic posture in sign language is made automatically by pattern recognition on a thermal image, and then a person's hand in the CG model is set. The hand part is made manually beforehand. If necessary, the model can be replaced manually by a more appropriate model corresponding to training key frames and/or the model can be refined manually. In our experiments, three persons experienced in using sign language recognized the Japanese sign language of 70 words expressed as animation with 94.3% accuracy. Then, we improved the system to correct the position and the direction of hand of the model automatically generated, using fuzzy algorithm and simulated annealing. Figure shows one scene of our proposed animation of YOUNGER BROTHER.

OS9-5 Music recommendation system using the time-series discrete wavelet transform and the FastICA

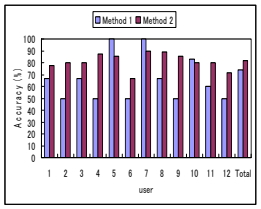
K. Horiike[1], Y. Yoshitomi[2], T. Tokuyama[3], and M. Tabuse[2]
([1]Taka Dance Fashion Co., Ltd., Japan)
([2]Kyoto Prefectural University, Japan)
([3]Shofu Inc., Japan)



We have proposed a content-base music recommendation system. In the system, we use three kinds of feature vector for characterizing music. They come from the time series of Wavelet coefficients of the music, some characteristics calculated from MFCCs, and rhythmic content features. In the music recommendation system, several strategies for music recommendation are prepared. Each strategy is composed of a combination of a feature vector and a decision rule for music recommendation. The system can find out a good strategy for each user for music recommendation by exploiting the user's music evaluation history up to the present time. Vocal is an important factor in listener's taste for music. Therefore, for music containing vocal song, we use FastICA for separating vocal from the music.

OS9-6 Music recommendation system aimed at improving recognition ability

H. Konishi and Y. Yoshitomi
(Kyoto Prefectural University, Japan)

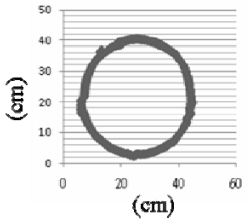


We propose a music recommendation method, in which a collaborative filtering and our content-base music recommendation are combined. In the music recommendation system, several strategies, composed of a combination of a feature vector and a decision rule for music recommendation, are prepared. The system can find out a good strategy for each user for music recommendation by exploiting the user's music evaluation history up to the present time. In the experiments, 12 users rated 52 songs coming from data base of music school book material for elementary school. The number of recommended music by the proposed method was 6.8 per a user, while that of collaborative filtering was 5.2 per a user. The recommendation accuracy of the proposed method (Method 2) was 81.8%, while that of collaborative filtering (Method 1) was 74.1%.

Session: OS10
Intelligent systems
OS10-1 The study of path error for an Omnidirectional Home Care Mobile Robot

Jie-Tong Zou[1] and Feng-Chun Chiang[2]
([1]National Formosa University, Taiwan)
([2]WuFeng Institute of Technology, Taiwan)

The first objective of this research is to develop an Omnidirectional Home Care Mobile Robot. The PC-based controller can control the mobile robot platform. This service mobile robot is equipped with "Indoor positioning system" and obstacle avoidance system. The indoor positioning system is used for rapid and precise positioning and guidance of the mobile robot. The obstacle avoidance system can detect static and dynamic obstacles.
In order to understand the stability of three wheeled omni-directional mobile robot, we make some experiments to measure the rectangular and circular path error of the proposed mobile robot in this research. From the experiment results, the path error is smaller with the guidance of the localization system. The mobile robot can return to the starting point. The localization system can successfully maintain the robot heading angle along a circular path.

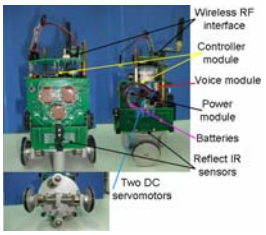


Circular path with the guidance of the localization system

OS10-2 A* searching algorithm applying in Chinese chess game

Cheng-Yun Chung[1], Te-Yi Hsu[2], Jyh-Hwa Tzou[3], and Kuo-Lan Su[1]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]Industrial Technology Research Institute, Taiwan)
([3]National Formosa University, Taiwan)

The article presented A* searching algorithm based to be applied in path planning of Chinese chess game, and used multiple mobile robots to present the scenario. The mobile robot has the shape of cylinder and its diameter, height and weight is 8cm, 15cm and 1.5kg. The controller of the mobile robot is MCS-51 chip. We play the Chinese chess game using multiple mobile robots according to the evaluation algorithm of Chinese chess game, and calculate the displacement by the encoder. The A* searching algorithm can solve shortest path problem of mobile robots from the start point to the target point on the chess board. The simulated results can found the shortest motion path for mobile robots (chesses) moving to target points from start points in a collision-free environment. Finally, we implement the simulated results on the Chinese chess broad using mobile robots. Users can play the Chinese chess game using the supervised computer via wireless RF interface. The scenario of the Chinese chess game feedback to the user interface using image system.



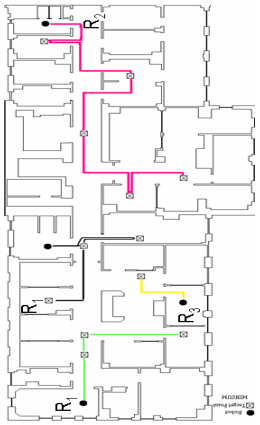
OS10-3 Multi-robot based intelligent security system

Yi-Lin Liao and Kuo-Lan Su
(National Yunlin University of Science and Technology, Taiwan)

The article develops a multiple security modules based intelligent security system that has multiple communication interfaces to be applied in home automation. The interfaces of the intelligent security system contain wire RS485, wireless RF and Internet. The detection modules of the system have active security modules and passive security modules. The passive security modules contain wire security modules and wireless security modules. The control unit of all security modules is HOLTEK microchip. Each security module has two variety interfaces. They use voice module to alarm users for event condition, and transmit the real-time event signals to the supervised computer via wire RS485 or wireless RF interface. If the event occurrence, the supervised computer calculates the belief values using Dempster-Shafter evidence theory according to the passive wire and wireless security modules. The belief value is over the threshold. The supervised computer controls the mobile robot moving to the event location, and receives the signal from the mobile robot via wireless RF interface, and recognizes the final decision output using Dempster-Shafter evidence theory, and displays detection and decision output values on the monitor of the user interface. Finally, we present some experimental results using wire passive security modules, wireless passive security modules and active security modules on the fire detection and gas leakage detection using the platform of the intelligent security system.

OS10-4 Implementation of an auction algorithm based multiple tasks allocation using mobile robots

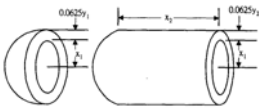
Kuo-Lan Su[1], Jr-Hung Guo[1], Chun-Chieh Wang[2], and Cheng-Yun Chung[1]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]Chienkuo Technology University, Taiwan)



The article uses the ant colony system (ACS) and auction algorithms to solve the path planning and task allocation problems of multiple mobile robots such that the robots can move from different start points to reach to different task points in a collision-free space. Ant colony optimization (ACO) is a new evolvement algorithm that is proposed by Dorigo M., and solves some task allocation and target searching problems. The utilization of the auction algorithm improve the efficiently of the tasks allocation. The article uses three performance functions to compare the cost on the motion displacement and waiting time for mobile robots. In this manner, a near optimal assignment of multiple task points according to a team objective can be obtained using the proposed algorithms. The simulated results present that Ant colony optimization and auction algorithm find the optimization motion path for multiple mobile robots moving to task points from start points in a collision-free environment.

OS10-5 Fuzzy programming for mixed-integer optimization problems

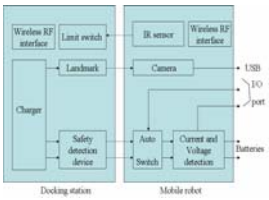
Yung-Chin Lin[1], Yung-Chien Lin[2], Kuo-Lan Su[1], Wei-Cheng Lin[3], and Tsing-Hua Chen[2]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]WuFeng University, Taiwan)
([3]I-Shou University, Taiwan)



The mixed-integer optimization problems are always described by precise mathematical programming models. However, many practical mixed-integer optimization problems inherit more or less imprecise nature. Under this circumstance, if we take into account the flexibility of constraints and the fuzziness of objectives, the original mixed-integer optimization problems can be formulated as fuzzy mixed-integer optimization problems. Mixed-integer differential evolution (MIHDE) is an evolutionary search algorithm, and has been successfully applied to many complex mixed-integer optimization problems. In this paper, the MIHDE is introduced to solve the fuzzy mixed-integer optimization problems. Finally, the illustrative examples show that reliable and satisfactory results can be obtained by the proposed method.

OS10-6 Develop a vision based auto-recharging system for mobile robots

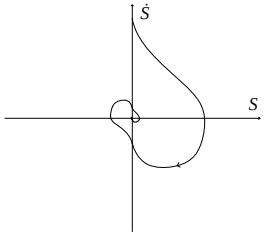
Ting-Li Chien
(Wu-Feng University, Taiwan)



The article develops a vision based auto-recharging system that guides the mobile robot moving to the docking station. The system contains a docking station and a mobile robot. The docking station contains a docking structure, a control device, a charger and a safety detection device and a wireless RF interface. The mobile robot contains a power detection module (voltage and current), an auto-switch, a wireless RF interface, a controller and a camera. The controller of the power detection module is Holtek chip. The docking structure is designed with one active degree of freedom and two passive degrees of freedom. In image processing, the mobile robot uses a webcam to capture the real-time image. The image signal transmits to the controller of the mobile robot via USB interface. We use Otsu algorithm to recognize the distance and orientation of the docking station from the mobile robot. In the experiment results, the proposed method can guided the mobile robot moving to the docking station.

Session: OS11
Control and automata II
OS11-1 Super-twisting second order sliding mode control for a synchronous reluctance motor

Huann-Keng Chiang[1], Wen-Bin Lin[1,] Chang-Yi Chang[1], and Chien-An Chen[2]
([1]National Yunlin University of Science and Technology, Taiwan)
([2]Automotive Research and Testing Center, Taiwan)



This paper presents design and implementation of a super-twisting second order sliding mode controller (SOSMC) for a synchronous reluctance motor. The second order sliding mode control is an effective tool for the control of uncertain nonlinear systems since it overcomes the main drawbacks of the classical sliding mode control, i.e., the large control effort and the chattering phenomenon. Its real implementation implies simple control laws and assures an improvement of the sliding accuracy with respect to conventional sliding mode control. This paper proposes a novel scheme that based on the technique of super-twisting second order sliding mode control. First, the SOSMC is derived by mathematics. Finally, the performance of the proposed method is verified by simulation and experiment. The proposed SOSMC shows the robustness for the motor parameters variation and the improvement of chattering phenomenon.

OS11-2 Shape recognition applied in a semi-autonomous weapon robot

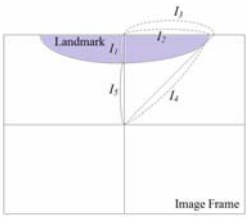
Chun-Chieh Wang[1], Chyun-Luen Lin[1], and Kuo-Lan Su[2]
([1]Chienkuo Technology University, Taiwan)
([2]National Yunlin University of Science and Technology, Taiwan)

A weapon robot with semi-autonomous shooting is implemented in this paper. The principal aim is the application of a shape recognition method so that the MP5K electric BB gun can shoot semi-autonomously. In addition, we use a LabVIEW graphical programming environment to design the human–machine interface surveillance system such that the supervisor can control the vehicle with a keyboard or a specially adapted mouse. In order to accomplish all these achievements, there have been major additions and overhauls in both system software codes and system circuit board developments. All these developments, including a new algorithm and hardware implementation, are described in this article.
The experimental results have shown the practicality of the shape recognition, the 89C51 microcontroller, the LabVIEW graphical programming environment, and ZigBee wireless technology applied to weapon robots.

OS11-3 Camera position estimation and feature extraction from incomplete image of landmark

Kuo-Hsien Hsia[1], Shao-Fan Lien[2], and Juhng-Perng Su[2,3]
([1]Far East University, Taiwan)
([2]National Yunlin University of Science and Technology, Taiwan)
([3]Overseas Chinese University, Taiwan)

On the autonomous unmanned helicopter landing problem, the position of the unmanned helicopter relative to the landmark is very important. A camera carried on the unmanned helicopter could capture the image of the landmark. In the earlier researches, the camera position could be estimated by the extracted features of the landmark image. However, it is necessary that the landmark image should be complete or with slight deficiency in order for the estimation process. In this paper, the innovated method is designed for camera position estimation from single image with incomplete landmark. An ANFIS is utilized for constructing the mapping relation between the features of complete and incomplete landmark image. It will be verified that it is possible to estimate the camera position from a landmark image with defects more than half via the proposed method.



The features $I_{1\sim5}$ for incomplete landmark image

OS11-4 A novel variable structure theory applied in design for wheeled mobile robots

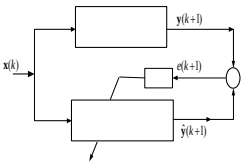
Chun-Chieh Wang
(Chienkuo Technology University, Taiwan)

This paper is concerned with the control of wheeled mobile robots using a conventional variable structure scheme and a novel variable structure theory. Firstly, we introduce the dynamic characteristic of a wheeled mobile robot. Secondly, the conventional variable structure control is reviewed. To remarkably improve the transient response during the reaching phase, a novel variable structure control is proposed.
The validity of the proposed variable structure theory is verified by means of a simulation testing on a homemade wheeled mobile vehicle, as shown in the right figure.
The simulation results validate the superiority and practicality of the novel variable structure for wheeled mobile robots.

OS11-5 Parameter identification of Lorenz system using RBF neural networks with time-varying learning algorithm

Chia-Nan Ko, Yu-Yi Fu, Cheng-Ming Lee, and Guan-Yu Liu
(Nan-Kai University of Technology, Taiwan)

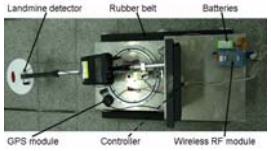
A hybrid evolutionary procedure is proposed to identify parameters for Lorenz chaotic system. In the proposed algorithm, time-varying learning algorithm based on annealing robust concept (ARTVLA) is adopted to optimize a radial basis function neural network (RBFNN) for parameter identification of Lorenz system. In the ARTVLA, the determination of the learning rate would be an important work for the trade-off between stability and speed of convergence. A computationally efficient optimization method, particle swarm optimization (PSO) method, is adopted to simultaneously find a set of promising learning rates and optimal parameters of RBFNN. The proposed RBFNN (ARTVLA-RBFNN) has good performance for identifying parameters of Lorenz system. Simulation results are illustrated the effectiveness and feasibility of the proposed ARTVLA-RBFNN.

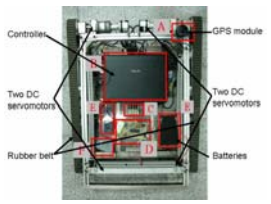


OS11-6 Motion planning of a landmine detection robot

Kuo-Lan Su, Hsu-Shan Su, Sheng-Wen Shiao, and Jr-Hung Guo
(National Yunlin University of Science and Technology, Taiwan)

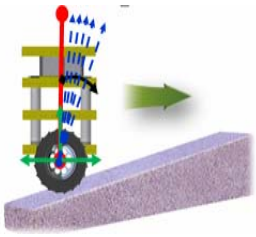
The article develops a mobile robot system that contains a landmine-detection mobile robot and a following mobile robot. In this system, the landmine-detection mobile robot goes ahead, and uses landmine detector and GPS module to find out landmines, and record the coordinate location, and transmits the landmine's coordinate to the following mobile robot via wireless RF interface. The following mobile robot can record the location and orientation of the landmine detection robot and the landmines on the region. The following robot moves closed to the landmine, and program the motion path to avoid obstacles automatically. The driver system of the landmine detection mobile robot uses a microprocessor dsPIC 30F4011 as the core, and controls two DC servomotors to program the motion path. The user interface of the following mobile robot uses Borland C++ Builder language to receive the location data. In the experimental results, the landmine mobile robot records the location of the landmines using GPS module, and transmits the location to the following robot via wireless RF interface. The following mobile robot avoids landmines quickly to enhance the safety to carry peoples or materials cross over the landmine area.





Session: OS12
Special environment navigation & localization
OS12-1 Optimal posture control of two wheeled inverted pendulum robot on a slanted surface

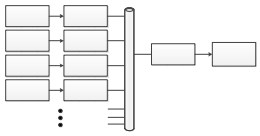
Youngkuk Kwon, Joonbae Son, Jaeoh Lee, Jongho Han, and Jangmyung Lee
(Pusan National University, Korea)



This paper proposes an optimal ARS control of a two-wheel mobile inverted pendulum robot. Conventional researches are highly concentrated on the robust control of a mobile inverted pendulum on the flat ground, *i.e.,* mostly focus on the compensation of gyroscope signals. This newly proposed algorithm deals with a climbing control of a slanted surface based on the dynamic modeling using the conventional structure. During the climbing control of the robot, unexpected disturbance forces are essentially caused by the irregular contact force which comes from the irregular contact angle between the wheel and the terrain. The disturbances have effects on the optimal posture of the mobile robot to compensate the slanted angle. Therefore the dynamics equations through physical interpretation are derived for the selection of optimum climbing posture through ARS. Also using the ultrasonic sensor the slope information is obtained to compensate for the force of gravity. The control inputs are dynamically adjusted to climb up the slanted surface effectively. The proposed algorithm is demonstrated through the real experiments.

OS12-2 Efficient CAN-based network for marine engine state monitoring system

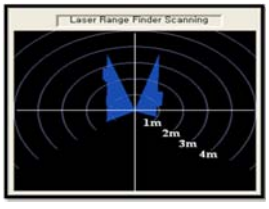
Junseok Lee, Yoseop Hwang, Jaehan Jo, and Jangmyung Lee
(Pusan National University, Korea)



This paper presents the marine engine state monitoring system implemented with Controller Area Network. As the marine engine state monitoring system requires various kind of engine information, it consists of a lot of sensor nodes. So, with the features of Controller Area Network which supports huge numbers of message ID, and its message arbitration ability, this paper presents scheduling method for the performance of monitoring system. And its effectiveness and validity have been shown through experiments.

OS12-3 Localization Algorithm using Virtual Label for a Mobile Robot in Indoor and Outdoor Environment

Kiho Yu, Mincheol Lee, Junghun Heo, and Youngeun Moon
(Pusan National University, South Korea)



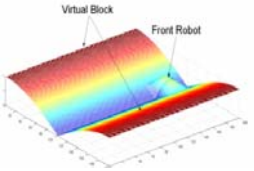
Laser Range Finder

The scanning laser range sensors provide range data consisting of a set of point-measurements. The laser sensor (URG-04LX) has a distance range of approximately 0.02 to 4 meter and scanning angle range 240 degrees. Usually, such a range image is acquired from one view-point by "moving" the laser beam using rotating mirrors/prisms. The orientation of the laser beam can be easily measured and converted into coordinates of the image. This paper conducts localization using virtual labels with environment distance data gotten from the 2D distance laser sensors. This method puts virtual labels on special feature and points which is on the way of mobile robot path. The current location is calculated by combining the virtual label and the range image of laser range finder.

OS12-4 Potential field method applied on the navigation of multiple mobile robots with limited ultrasonic sensing

Chiyen Kim, Mincheol Lee, Junyoung Beak, and Chibeom Noh
(Pusan National University, South Korea)

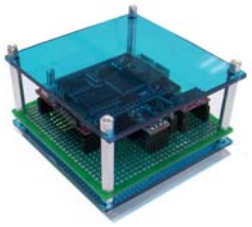
Multi-robot manipulation can accomplish complex task with simple robot systems comparing with singular mobile robot. In spite of systemic simplicity, Multi-robot causes subsidiary problem, group driving. Each mobile robots have to consider not only target and obstacles but also other member robots. Previous researches attempt to solve it by using communication and formation method. As this paper studies to solve the problem in the simplest way, it is proposed the formatted navigation method using simple microrobots equipped with ultrasonic sensor without network communications. The navigation is based on potential field algorithm, and virtual hill concept is applied for the formation.



OS12-5 Adaptive tuning of a Kalman filter using Fuzzy logic for attitude reference system

Taerim Kim, Joocheol Do, Eunkook Jung, Gyeongdong Baek, and Sungshin Kim
(Pusan National University, Korea)

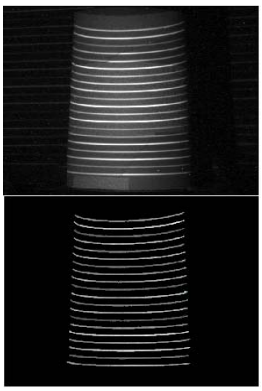
This paper proposed parameter control method for covariance of Kalman filter using fuzzy logic. Most people use accelerometer and gyro for calculating attitude and fusion algorithm of two sensors is usually used Kalman filter. However, parameter of Kalman filter isn't correctly predicted and ARS (Attitude Reference System) using Kalman filter which has non-controlled parameter has many errors when it is moved a great variation. For improving this problem, we proposed parameter of Kalman filter tuning method using fuzzy logic and then we compared our ARS module with Crossbow Nav420CA.



Session: OS13
Intuitive human system interaction
OS13-1 A high-speed 3D image measurement method

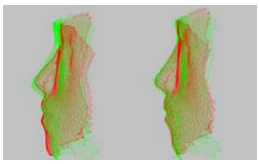
Ke Sun, Yundi Yao, and Cunwei Lu
(Fukuoka Institute of Technology, Japan)

The intensity modulation projection technique has been in great anticipation of practicability with the popularization of digital camera and projector recently with reason that it may get much more information with single projection pattern through measurement and calculate the high sensitive 3D information. But the technique is premised on the situation that it must get observation pattern image with essential number of stripe and intensity distribution, that is to say, the ideal observation pattern image so as to secure the sensitivity and accuracy of measurement. So, as for the target object without specification on the surface reflectance and distribution of surface color, the measurement would encounter several problems such as deficiency of the volume of information on the observation pattern, uncertainty of the target measurement sensitivity as well as the trouble of measurement manipulation. In order to solve the problems presented above. We propose an image analysis method of intensity correction with synthesis image technique in order to extract the stripes precisely when measuring the 3D shape of an object by using single projection pattern. By using this analysis method, if the surface reflection of the target is simple, 3D shape measurement is realized using only one observation image.



OS13-2 3-D face recognition method based on optimum 3-D image measurement technology

Hiroya Kamitomo, Yao Xu, and Cunwei Lu
(Fukuoka Institute of Technology, Japan)



We propose a 3-D face recognition method using the iterative closest point (ICP) algorithm. So far, the reported 2-D face recognition methods have weak points by source of light, make-up and facial positioning. A using 3-D shape measurement system includes a technique for optimizing the intensity-modulation pattern projection. Therefore, we propose 3-D face recognition system which is robustness in the color change. The face recognition method is possible for facial registrations. This method estimate rotations and translations for different positions and directions. Consequently, experimental results obtained the high accuracy that the rate of face recognition is 96%.

OS13-3 User study of a life-supporting humanoid directed in a multimodal language

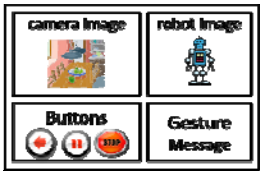
T. Oka[1], T. Abe[2], K. Sugita[3], and M. Yokota[3]
([1]Nihon University, Japan)
([2]Nihon Computer Kaihatsu Co. Ltd., Japan)
([3]Fukuoka Institute of Technology, Japan)

This paper describes a user study of a life-supporting humanoid directed in a multimodal language and discusses the results. Twenty inexperienced users commanded the humanoid in a computer simulated remote home environment in the language by pressing keypad buttons and speaking to the robot. The results show that they comprehended the language well and were able to give commands successfully. They often chose a button press action in place of verbal phrases to specify a direction, speed, length, angle, and/or temperature value, and preferred multimodal commands to spoken commands. However, they did not think that it was very easy to give commands in the language. This paper discusses the results and points out both strong and weak points of the language and robots.

← Left	↑ up	→ right	Fast
← Left		→ right	Moderate
← Left	↓ down	→ right	Slow
empty	query	repeat	Cue

OS13-4 A multimodal language to communicate with life supporting robots through a touch screen and a speech interface

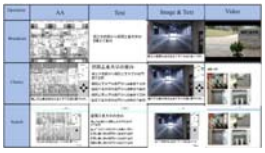
T. Oka, H. Matsumoto, and R. Kibayashi
(Nihon University, Japan)



This paper proposes a multimodal language to communicate with life supporting robots through a touch screen and a speech interface. The language is designed for untrained users who need support in daily lives from cost effective robots. In this language, the users can combine spoken and pointing messages in an interactive manner in order to convey their intensions to robots. Spoken messages include verb and noun phrases which describe intensions. Pointing messages are given when users finger-touch a camera image, a picture containing a robot body, or a button on a touch screen at hand, which convey a location in their environment, a direction, a body part of the robot, a cue, a reply to a query, or other information to help the robot. This work presents the philosophy and structure of the language.

OS13-5 Some consideration on user interface switching functions for the weaker at IT

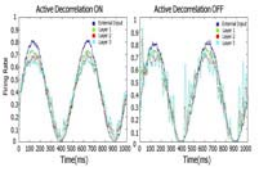
Shinichi Inenaga[1], Kaoru Sugita[1], Tetsushi Oka[2], and Masao Yokota[1]
([1]Fukuoka institute of technology, Japan)
([2]Nihon university, Japan)



We have already proposed a new concept of 'universal multimedia access' intended to narrow the digital divide by providing appropriate multimedia expressions according to users' (mental and physical) abilities, computer facilities and network environments. Previous works, have evaluated some types of multimedia user interfaces according to users' (mental and physical) abilities, computer facilities and network environments. In this paper, we discuss the user interface switching functions.

Session: OS14
Dynamical information processing in the brain
OS14-1 Signal transmission in multilayer asynchronous neural networks

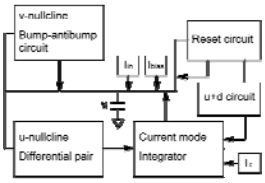
Wataru Kobayashi, Makito Oku, and Kazuyuki Aihara
(The University of Tokyo, Japan)



It is believed that common input to nearby neurons leads synchronous spiking. However, recent studies have shown that recurrent neural networks can generate an asynchronous state characterized by low mean spiking correlations despite substantial amounts of shared input. The asynchronous state is generated by the interaction of excitatory and inhibitory populations, which is called active decorrelation. Here, we investigate the advantage of the active decorrelation on signal transmission in multilayer neural networks. The results of numerical simulations show that the active decorrelation is suitable for transmission of rate code because it can suppress the layer-by-layer growth of correlation.

OS14-2A two-variable silicon neuron circuit based on the Izhikevich model

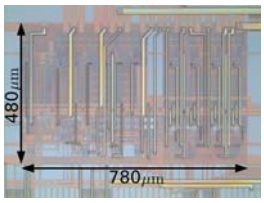
Nobuyuki Mizoguchi, Yuji Nagamatsu, Kazuyuki Aihara, and Takashi Kohno
(The University of Tokyo, Japan)



The silicon neuron is an analog electronic circuit that reproduces the dynamics of a neuron. It is a useful element for artificial neural networks that work in real time. Silicon neuron circuits have to be simple and at the same time be able to reproduce rich dynamics in order to reproduce various activities of neural networks with a compact, low-power consumption, and easy-to-configure circuit. We have been developing a silicon neuron circuit based on the Izhikevich model, which has rich dynamics in spite of its simplicity. In our previous works, we proposed a simple and low-power consumption silicon neuron circuit by reconstructing the mathematical structure in the original model using an analog electronic circuit. In this paper, we propose an improved circuit in which all of the MOSFETs are operated in subthreshold region.

OS14-3 A three-variable silicon neuron circuit

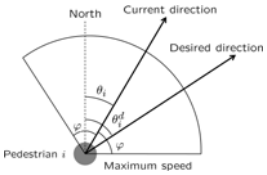
Yohei Nakamura, Kazuyuki Aihara, and Takashi Kohno
(The University of Tokyo, Japan)



The silicon neuron is a type of artificial neuron implemented with electronic circuit. Previously a design approach based on mathematical structures under neuronal dynamics was proposed. It is based on the mathematical techniques such as phase plane and bifurcation analysis. These methods allow us to implement silicon neuron with smaller circuit area and to strategically adjust the bias parameter voltages without losing variety of output patterns. In this study we demonstrate one of the mathematical structure based silicon neuron, which operates a three-dimensional system. This silicon neuron can generate a firing pattern called square wave bursting. In this report we show the experimental results of this silicon neuron. We are planning to make pattern generating network with this neuron and silicon synapse.

OS14-4 Theory of mind in a microscopic pedestrian simulation model

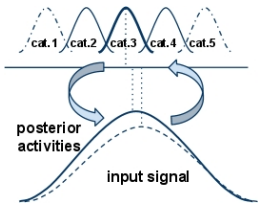
Ryo Adachi and Kazuyuki Aihara
(The University of Tokyo, Japan)



In this paper we propose a microscopic pedestrian simulation model, which focuses on pedestrians' anticipatory behavior in collision avoidance. Although it is obvious that inferring other pedestrians' behavior is playing a crucial role when we intend to avoid collision, few models seriously tackled with this mental attribution. Our model assumes that each pedestrian has theory of mind, which refers to the capacity to make accurate judgments about beliefs, desires and intentions of other people, and he decides his action based on his current state in cognitive hierarchy. We also present various simulation results to understand how our anticipatory behavior affect pedestrians' behavior as a whole.

OS14-5 A neural network model for categorical effects in color memory

Chihiro Imai[1], Satohiro Tajima[2], Kazuyuki Aihara[1], and Hideyuki Suzuki[1]
([1]The University of Tokyo)
([2]Japan Broadcasting Corporation, Japan)



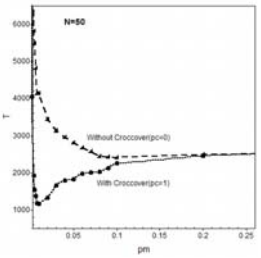
Color perception is categorical. Previous experimental studies have shown that the color category has profound effects on cortical neural responses, perceptual color discrimination and color memory. However, existing theoretical studies are not enough to provide an inclusive model which accounts for categorical color perception and its involved effects. We propose a computational model for categorical color perception, assuming that color selective neurons in cortex express colors in memory. Our model reproduces the characteristics of color memory including temporal and other factors reported in the previous experimental studies. This study suggests that perceptual biases found in color processing and task-dependent modulations of neural responses may be explained as a natural consequence of statistically optimal estimation.

Session: OS15
Bio-inspired theory and application

OS15-1 Study of computational performance of Genetic Algorithm for 3-Satisfiability problem

QingLian Ma, Yu-an Zhang, Makoto Sakamoto, and Hiroshi Furutani
(University of Miyazaki, Japan)

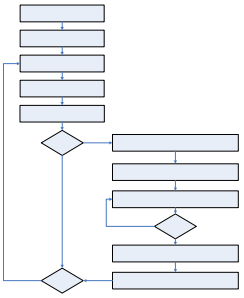
In order to improve the computing performance of Genetic Algorithms (GAs), it is important to study the effects of crossover rate and mutation rate. In this study, we examine the relations of first hitting time (T) of optimum solution in population, success probability (S), mutation rate (p_m) and crossover rate (p_c) by experimentation, which are based on the 3-Satisfiability (3-SAT) problem. Here, S is defined as that there is at least one optimum solution in a population at the stationary distribution. We found that, when mutation rate becomes strong, the average fitness is not the best, and converges into a smaller value, and the effect of crossover on T is small. We obtained the result of $T \approx 1/S$ when p_m is large.



OS15-2 An adaptive resolution hybrid binary-real coded genetic algorithm

Omar Abdul-Rahman, Masaharu Munetomo, and Kiyoshi Akama
(Hokkaido University, Japan)

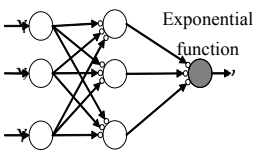
Which is better to be used in Genetic Algorithms (GAs) Binary or Float? In this paper, we try to answer this controversial question by proposing a novel algorithm that shares the computational power between two cooperated versions of GAs, a binary coded GA (bGA) and a real coded GA (rGA). The evolutionary search is primarily lead by bGA, which is used to identify promising regions in the search space. While, the rGA is used to increase the quality of the obtained solutions by conduct a detailed search through these regions. The interactions between two versions are organized by a resolution factor (R) that it is increasingly adapted during the evolutionary search. Comparison experiments were conducted to proof the feasibility of this algorithm.



OS15-3 Neural network with exponential output neuron for estimation of physiological activities from protein expression levels

Kazuhiro Kondo, Kunihito Yamamori, and Ikuo Yoshihara
(University of Miyazaki, Japan)

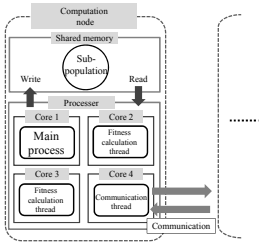
Some foods can affect out health condition through their physiological activities. However, measurement of physiological activity for all kinds of foods is impossible. Therefore we have proposed a method to estimate physiological activities from protein expression levels using artificial neural networks (ANNs). Estimation of the physiological activity using conventional ANN has a problem that the physiological activities takes positive real number more than 1.0. To solve this problem, we employ exponential function as the activation function in output neuron. By using exponential function in output neuron, ANN can directly handle the physiological activity as the training signals those are more than 1.0. Experimental results show that our method can also improve estimation accuracy for anti-angiogenic activity.



OS15-4 Asynchronous migration for parallel genetic programming on computer cluster with multi-core processors

Shingo Kurose, Kunihito Yamamori, Masaru Aikawa, and Ikuo Yoshihara
(University of Miyazaki, Japan)

Island model is a typical implementation model of parallel distributed genetic programming. To leave local optimum, island model has migration process that exchange individuals among islands. Meanwhile, migration process increases computation time because the migration process synchronizes all processors to exchange individuals in the same generation. So, we propose a new parallel genetic programming model based on the island model with asynchronous migration. We implement island model using MPI, and fitness calculation is processed in parallel by multi-threading. In addition, proposed method employs a communication thread for migration between computation nodes. Experimental results show that our proposed method with five processors and forty threads can reduce computation time to 18% of serial GP.



OS15-5 Classification of species by information entropy and visualization by self-organizing map

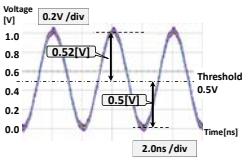
Kentaro Nishimuta[1], Ikuo Yoshihara[1], Kunihito Yamamori[1], and Moritoshi Yasunaga[2]
([1]University of Miyazaki, Japan)
([2]University of Tsukuba, Japan)

Most analysis methods of base sequences are based on the idea of pattern matching, but feature patterns known until today are probably a part of all the patterns hidden in base sequences. We develop a novel analyzing method based on disorder of base sequences, for example information entropy and self-information. We try to classify species based on self-information of base sequences. A relation between species are visualized by self-organizing map (SOM). Neighboring regions of the SOM might indicate near species. We compare neighboring regions of the SOM with neighboring branches of evolutionary tree produced by Clustal-W.

OS15-6 Digital-signal-waveform improvement on VLSI packaging including inductances

H. Shimada[1], S. Akita[1], M. Ishiguro[1], N. Aibe[1], I. Yoshihara[2], and M. Yasunaga[1]
([1]University of Tsukuba, Japan)
([2]University of Miyazaki, Japan)

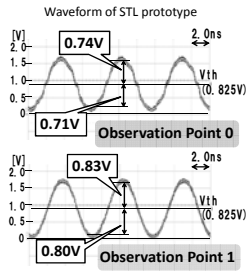
In recent years, digital-signal-frequency is becoming faster and faster higher and higher, and ensuring Signal Integrity (SI) is becoming a serious problem. It is difficult to get high SI on the Printed Circuit Board (PCB) using conventional methods in GHz order. To get high SI, we have proposed a new method called Segmental Transmission Line (STL) so far. In the STL design, however, combinatorial-explosion problem occurs. As the solution candidate is too many, we use We thus make use of Genetic Algorithms (GA) to design STL. We have already shown the effectiveness of STL in bus systems, which only include capacitances. This paper proposes an application of the STL to the wires including inductances, not only capacitance but also inductances, and shows the results of simulation and actual experiments.



OS15-7 Digital-signal improvement-method using Pareto optimization

S. Akita[1], H. Shimada[1], M. Ishiguro[1], N. Aibe[1], M. Yasunaga[1], and I. Yoshihara[2]
([1]University of Tsukuba, Japan)
([2]University of Miyazaki, Japan)

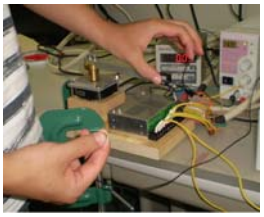
Recently, it is getting more and more difficult to obtain digital signals with low distortion in the PCB (printed circuit board) as the frequency increases. In order to solve this problem, that is, to improve the signal integrity, we have proposed "Segmental Transmission Line (STL)". In the STL, a transmission line is divided into multiple segments which have individual characteristic impedance and length. The multiple segments are designed to improve signal integrity using the Genetic Algorithms. In this paper, we try to improve signal integrity at two points simultaneously. We have fabricated an STL prototype using a real PCB. As a result, at the two observation points, logical margins are improved simultaneously 1.7 times and 2.0times, respectively. It is thus shown that STL has the ability to improve signal integrity at the multiple points.



Session: OS16
Biomimetic machines and robots
OS16-1 Basic position/force control of single-axis arm designed with an ultrasonic motor

Keisuke Ogiwara[1], Fusaomi Nagata[1], and Keigo Watanabe[2]
([1]Tokyo University of Science, Japan)
([2]Okayama University, Japan)

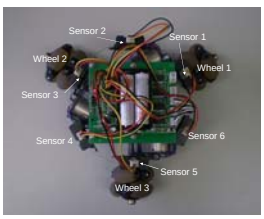
Recently, many studies on assist robots are conducted, in which the development of a unique system is required to support aged persons, physically handicapped persons and/or caretakers. One of the representative systems is called the assist suit and is partly practiced. The assist suit is a mechatronics device which can assist physical human actions. However, the current assist suit has a few problems with respect to cost, size, weight, long-time run and so on. In this article, a fundamental study concerning a compact assist device is conducted. Where the assist device supports is one spot on the body such as a knee, an elbow and a shoulder. First of all, a simple single-axis arm is designed by using an ultrasonic motor which can generate high torque from a low velocity range. Then, a servo system, a torque control system and a passive torque control system are applied and their characteristics are evaluated.



OS16-2 Cooperative swarm control for multiple mobile robots using only information from PSD sensors

Takahiro Yamashiro[1], Fusaomi Nagata[1], and Keigo Watanabe[2]
([1]Tokyo University of Science, Japan)
([2]Okayama University, Japan)

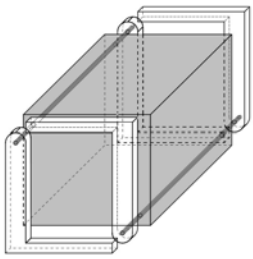
Recently, many studies on swarm robotics are conducted, in which the aim seems to be the realization of complex task ability by cooperating with each other. Future progression and concrete applications are being expected. The objective of this study is to construct an attractive system by using multiple mobile robots. First of all, multiple mobile robots with six PSD (Position Sensitive Detector) sensors are designed. The PSD sensor is a kind of photo sensors. A control system is considered to realize such a swarm behavior as Ligia exotica by using only information of PSD sensors. Experimental results show interesting behaviors of multiple mobile robots such as following, avoidance and schooling. The proposed system was intriguingly demonstrated to high school students in OPEN CAMPUS 2010 held in Tokyo University of Science, Yamaguchi.



OS16-3 Control of movement on stairs for a cleaning robot

Takahisa Kakudou, Keigo Watanabe, and Isaku Nagai
(Okayama University, Japan)

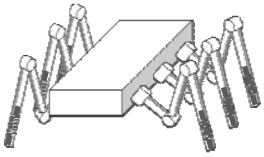
An autonomous cleaning robot is proposed so as to move between floors in a high-rise building. The cleaning robot reduces labors and saves energy for cleaning task. However, many of cleaning robots are not considered to move on places between floors. In human living environments, it is often the case that the cleaning area is three-dimensional space such as a high-rise building. Therefore, the cleaning robots can not clean the area such as stairs. Proposed cleaning robot consists of a body frame of rectangular solid and L-shaped legs. The robot climbs down stairs by rotating the body so that the upper and lower sides of it may be reversed. In this paper, a mechanism and a control method are described for moving on stairs.



OS16-4 Jumping rhythm generator by CPG for a multi-legged robot

Masaaki Ikeda[1], Kiyotaka Izumi[1], and Keigo Watanabe[2]
([1]Saga University, Japan)
([2]Okayama University, Japan)

Three features of a legged robot are list as the discrete disposition of supported legs, the flexible posture without changing disposition of supported legs, and the obstacle avoidance with a three dimensional behavior. A legged robot determines the maximum height of an obstacle by own leg mechanism. The capability of obstacle avoidance is improved by a jumping motion. In this paper, we discuss the rhythmic jumping of a multi-legged robot using the central pattern generator (CPG). Authors propose the construction method of CPG for six legged robot, in which each leg has a compressed spring. The effectiveness of the present method is illustrated by some simulations.



OS16-5 A bearing-only localization solved by an unscented Rauch-Tung-Striebel smoothing

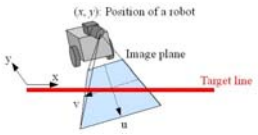
Saifudin bin Razali, Keigo Watanabe, and Shoichi Maeyama
(Okayama University, Japan)

The unscented Kalman filter (UKF) has become an alternative in nonlinear estimation problems to overcome the limitation of Taylor series linearization used by the extended Kalman filter (EKF). It uses a deterministic sampling approach known as sigma points to propagate nonlinear systems and has been discussed in many literature. However, a nonlinear smoothing problem has received less attention than the filtering problem. Therefore, in this article we examine an unscented smoother based on Rauch-Tung-Striebel form for discrete-time dynamic systems. This smoother has advantages available in unscented transformation over approximation by Taylor expansion as well as its benefit in derivative free. This smoothing technique has been implemented and evaluated through a bearing-only localization problem.

OS16-6 Trajectory tracking control for nonholonomic mobile robots by an image-based approach

Tatsuya Kato, Keigo Watanabe, and Shoichi Maeyama
(Okayama University, Japan)

Kurashiki et al. have already studied an image-based robust trajectory tracking control for a nonholonomic mobile robot. In particular, they considered a situation when the trajectory line and the image plane satisfy a constrained condition. However, it should be noted that in a practical case, there is an alternative situation, which is just as a complimentary case of that studied by Kurashiki et al. Thus, the present image-based method completes the trajectory tracking control for nonhonolomic mobile robots, in which the objective of the trajectory tracking is set as a line tracking in a two-dimensional image plane. The effectiveness of the present method is illustrated through some simulations.



OS16-7 A nonholonomic control method for stabilization an X4-AUV

Zainah Md. Zain[1], Keigo Watanabe[1], Kiyotaka Izumi[2], and Isaku Nagai[1]
([1]Okayama University, Japan)
([2]Saga University, Japan)

We consider the nonholonomic control method for stabilizing all attitudes and positions (x, y or z) of an X4-AUV with four thrusters and six degrees of freedom (DOF), in which the positions were stabilized according to the Lyapunov stability theory. The derived model is dynamically unstable, so a sequential nonlinear control strategy is implemented for the X4-AUV, composed of translational and rotational subsystems. A controller for the translational subsystem stabilizes one position out of x-, y-, and z-coordinates, whereas controllers for the rotational subsystems generate the desired roll, pitch and yaw angles. Thus, the rotational controllers stabilize all the attitudes of the X4-AUV at a desired (x-, y- or z-) position of the vehicle.

Session: OS17
Medical science and complex system
OS17-1 The inevitability of the bio-molecules: five nitrogenous bases and twenty amino acids

K.Hashimoto, H.Inoue, and K.Naitoh
(Waseda University, Japan)

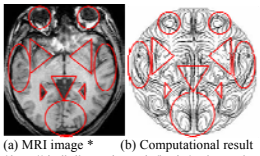
Living beings use only five types of nitrogenous bases and twenty amino acids selected naturally. The unified momentum theory [K. naitoh, Artificial Life Robotics, 2010] reveals the reason why the molecular weights of the twenty types of amino acids show a threefold variation between 240 of cysteine as the maximum and 75 of glycine as the minimum, whereas that of purines and pyrimidines among nitrogenous bases varies by only about 1.5 times. Let us take a higher order of the Taylor series for the unified momentum equation. The threefold variation of amino acids will come from the third term of the Taylor series.

Stability	surface tension term	convective term
Quasistable	3:2	1:1
Semi-quasistable	3:2	1.27:1
Semi-quasistable	3:2 3.6:1	1.35:1

OS17-2 Engine for brain development: Similarity between engine and brain

H. Kawanobe and K. Naitoh
(Waseda University, Japan)

Observations of the development of the human brain show the bones of the skull become increasingly larger over the neck, and a lot of soup like fluid for generating brain cells enters the skull from the body. This process is essentially similar to the intake process of an internal combustion engine and also that the soup for generating flexible brain cells can be essentially modeled by using the Navier-Stokes equation. In this report, we will examine the spatial patterns of convexoconcave of brain and blood vessels in details.

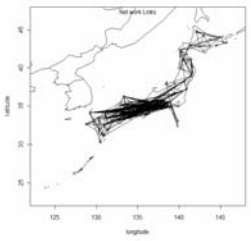


(a) MRI image * (b) Computational result
*http://riodb.ibase.aist.go.jp/brain/welcome.html

OS17-3 Spatial surface wave spread network from Ambient Noise correlation

Z. Zheng, K. Yamasaki, T. Fujiwara, N. Sakurai, and K. Yoshizawa
(Tokyo University of Information Science, Japan)

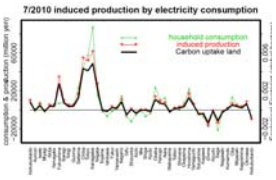
We computed the correlations of the ambient noise correlation of 66 stations of F-NET (Broadband Seismic Network JAPAN) that were apart from tens to hundreds kilometers. By stacking cross-correlation functions of ambient noise, we can extract the coherent part of each two stations. (Nikolai M et.al 2005) By quantitative analysis the magnitude of these extracted pluses of ambient noise correlation from any two stations, we construct a network that may reflect the main surface wave spread characters in spatial field.



OS17-4 Effect of hot summer against environment which was induced by extra economical demand via Japanese Ecological Footprint

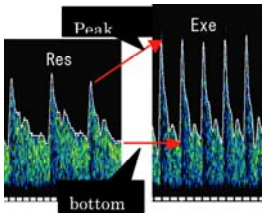
K. Yamasaki, T. Fujiwara, N. Sakurai, K. Yoshizawa, and Z. Zheng
(Tokyo University of Information Sciences, Japan)

The Ecological Footprint (EF) indictor which had been presented by Wackernagel and Rees in 1990's has attracted larger attention as a numerical assessment value for sustainable development on Earth. In this paper, we analyze the effect of hot summer against environment which was induced by extra demand via Japanese EF based on 47 prefecture's Input-Output table. The electricity sector and the gas & heat supply sector are affected by high temperature within 48 industry sectors in this Input-Output table. The extra demand of the electricity sector increases in the EF through the increase of CO2 emission in the same prefecture and the same sector. The effect of the extra demand loss of the gas & heat supply sector is not strong but is affected opposite direction. The extra demand (demand loss) does not affect other prefectures and other sectors so much.



OS17-5 Blood flow velocity waveforms in the middle cerebral artery at rest and during exercise

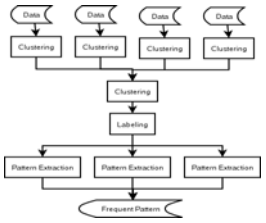
T. Matsuo[1], S. Watanabe[1], M. Sorimachi[1], M. Kanda[1], Y. Ohta[1], and T. Takahashi[2]
([1]Kanagawa Institute of Technology, Japan)
([2]Asahikawa Medical College, Japan)



We have been studying the blood flow waveforms in the middle cerebral artery (MCA) in the brain using a ultrasound Doppler anemometer, in order to understand the flow change due to cycle exercise and posture change. In moderate cycle exercise, the mean MCA blood velocity was found to increase as the strength of exercise. As shown in the figure, the peak flow velocity (systolic velocity) increases markedly during exercise, while the bottom flow velocity (end-diastolic velocity) showed no remarkable increase. Accordingly, the calculated resistance index increased considerably in exercise. On the contrary, after a posture change (standing up from supine), the end-diastolic velocity was found to change markedly compared with the systolic velocity. Thus, the brain blood flow shows significant variation due to physical activities.

Session: OS18
Data mining
OS18-1 Two-level time-series clustering for satellite data analysis

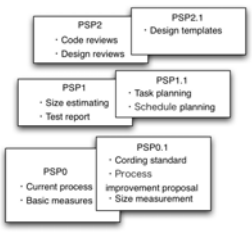
Ayahiko Niimi, Takehiro Yamaguchi, and Osamu Konishi
(Future University Hakodate, Japan)



In this paper, we propose a method for finding the frequent occurrence patterns and the frequent occurrence time-series change patterns from the observational data of a weather-monitoring satellite. The observational data of the weather-monitoring satellite are temporal and spatial large-scale data. However, to analyze this large amount of data incurs a high calculation cost. Therefore, we propose parallel computation when the frequent occurrence pattern and the frequent occurrence time-series change pattern are extracted at the Artificial Life and Robotics conference (AROB) 2010. In this paper, we apply the proposed system to Moderate Resolution Imaging Spectroradiometer (MODIS) data and discuss its results.

OS18-2 PSP practice support system using defect types based on phenomenon

Daisuke Yamaguchi[1], Ayahiko Niimi[2], Fumiyo Katayama[1], and Muneo Takahashi[1]
([1]Toin University of Yokohama, Japan)
([2]Future University-Hakodate, Japan)



In this paper, we propose the PSP Practice Support System using Defect Types based on Phenomenon. This system can transmit programming to specific human among many software processes using a Multiagent technology. The system is also synthesized to do parallel and cooperative proposing internally. Applying the proposed method to a personal process-removing task, a flexible programming for quality of software. Software developments depend on information, which is possible to collection of personal process. Agent planning has get use working data on user action and other communication. Therefore collection of all user data is necessary for agent learning. Agent studies the best transmission programming, planning and quality according to the makes planning in the personal process.

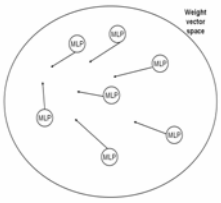
OS18-3 Development and evaluation of satellite image data analysis infrastructure

Akihiro Nakamura, Jong Geol Park, Kotaro Matsushita, Kenneth J. Mackin, and Eiji Nunohiro
(Tokyo University of Information Sciences, Japan)

Tokyo University of Information Sciences (TUIS) receives Moderate Resolution Imaging Spectroradiometer (MODIS) data. When using satellite data, one common problem is the interference of clouds. In order to remove the interference of clouds, the standard solution is to create a composite data of the same regions during a selected time span, and to patch together data not covered by clouds to create a clear image. We introduced a piece processing, which separate one satellite image data into many small pieces of image data, making it quicker and easier to analyze and process the time-series satellite data. In this research, we implemented the piece processing and composite processing in order to increase the analysis speed within the satellite image database. We tested the proposed processing and verified the effectiveness for target applications.

OS18-4 Application of neural network swarm optimization for paddy field classification from remote sensing data

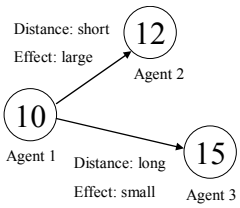
Kazuma Mori, Takashi Yamaguchi, Jong Geol Park, and Kenneth J. Mackin
(Tokyo University of Information Sciences, Japan)



Monitoring changes in paddy area is important for economic and environment research since rice is staple food in Asia, and paddy agriculture is a major cropping system in Asia. Recently, remote sensing is used actively to observe the change of paddy area. However, monitoring paddy area by remote sensing is difficult due to the temporal changes of paddy and difference of spatiotemporal characteristics of paddy agriculture between countries or regions. In our previous research using MLP and spatiotemporal satellite sensor data, the proposed classifier yielded 90.8% correct classification rate. In this paper, we proposed a cooperative learning method using PSO as the global search method and MLP as the local search method in order to improve the classification accuracy for practical use.

Session: OS19
Embracing complexity in natural intelligence
OS19-1 A systemic payoff in a self-repairing network

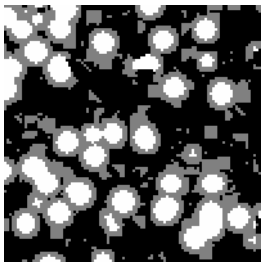
Masahiro Tokumitsu and Yoshiteru Ishida
(Toyohashi University of Technology, Japan)



Cooperation among agents is a crucial problem in autonomous distributed systems composed of selfish agents pursuing their own profits. An earlier study of a self-repairing network revealed that the systemic payoff enabled to make the selfish agents cooperate with other agents. The systemic payoff is the payoff mechanism that sums up not only the agent's own payoff but also the neighbor's payoff. In the systemic payoff, the distant effect between the agents in the network has not been studied yet in this line. This paper introduces the distant effect among the agents for the systemic payoff. We study the effect of the proposed mechanism for the network performance by computer simulations.

OS19-2 Effects of a membrane formation in Spatial Prisoner's Dilemma

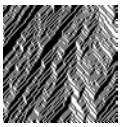
Yuji Katsumata and Yoshiteru Ishida
(Toyohashi University of Technology, Japan)



A cooperative relationship has been developed among individuals. However, an altruistic behavior has little advantage against selfish behavior in the sense of rational terms. Each individual chooses a selfish behavior pursuing their own payoff then the altruistic behavior will vanish. Earlier studies proposed the mechanisms based on game theory which explains the problem of the difference between the theoretical prediction and observation. Furthermore, those studies also considered the mechanisms of protecting a cooperators cluster in a spatial prisoner's dilemma involving spatial strategies and a spatial generosity, although did not analyze rigorously effects of the membrane for the cooperators. In this paper, we report the quantitative effect of membrane for protecting the cooperators from the exploitation of the defectors.

OS19-3 Extracting probabilistic cellular automata rules from spatio-temporal patterns and analyzing features of these rules

Takuya Ueda and Yoshiteru Ishida
(Toyohashi University of Technology, Japan)



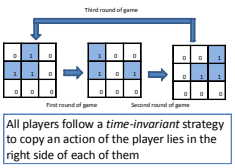
ASEP

General PCA

This research deals with one of the inverse problem. It is estimating rules or strategies of generating spatio-temporal patterns which is generated by natural phenomena or social phenomena. We try to consolidate identifying method and evaluation method to clarify generative mechanism. In this research, mainly, we use probabilistic cellular automata (PCA) to describe generative mechanism. And we restrict spatio-temporal patterns to ASEP patterns. In particular, we discuss law of conservation of mass in ASEP model from spatio-temporal patterns.

OS19-4 Emergence of observable rules in a spatial game system

K. Harada and Y. Ishida
(Toyohashi University of Technology, Japan)

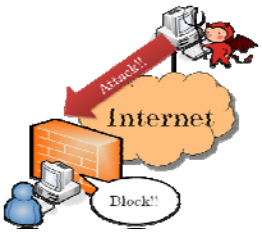


This study treats with our original spatial game which is iterated by a batch of players, each of which placed in each lattice site on a two dimensional square lattice. A particularity of the game lies in the point that a player's strategy is not preliminary given and fixed, but constructed dynamically in response to a pattern of player's actions. This means the strategy can evolve in time. However simulations bring us unexpected results. Actually all of observed strategies did not evolve and were fixed in time. The right figure shows an example of a time-invariant strategy. This paper enumerates all of the observed strategies in detail and examines their characteristics.

OS19-5 An artificial intelligence membrane to detect network intrusion

Takeshi Okamoto
(Kanagawa Institute of Technology, Japan)

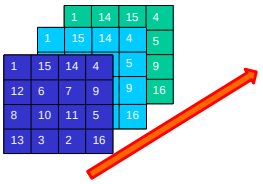
We propose an artificial intelligent membrane for network intrusion detection. As if a biological membrane prevents viruses from breaking into our cells, the artificial membrane monitors incoming packets, and prevents a malicious program code (i.e., shellcode) from breaking into a stack or a heap in memory. The artificial membrane monitors incoming TCP packets, and it constructs a TCP session of incoming packets. Then, it derives byte frequency of the TCP session from 0 byte to 255 byte, the entropy and the size of the session. These features of the session are classified by a data mining technique such as a decision tree, neural network, etc. If the data mining method finds a suspicious byte sequence, the sequence is emulated to ensure that it is just a shellcode.



OS19-6 A dynamic Houjin (square) and a symmetric Houjin

Yuki Tsuzuki and Yoshiteru Ishida
(Toyohashi University of Technology, Japan)

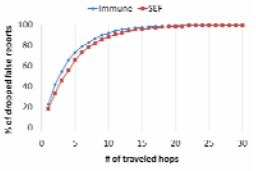
A Houjin is an n by n square lattice with each cell containing a symbol (such as a number or a letter). Further, these numbers or letters are designed to exhibit symmetry. For example, a magic square is a Houjin where the symmetry embedded is that the numbers in each row, column and a center diagonal have an equal sum. This paper reports a new Houjin: a dynamic Houjin. A dynamic Houjin changes its containing numbers at each time step while satisfying the symmetry as the Houjin (the magic square). The dynamic Houjin has a further symmetry in a time dimension, that is, the sums of the numbers for each cell are identical.



Session: OS20
Embracing complexity in sensor system organization
OS20-1 Performance evaluation of immunity-based statistical en-route filtering in wireless sensor networks

Yuji Watanabe
(Nagoya City University, Japan)

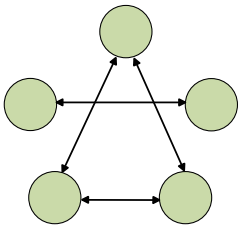
Statistical en-route filtering (SEF) schemes can detect and eliminate false data injection attacks in wireless sensor networks. However, SEF do not address the identification of compromised nodes injecting false reports. In this paper, we propose an immunity-based SEF to identify compromised nodes and achieve the earlier detection of false reports. In the proposed scheme, each node has a list of neighborhood and assigns credibility to each neighbor node. Each node can update the credibility of neighbor node based on success or failure of filtering and communication and then use the updated credibility as the probability of next communication. We carry out some simulations to evaluate the performance of the proposed scheme. Some results show that the immunity-based SEF outperforms the original SEF.



OS20-2 Improvement of immunity-based diagnosis for a motherboard

Haruki Shida[1], Takeshi Okamoto[1], and Yoshiteru Ishida[2]
([1]Kanagawa Institute of Technology, Japan)
([2]Toyohashi University of Technology, Japan)

We have utilized immunity-based diagnosis to detect abnormal behavior of components on a motherboard. After simulating the abnormal behaviors of some components on the motherboard, we assessed the ability of the immunity-based diagnostic model to detect these abnormalities. To improve the diagnostic accuracy of the model, which can be decreased by isolated nodes, we used multiple diagnostic networks to connect isolated nodes to a network or other isolated nodes. This simulation showed that the immunity-based diagnostic model containing multiple diagnostic networks was an effective method for detecting abnormal behavior of components on the motherboard.



OS20-3 Visualization of keystroke data and its interpretation

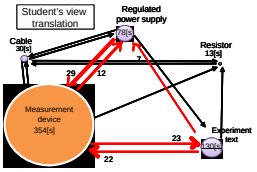
T. Samura[1], K. Tani[1], and Y. Ishida[2]
([1]Akashi National College of Technology, Japan)
([2]Toyohashi University of Technology, Japan)

Keystroke data from keyboard input is time-series data and follows a fixed pattern. However, it is difficult to intuitively grasp the meaning of the data. In this paper, we have investigated visualization methods of keystroke data, as a kind of biological sensors. We extracted feature indices from the keystroke timing between consonant-vowel letter pair in Japanese text input and propose two visualized methods: a consonant-vowel doughnut method and a consonant-vowel matrix method. These patterns of visualization would be expected to analyze personal characteristics and to authenticate individuals.

OS20-4 Extraction of learning point by visualization of skill

Shihoko Kamisato[1], Yukihiro Mori[1], Nobuhiro Yamashiro[1], Kentaro Noguchi[1], and Yoshiteru Ishida[2]
([1]Okinawa National College of technology, Japan)
([2]Toyohashi University of Technology, Japan)

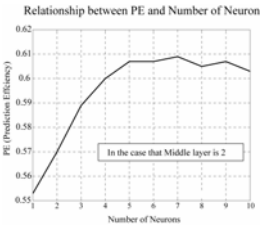
In precedence research, we considered the technical skill education imparted during engineering experiments and analyze eye and arm movements of the teachers and students in the experiments. Purpose of this research is improvement of engineering experiment by visualization of skills. We visualized the teaching materials movie of the teacher and student. Furthermore, it made clear a weak point of engineering experiment using principal component analysis and protocol analysis.
As a result it was able to make sure of having weak point consciousness with default setting of device and relation of connection of device.



OS20-5 Prediction of electron flux environment at geosynchronous orbit using neural network technique

Kentarou Kitamura[1], Yusuke Nakamura[1], Masahiro Tokumitsu[2], Yoshiteru Ishida[2], and Shinichi Watari[3]
([1]Tokuyama College of Technology, Japan)
([2]Toyohashi University of Technology, Japan)
([3]National Institute of Information and Communications Technology, Tokyo, Japan)

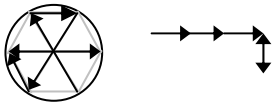
It is well known that spacecrafts sometimes have serious troubles on their electric circuit by the internal charging due to a sudden enhancement of high-energy electron flux at geosynchronous orbit. In this study the neural network technique is adopted to prediction of the electron flux at the geosynchronous orbit using the several solar wind data obtained by ACE spacecraft and magnetic variations observed on the ground as input parameters. The parameter tuning for back-propagation leaning method is attempted to the feed-forward neural network. As a result, the prediction using the combined data of solar wind and ground magnetic data shows the highest prediction efficiency of 0.61, which is enough to adapt the actual use of the space environment prediction.



OS20-6 A diagrammatic classification in a combinatorial problem: The case of a Stable Marriage Problem

Tatsuya Hayashi, Yoshikazu Hata, and Yoshiteru Ishida
(Toyohashi University of Technology, Japan)

The Stable Marriage Problem (SMP) is a combinatorial problem to find stable matching between n women and n men. An instance of SMP can be expressed by a bipartite graph with multiple (weighted) edges. By rearranging the graph, we use a diagram that involves several constraints to visualize several symmetries. By the diagram, all the instances of the size 3 SMP (three women and three men) are classified. The classification may be supported by the fact that the same class has the same stable matching.

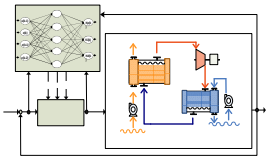


Diagrams indicating a class

Session: OS21
Learning control and robotics
OS21-1 A neuro PID control of power generation using low temperature gap

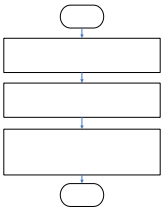
Kun-Young Han, Hee-Jae Park, and Hee-Hyol Lee
(Waseda University, Japan)

Recently, renewable energy is increasingly attractive in solving global problem such as the environmental pollution and energy shortage. Among varieties of renewable energy resource, power generation using low temperature gap has received much attention of researchers. However, this system is difficult to control because each of the components of this system, such as heat exchanger, working fluid and turbine, has a dynamic characteristic or nonlinear factor. In order to overcome this problem, PID controller based on neural network for power generation using low temperature gap is designed to keep the stable speed of the steam turbine in real environment.



OS21-2 An efficient identification scheme for nonlinear polynomial NARX model

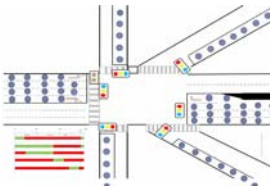
Yu Cheng, Miao Yu, Lan Wang, and Jinglu Hu
(Waseda University, Japan)



Recently, optimization methods have been commonly used for identification of nonlinear polynomial model. However, it is still considered as a difficult task because the size of candidate terms increase drastically with maximum time delay of input-output data and order of polynomial model. This paper proposes an efficient identification scheme with pre-processing to reduce the searching space effectively. Both the input selection and term selection are implemented to truncate the candidate pool with the help of correlation based orthogonal forward selection (OFS) algorithm and simplified orthogonal least square (OLS) algorithm, respectively. Then multi-objective evolutionary algorithm (MOEA) is used to identify the polynomial model in a relative small searching space.

OS21-3 Traffic signal control of multi-forked road

ChengYou Cui, Mizuki Takamura, and HeeHyol Lee
(Waseda University, Japan)



The traffic jam has become more serious at the Multi-Forked Road intersection, and the conventional pre-timed control is less efficiencies to the congestion problem. In this paper, the new traffic signal control system for multi-forked road is proposed. Firstly, the cellular automaton model is used to establish a traffic simulator for multi-forked road. Next, the stochastic model of traffic jam is built up. In addition, new traffic signal control algorithm is designed using the optimization technique Genetic Algorithm. Finally, the effectiveness of the proposed method is shown using the actual traffic data with traffic simulator.

OS21-4 Control design methods for platooning in robot car

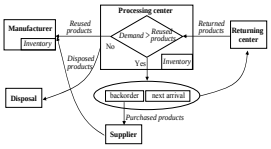
Ryo Takaki, Xin Zhao, and Harutoshi Ogai
(Waseda University, Japan)

Platooning technology is becoming a future task which suggests as a way of reducing carbon dioxide emissions and realizing safe driving at a high speed velocity. This paper describes a few control methods for platooning in car or robot car.
The conventional control method improved fuel consumption by shortening the distance between two cars. By contract, the method we propose improves it by controlling the vehicle velocity at the time of acceleration gently. The velocity is controlled by generating the desired value of inter-vehicular distance corresponding to the leading vehicle velocity. Another method which is planned to realize a highly efficient arterial traffic distribution system includes reducing aerodynamic drag by minimizing the distance between vehicles to allow drafting. The model predict control method is applied for it. These proposed methods are evaluated by simulation and some experiments.

OS21-5 Building of reverse logistics model in reusable recovery and optimization considering transportation, inventory, and backorder costs

Jeong-Eun Lee and Hee-Hyol Lee
(Waseda University, Japan)

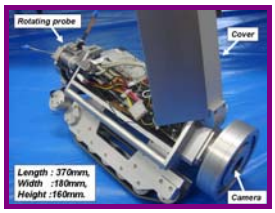
This paper deals with the building of the reusable reverse logistics model considering the decision of the backorder or the next arrival of goods. The optimization method to minimize the transportation cost and to minimize the volume of the backorder or the next arrival of goods occurred by the Just in Time delivery of the final delivery stage between the manufacturer and the processing center is proposed. Through the optimization algorithms using the priority-based genetic algorithm and the hybrid genetic algorithm, the sub-optimal delivery routes are determined. Based on the case study of a distilling and sale company in Busan, Korea, the new reverse logistics model in reusable recovery of empty bottles is built and the effectiveness of the proposed method is verified.



OS21-6 Advanced pipe inspection robot using rotating probe and image processing

Ryuta Oyabu[1], Kentarou Nishijima[1], Zhicheng Wang[1], Harutoshi Ogai[1], and Bishakh Bhattacharya[2]
([1]Waseda University, Japan)
([2]Indian Institute of Technology Kanpur, India)

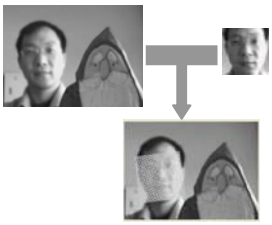
Recently many drain pipes used for transportation of water and gas at the plants have become old. These pipes have many defects caused by corrosion and cracking and they cause serious accidents because of leakage, fire and blasts. Therefore, to forestall these accidents, we believe it is important to do drain pipe inspections and maintenance using drain pipe inspection robots.
'Rotating probe' and 'Image processing' are used for the method of inspecting pipe in the present research. Then, the development of the Pipe Inspection Robot measures the ruggedness and the form of the defect in pipe. This robot using the rotating probe of this touch sensor is profitable.



Session: OS22
Robotics and pattern recognition
OS22-1 Application of the genetic algorithm on face recognition

Fengzhi Dai[1], Liqiang Shang[2], Naoki Kushida[3], and Masanori Sugisaka[4]
([1]Tianjin University of Science and Technology, China)
([2]Vestas Wind Technology (China) Co., Ltd, China)
([3]Oshima National College of Maritime Technology, Japan)
([4]Nippon Bunri University, ALife Robotics Co., Ltd, Japan)

To search the object in an image, lots of data need to be processed. The genetic algorithm is a search algorithm that it is based on the mechanics of natural selection and natural genetics. In this paper, the chromosomes generated by the genetic algorithm contain the information of the image data, and we use the genetic operators to obtain the best match part in an image for the template. Searching the optimal match is the goal of the paper. This thought emerged from the features of the genetic algorithm and the need of easily and quickly recognizing the face of people in an image.



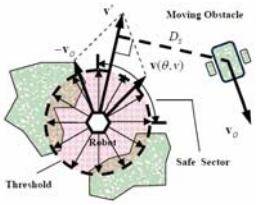
OS22-2 Study on the disturbance rejection of Virtual Slope Walking by Stepper-2D Robot

Mingguo Zhao[1,2], HaoDong[1], and Naiyao Zhang[1]
([1]State Key Laboratory of Robotics and System (HIT), China)
([2]Tsinghua University, China)

Virtual Slope Walking is a new realization of powered walking based on Passive Dynamic Walking, which is not only effective in generating fast walking, but also achieving advantages on disturbance rejection. Under the open-loop condition without external sensing device, the step-handling walking with maximum step height of 10% leg length is realized on a planar bipedal robot Stepper-2D. This paper theoretically studies the disturbance rejection of Virtual Slope Walking by introducing the ground step perturbation. We theoretically proved that the step perturbation can be transformed to the disturbance of initial system state and successful step handling walking comes from the system's cyclic stability. Based on the analysis of the relationship between the system state and minimum initial state during the transition phase, the necessary and sufficient condition of recovering from the step perturbation is obtained and confirmed by the experiment on Stepper-2D.

OS22-3 A new method for mobile robots to avoid collision with moving obstacles

Yi Zhu[1], Tao Zhang[1], Jingyan Song[1], and Masatoshi Nakamura[2]
([1]Tsinghua University, China)
([2]Saga University, Japan)



A new method for mobile robots to avoid collision with moving obstacles is proposed in this paper. It adopts the concept of safe sectors in the vector field histogram (VFH) method but simplifies its description. Moreover, the new method takes the threat of moving obstacles into account when selecting motion direction and a new speed control law that considers more factors is designed. Hence it can better avoid moving obstacles than the VFH method. Simulation results indicate that the new method also shows many advantages over the dynamic potential field (DPF) method which is a representative approach for avoiding moving obstacles. Experiments have further verified the applicability of the new method.

OS22-4 Some thought for the Mckibben muscle robots

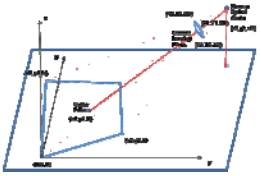
Huailin Zhao[1], Xiaoqing Jia[2], and Masanori Sugisaka[3]
([1]Shanghai Institute of Technology, China)
([2]Shanghai Maritime University, China)
([3]Nippon Bunri University, Japan)

This paper introduces the background of the research. It summarizes the applications related with robots actuated by Mckibben muscles. Based on the robot joint structure, the robots are classified into two types. The paper indicates that the different modeling methods and the control algorithms are needed to the two types of robots.

OS22-5 Vehicle 3D estimation based on time series images and prior knowledge

Haoyin Zhou, Tao Zhang, Changshui Zhang, and Peng He
(Tsinghua University, China)

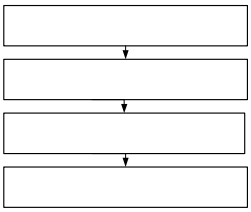
Vehicle 3D estimation is important in intelligent transportation systems. To simplify system structure and improve system accuracy, an algorithm based on one-camera system and prior knowledge is presented. The experimental result shows that the algorithm can achieve satisfied accuracy.



OS22-6 Automatic drawing of correct topographical distribution of EEG rhythms based on unified suitable reference selection

Bei Wang[1], Xingyu Wang[1], Akio Ikeda[2], Takashi Nagamine[3], Hiroshi Shibasaki[4], and Masatoshi Nakamura[5]
([1]East China University of Science and Technology, China)
([2]Kyoto University, Japan)
([3]Sapporo Medical University, Japan)
([4]Takeda General Hospital, Japan)
([5]Saga University, Japan)

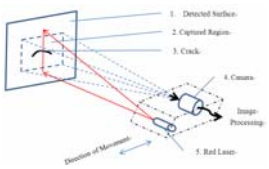
Electroencephalography (EEG) interpretation is important for brain diseases inspection. In this study, an automatic technique was developed to realize the automatic drawing of correct topographical distribution of EEG rhythms, which would be an assistant tool for EEG interpretation. Unified suitable reference electrode was selected automatically to construct the common referential derivation. The amplitudes of EEG rhythms were calculated among the scalp of head based on the common referential derivation. The final result of topography was helpful to highlight the EEG wave of interest for EEG interpretation. The developed technique has application significance for real clinics.



OS22-7 Research on surface crack detection based on laser scanning and image processing techniques

Guangming Cai[1], Jiwu Wang[1], Mingcheng E[1], Wenliang Guo[1], and Sugisaka Masanori[2]
([1]Beijing Jiaotong University, China)
([2]Nippon Bunri University, Japan)

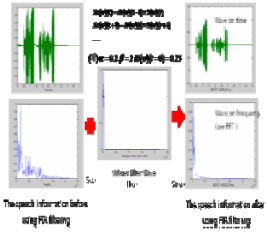
The traditional Surface crack detection method based on artificial vision, due to low detection efficiency and high labor strength etc., can hardly fit the demand of the actual testing operation. In order to meet this demand, in this paper we propose a new method based on laser scanning and image processing techniques for surface crack detection. The analysis of experimental results has shown the feasibility, accuracy and effectiveness of this method, and detection results were quite satisfied.



Session: OS23
Intelligent systems II
OS23-1 Intelligent speech recognition filtering

Young Im Cho
(University of Suwon, Korea)

In Emergency situation, speech recognition speed is very important. Therefore, in this paper, we propose a fast filtering algorithm. Firstly, FIR filter selectively passes through the frequency range of speech, and secondly, the Wiener filter filters out the extraneous noises. Because of that, the processing time is reduced.



OS23-2 Multi robotic system and the development of cooperative navigation behaviors for humanitarian demining

Maki K. Habib
(The American University in Cairo, Egypt)

Multiple robotic systems can accomplish tasks that no single robot achieve, since ultimately a single robot, no matter how capable, is spatially and physically limited. However, achieving cooperative robotics is quite challenging. Many issues must be addressed in order to develop a working cooperative team, such as action selection, coherence, conflict resolution, resources management, coordination, cooperation and communication. In this paper Pemex-BE robot is used to represent the individual robot that makes up a team for multi robotic system dedicated for humanitarian demining. The multi Pemex-BE robots for mine clearance represents an attempt to reduce the gap between the research level and the actual needs on the ground. The technical features and navigation system with obstacle avoidance along with the scenario of multi robotic system is presented.

OS23-3 Development of Flexible Surgical Manipulator for Natural Orifice Transluminal Endoscopic Surgery

Jungwook Suh, Hoseok Song, Kiyoung Kim, and Jungju Lee
(KAIST, Republic of Korea)

Natural Orifice Transluminal Endoscopic Surgery is an advanced and experimental surgical technique performed via natural orifices (mouth, anus, vagina, urethra, etc.). Therefore, unlike other surgery methods such as laparoscopic surgery or single port access surgery, NOTES can avoid an external incision or scars. Surgical manipulator for NOTES should be flexible in order to be inserted into channels of overtube. This paper presents a development of flexible robotic manipulator for NOTES, including design and kinematic analysis. Developed thin manipulator has 4 DOF motion and only 5.0 mm in diameter. And it uses multi-revolute joints that have gradual curve in order to enlarge the workspace and minimize the diameter of manipulator.

OS23-4 Swing-up and LQR stabilization of rotary inverted pendulum

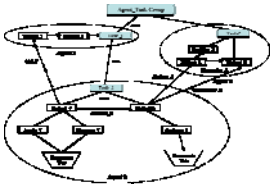
Minho Park, Yeoun-Jae Kim, and Ju-Jang Lee
(Korea Advanced Institute of Science and Technology, Republic of Korea)

Swing up and LQR stabilization of rotary inverted pendulum is considered. A DC motor rotates rigid arm. Joint is attached end of rigid arm and it suspends pendulum. Two encoders check the degree of rigid arm and pendulum every 0.5ms. This paper proposes modified bang-bang control which swings up pendulum fast and safe. In order to solve stabilization problem, this paper used linear quadratic regulator. When user gives large disturbance to the pendulum to lose its position, controller backs it up to upright position. Experimental results show that the proposed bang-bang controller and LQR controller can stabilize a rotary inverted pendulum system within 3.0s for any starting point and system shows robustness from large disturbance.

OS23-5 Intelligent information retrieval system

Young Im Cho
(University of Suwon, Korea)

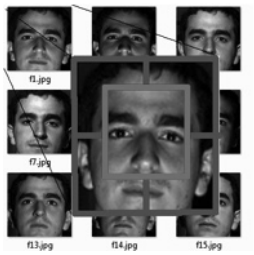
In this paper, we propose a multi agent based information retrieval system in digital library. We propose a new algorithm for each multi agent module in detail. Each module is for personalized information retrieval. In the future, we have to apply to a real situation for proving.



OS23-6 A study on real-time face verification and tracking with segmented common vector

Dongkyu Ryu, Minho Park, and Ju-Jang Lee
(Korea Advanced Institute of Science and Technology, Republic of Korea)

Recently, There has been much interest in automatically face recognition and tracking in many areas such as Intelligent Robotics, Military, Intelligent Transport System (ITS) and Smart device applications. However so far there has not been simultaneously face tracking and verification algorithms, so we propose the method in simultaneously verifying and tracking face which is segmented common vector method and It is theoretically based on discriminative common vector method and Fisher's LDA. The algorithm trains segmented and shift face image to obtain new face vector. The Gram-Schmidt orthogonalization is employed to calculate the orthogonal projection matrix. Our goal can be defined as the identification of individuals and real-time face tracking from video images simultaneously, so we use segmented common vector for two kind of different task at the same time.



Session: OS24
Human agent interaction toward social modification
OS24-1 Social modification using implementation of partial agency toward objects

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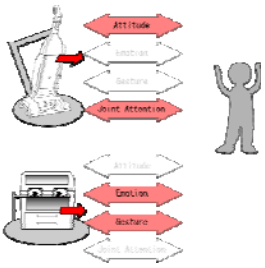
This paper discusses what kind of partial agency is implementable for objects to bring more suitable agencies toward human agent interaction. Human beings have an ability to inform fellows about our intention, internal states and requirements using verbal talk, gestures, attitudes, timings and other representations. These representations can keep our belief that we are sufficient agents mutually. The robots and virtual agent also mimic these representations, reproduce as if they have an agency, and interact with them. However, their agencies are sometimes too excessive compared to its task. This mismatch leads high cognitive load toward users and brakes interaction consequently. This defect prevents to apply human agent interaction method toward application field. The authors consider that our agency is constructed by multiple features and dividable. If these features are selectable, we can choose more proper design for virtual agents, robots, machineries, daily home appliances according to their traits. The authors categorized these agencies in several group and discusses about what elements achieves these features. The paper also shows what method can extract these features from human being.



OS24-2 Inducement of attention to agent through averting gaze from the other

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Social relationship established through mutual gaze, averting from the other's gaze, treats as an act to refuse social relationship, was not discussed as act that intends to engage social relationship. In this paper, we examine whether people perceive a feeling the attention when they are refused their eye contact from the agent. And we discuss natural means of social engagement between human and agent based on the result of psychological experiment.

OS24-3 Behaviors for getting conscious responses

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This paper investigates robot's behaviors to get voluntary conscious responses from users. Our final goal is to construct an asynchronous human-to-human communication mediated by a potable robot. The robot has a behavior system which makes the robot behave in response to the acquired conscious response. The system also enables the user to give the robot feedback at anytime and anywhere while the robot presents a script which an author prepared. We investigate how well the behavior system encourages the users to give the robot feedback and how much the users consider inputting the response to be meaningful. The results show that there are definite relation between response behavior and the acquisition of the conscious responses.

OS24-4 Cross-modal effects between gestures and words in human robot interaction

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This paper reports a novel phenomenon, "cross-modal effect" between gestures and words in human-robot interaction; it is defined as an effect of one robot's modality on another person's modality. The cross-modal effect is related to entrainment, which is a phenomenon that person's behavior is synchronized with robot's behavior. The entrainment is an effect between similar modalities; such as between person's gestures and robot's gestures or between person's words and robot's words. Since human-robot interaction is multi-modal interaction including gestures and words, there would be an effect across modality. In this paper, we focused on a pointing gesture and a deictic word, and investigated whether person's pointing gestures were changed by robot's deictic words and whether person's deictic words were changed by robot's pointing gestures. According to our experimental results, a person used pointing gestures more often when the robot used deictic words, and a person used deictic words more often when the robot used pointing gestures. This result suggests that not only the entrainment but also the cross-modal effect should be considered in human-robot interaction. We believe these findings are available to robot's dialog design to elicit comprehensible behavior from people.