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目　　次

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CONTENTS

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Study on OFDM Based Transmission Techniques for Next Generation Wireless LAN Communication Systems

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1. Introduction

The Orthogonal Frequency Division Multiplexing (OFDM) technique has been widely accepted and becomes one part of Wireless LAN (WLAN) industry standards for its efficient usage of frequency bandwidth and robustness to frequency selective fading. Recently, the researches on extending OFDM concept to the adaptive modulation method, multiple antenna system, and multiple access scheme have received considerable attentions for its potential to achieve the higher transmission date rate for next generation WLAN system. This research focuses on studies of problems in these OFDM based systems and proposes several novel methods to solve the problems so as to provide the promising solutions for practical considerations.

2. Proposed Methods

The OFDM technique in conjunction with adaptive modulation (AM) method is well known to enable significant improvement on transmission date rate of WLAN system. In practical system, the receiver needs to have the knowledge of the adaptive modulation information (AMI), which describes that which kind of modulation scheme is employed on each sub-carrier, and whose amount is usually proportional to the number of sub-carriers, and modulation schemes. Therefore, the large number of AMI bits would degrade the transmission efficiency and quality in practical AM aided OFDM system. This thesis proposes Grouping Adaptive Modulation (GAM) -OFDM method to reduce the number of AMI bits for AM aided OFDM system. The proposed GAM-OFDM method divides all sub-carriers into certain number of groups to reduce the AMI bits significantly at a cost of slight decrease of channel capacity. The proposal of GAM-OFDM system also includes an efficient transmission method of the AMI bits by using only two preamble symbols that are conventionally used for the frame synchronization and channel estimation. The proposed method employs the Multi-Carrier Spectrum Spreading (MC-SS) technique for the transmission of AMI bits to achieve the higher transmission quality even under severe multi-path fading environments.

The SDM (Space Division Multiplexing) -OFDM method is one of the promising solutions to extend Multi Input Multi Output (MIMO) technique to broadband communication system so as to achieve the linearly increased transmission date rate with increased antennas. For SDM-OFDM system, the number of AMI bit is also proportional to the number of transmit antennas. To solve the AMI problem in SDM-OFDM system, this thesis proposes AM aided SDM-SCOFDM (Single Carrier OFDM) method, which employs SCOFDM technique instead of OFDM technique so as to reduce the AMI bits remarkably. The proposed SDM-SCOFDM also has the advantage of low peak to average power ratio (PAPR), which would not cause severe performance degradation through nonlinear amplifier as conventional OFDM does.

The maximum likelihood detection (MLD) method is the optimal detection method for SDM-OFDM system in the term of minimum transmission error. However, the exhausted MLD search would become infeasible when the number of antennas and signal constellation size is large. Although several suboptimal detection methods exist, the performance is very far from the MLD performance. This thesis proposes the adaptive MLD (AMLD) and parallel MLD (PMLD) methods to achieve the near exact MLD performance with significant reduced computational complexity. The BER performance and complexity analysis show that the two proposed methods can outperform the conventional suboptimal methods and achieve very near optimal performance with low complexity.

In practical MIMO-OFDM systems, the efficient and highly accurate channel estimation method is the mandatory requirement to achieve the potential system performance. Although the conventional

DFT interpolation-based channel estimation (DFTI-CE) method could use the preamble symbols efficiently, it could no provide the high estimation accuracy of channel responses and suffers from the severe performance degradation when the zero padding is added at the transmitter to avoid the aliasing occurring at D/A converter. This thesis proposes the Discrete Cosine Transform interpolation-based channel estimation (DCTI-CE) method for MIMO-OFDM system to enable the estimation of all link conditions in high accuracy by using only one preamble symbol, even if the number of FFT points is larger than the number of subcarriers due to zero padding.

The Orthogonal Frequency Division Multiple Access (OFDMA) technique can be considered the extension of OFDM concept to multiple access scheme and expects to be able to improve the frequency bandwidth efficiency for the point-to-multipoint system by assigning different subchannel to individual users. However, since the subchannels for individual users will fluctuate over a wide range due to their different multi-path fading conditions, the overall system performance of the fixed subchannel allocation method will degrade severely. Furthermore, the conventional adaptive subchannel and bit allocation method could not satisfy the practical requirements due to the high computational complexity. This thesis proposes an efficient adaptive subchannel allocation (ASA) method for OFDMA system, which employs priority rule based allocation algorithm, and assigns subchannel to each according to its instantaneous channel conditions. Then, this thesis proposes adaptive subchannel and bit allocation (ASBA) method for OFDMA system by introducing the GAM concept to ASA-OFDMA system. The salient feature of the proposed method is to employ the low complexity allocation algorithm for assigning both of the subchannel and modulation scheme to each user adaptively so as to improve the channel capacity with keeping the required signal quality. This thesis also proposes the OFDMA system with time and frequency domain code division multiplexing (TFCDM) method to achieve both time and frequency domain diversity gains so as to improve the signal quality under severe multipath fading environments. The proposed OFDMA-TFCDM method assigns different spreading codes to each data signal of the same user in OFDMA system. This kind of processing will not cause any user interferences at the receiver so as to enable the simpler detector without the requirement of the complicated multiple user detection technique as well as achieving diversity gains.

3. Conclusions

The numerous computer simulations are conducted to confirm the effectiveness of all proposals included in this thesis. The measurements of transmission quality, channel capacity, complexity analysis, and estimation accuracy, etc, are employed to evaluate these proposed methods. As a conclusion of researches in this thesis, the OFDM based techniques could provide various practical solutions for next generation high date rate WLAN system.

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Study on Aerodynamic Force Acting on Rotating Blade in Field Horizontal Axis Wind Turbine

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1.Introduction

Though in recent years there has been substantial progress in the aerodynamic modeling and design of horizontal axis wind turbine, there is still a failure to predict high aerodynamic loads. Though today's rotor blade is taking out about 40% of wind energy, it is possible to take it out up to 59.3% theoretically. However, because the distribution of wind direction and speed changes, the amount of energy that can be actually taken out is influenced by wind condition.

Generally, wind turbine blade airfoil is designed by 2D numerical analysis combined with blade element momentum theory, and verified in the wind tunnel test. However, in the field, the flow around the wind turbine blade is unsteady, and it becomes complex due to the effect of Coriolis force, centrifugal force and three-dimensional flow. It is uncertain that sufficiently detailed field measurements exist for validating aerodynamic models against the actual three-dimensional, unsteady flow. Complexity of the flow behavior on the wind turbine blade, makes it necessary to provide more data and for a broad range of experimental conditions.

This thesis shows the wind profile of upstream, and the pressure distribution on a rotor blade of a 10m-diameter wind turbine. The upstream wind condition of wind turbine and the aerodynamic force characteristics of rotor blade are clarified by field experiment data, and it is used to develop the rotor blade and improve the wind turbine performance in the future.

2.Experiment and remarks

Results of this thesis are as follows:

(1) At the radial section which close to two dimensional flow condition, the aerodynamic force improves from the wind tunnel experiment.

(2) At the radial section in which the mainstream wind influence becomes remarkable, when the spatial in-homogeneity of the wind speed profile is large, the aerodynamic force decreases more than the wind tunnel experiment.

(3) At the radial section in which the mainstream wind influence becomes remarkable, the aerodynamic force decreases more than the wind tunnel experiment in yawed condition.

This result is not reflected in a current blade design, and it seems that it greatly influences development of a rotor blade and a three-dimensional blade shape in the future. In addition, it proposed a concrete method to keep the aerodynamic force of the rotor blade to be large from the correlation of an atmospheric turbulence and an aerodynamic force of rotor blade.

3.Conclusions

In the region of a large atmospheric turbulence and a complex terrain such as Japan, it is necessary to research including the upstream wind condition of wind turbine and the aerodynamic force characteristics of rotor blade. Therefore, the data of aerodynamic force characteristic of rotor blade in operating condition are

demanded to design a blade. It is believed that the result of this thesis contributes to development of rotor blade, which shows high efficiency in unsteady shear flow.

Table 1 Contents of thesis

1. Introduction
  1.1 Background of this study
  1.2 Purpose of this study
  1.3 Contents of this thesis
  1.4 Nomenclature

2. Experimental apparatus and methodology
  2.1 Test turbine and peripheral apparatus
  2.2 Test blade and pressure measurement device
  2.3 Calibration method of pressure measurement
  2.4 Experiment method of pressure measurement
  2.5 Visualization experimental apparatus
  2.6 Visualization methodology
  2.7 Wind tunnel test methodology

3. Equation for reducing an experiment result
  3.1 Definitional equation
  3.2 Data reduction method

4. Change of the mean aerodynamic force characteristic of a blade due to radial flow
  4.1 Prolusion
  4.2 Change of the measured value due to the unsteady wind
  4.3 Change of the blade performance against local angle of attack
  4.4 Change of the blade performance against local slip

  4.5 Comparison of the pressure distribution on a blade surface
  4.6 Summary

5. Change of the mean aerodynamic force characteristic of a blade due to the fluctuation of mainstream wind
  5.1 Prolusion
  5.2 Effect of the difference in the wind shear in 0 degree of yaw angles
  5.3 Effect of the difference in yaw angle
  5.4 Summary

6. Change of the mean aerodynamic force characteristic of a blade for every azimuth angle due to the fluctuation of mainstream wind
  6.1 Prolusion
  6.2 Effect of the difference in the wind shear in 0 degree of yaw angles
  6.3 Effect of the difference in yaw angle
  6.4 Summary

7. Conclusions
  7.1 Summary of Chapter 4
  7.2 Summary of Chapter 5
  7.3 Summary of Chapter 6

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Acknowledgement

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A Study on the Landscape Administrative Measures Centered on the Landscape Ordinance in the Prefectures

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Keyword:　the Prefectures, landscape ordinance, landscape administrative measure

1. The Background and Purpose

In Japan, the equipment and preservation of the landscape has been wrestled mainly with the landscape ordinances of the Prefectures and the municipalities from 1960's. The number of the landscape ordinances is 27 in the Prefectures, in the case of including the municipalities about 500. In 2004, the Landscape Law's been enacted, for taking a new turn, it's important to estimate thus landscape administrative measures.

So in this study, I'll make clear the roles of the landscape administrative measures while taking the relation between the municipalities into consideration, and survey how the landscape administration of the Prefectures should be in future.

2. The types and change of the landscape ordinances in the Prefectures

About the present condition of the landscape administration of the Prefectures and the municipalities, we've made the hearing from 2002 to 2005.

It's clarified that in the main measures of the landscape ordinances of the Prefectures and the municipalities there're "the landscape-forming region etc. (the wide-landscape region and the landscape-forming district)", "the large-scale activities etc.", "the important landscape structure etc." and "the public enterprise etc." as the hard measures, "the enlightenment etc.", "the landscape-forming agreement", "the landscape-forming group" and "the support etc." as the soft measures.

According to these analyses, the landscape ordinances of the Prefectures' been classified in 3types of the region protective type which regulates a limited region and has begun in 1969 in Miyazaki, the total development type which has the hard and the soft measures for all region of the Prefectures and has been established in the 20 Prefectures from the beginning in 1984 in Shiga, and the idea active type which supports with the soft measures only the landscape formation by the lead of the residents and the municipalities and has established in 2000 in Fukuoka, in 2001 in Hokkaido.

Still more, through the analyses of the correlation of the landscape ordinances of the Prefectures and the municipalities, the landscape ordinances of the Prefectures have classified in 3 types of the standing side by side type for the Prefectures and the municipalities of the region protective type, the adjustment type for the Prefectures and the municipalities of the total development type, the self-support type for the Prefectures and the municipalities of the idea active type.

3. The applying circumstances of the adjustment type

The characteristic of the adjustment type is that the Prefectures can apply the landscape administrative measures suitably in by the shift etc. in response to the circumstances of the municipalities. The Prefectures entrust the municipalities with the landscape administrative measures fundamentally avoiding the duplication of the region by the shift in the case which the municipality enact the landscape ordinance having the hard measures afterward for planning the landscape formation in all region by the hard measures.

Co, Nissetu Architecture Office

Besides, a part of the Prefectures act the competence devolution and the consignment contract.

The soft measures don't be shifted basically and the Prefectures and the municipalities apply their administrative measures severally. But under some circumstances, the Prefectures put in joint support, promote the administrative measures for the support, and improve the consciousness of the municipalities.

4. The applying circumstances of the standing side by side type

The characteristic of the standing side by side type is that the Prefectures apply the hard and the soft measures for the wide landscape in spite of the circumstances of the municipalities. It has cased the doubleness of the notifying system for the duplication of the region in the Prefectures and the municipalities.

5. The applying circumstances of the self-support type

The characteristic of the self-support type is that the Prefectures can act the own administrative measures effectively for the municipalities which have the landscape ordinances regulating the administrative measures directly.

As the case of "the wide-landscape region" etc., it seems to be the subject that the Prefectures can't act the landscape formation by the administrative measures directly.

6. The roles of the landscape administrative measures

From these analyses, in the landscape ordinances of the Prefectures, it's clear that there're 3 roles which are the wide region role acting the landscape formation extending all over the plural municipalities, the leading role that the Prefectures lead the administrative measures of the municipalities and the promotive role promoting the landscape administrative measures of the municipalities etc. .

Though the standing side by side type has the wide region role and the self-support type has the promotive role, the adjustment type has all 3 roles. Thereupon the adjustment type is the most effective for the promotion of the landscape administrative measures smoothly.

Then I suggest about the adjustment type for the Prefectures and the municipalities to work together still more from 2 view points.

One is that in the landscape ordinances it needs to prescribe all of the main administrative measures concluding "the important landscape structure etc." and "the landscape–forming group" which haven't been acted enough.

The other is to carry favor with the competence devolution, the consignment contract, the unification of the notifying system, the joint support etc. for acting the promotion of the landscape administrative measures.

7. The future view

According to "the unification of the landscape administration" of the Landscape Law, in the case that both the Prefectures and the municipalities are the landscape administrative party, in principle the municipalities bear the landscape administration. So it's worried about that the Prefectures can't bear the wide region role, the promotive role and the leading role sufficiently and that it cases the region which the regulation doesn't reach. Therefore it's desirable that the Prefectures build the working relationship with the municipalities and make good the both landscape ordinances by the Landscape Law.

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A Study on Historic Conservation Plan by the Integration of the Fields of Cultural Property Preservation and Landscape Conservation by Local Authorities in Taiwan
– Focus on the Comparison with the System of Preservation Districts for Groups of Historic Buildings in Japan-

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Keywords: Taiwan, Historic Conservation Plan, Cultural Property Preservation, Landscape Conservation, System of Preservation Districts for Groups of Historic Buildings

1. Research Purpose

This purpose of this research is first to analyzes the transition and current status of the historic environmental conservation systems and conservation plans in Taiwan in modern times, focusing on the following two point of views: 1. the local government's role in decentralization society", and 2. conservation plans by integration of the fields of cultural property preservation and landscape conversation. Then, the second purpose is to analyze the characteristics and issues, and the possibility of the contribution to Taiwan by Japanese experience through the comparative analysis with the situation of Japan. Finally, based on the above analysis, give the proposal of the basic frame of the historic environmental preservation plan with integration of fields of cultural property preservation and landscape conversation by the local authorities in Taiwan on the study of "village conservation system" newly enacted in 2005.

2. Related to prior arts

This research which intergrades two fields, "cultural property preservation" and "landscape conversation", and lets a comparative analysis with Japanese experience. Therefore, the meaning of considering the characteristics on the preservation in Taiwan is significant.

3. Contents

This research consists of introduction chapter and other 6 chapters.

In introduction chapter, it discusses the background, the purpose and points of view, the framework of research, the research method, the analysis of previous research and the positioning of this research, and terminological definition.

In Chapter 1, it discusses the transition of the historic environmental conversation systems in Taiwan. by dividing into 5 periods, and mentions about the background and the main contents of establishment in each period from two flows, "transition of a cultural property preservation related systems", and "transition of landscape conversation related systems".

In Chapter 2, it discusses the current conservation systems("village conservation system" ,"conversation area System", "exclusive use district system", "special district system", and "national park system", by analyzing the frame of systems, authorities in charge, and the operation.

In Chapter 3, it analyzes 4 case studies(Lu-gang conversation Area in Zhang-hua prefecture, Da-Dao-Cheng exclusive use district in Taipei city, Er-kan special district in Peng-hu prefecture and Kinmen national park in Lian-jiang prefecture based on the preservation situation of above systems, by analyzing the background, the plans.

In Chapter 4, it discusses the transition of the historic environmental conversation systems in Japan. by dividing into 6 periods, and mentions about the background and the main contents of establishment in each period from two flows, "transition of a cultural property preservation related systems", and "transition of landscape conversation related systems".

In Chapter 5, Focusing on the the conversation regulations and plans of 64 national designated districts based on System of Preservation Districts for Groups of Historic Buildings in Japan , by analyzing the authorities in charge, preservation regulations, the contents of the preservation plan, and the preservation situation.

In Chapter 6, it analyzes the characteristics and issues, and the possibility of the contribution to Taiwan by Japanese experience through the comparative analysis with the situation of Japan. Finally, based on the above analysis, give the proposal of the basic frame of the historic environmental preservation plan with integration of fields of cultural property preservation and landscape conversation by the local authorities in Taiwan on the study of "village conservation system".

4. Concluding Remarks

1) The Characteristics and issues of the current conservation systems in Taiwan are as follows:

The Characteristics of the current systems is the establishment of Village conversation system, and the issues are lack of clear definition for conversation district, lack of integration of cultural property preservation system and landscape conversation system, inadequate technical standard on the plan making, etc.

2) The Characteristics and issues of the current conservation plans in Taiwan are as follows:

The Characteristics of the current systems is the establishment of Village conversation system, and the issues are lack of clear definition for conversation district, lack of integration of cultural property preservation system and landscape conversation system, inadequate technical standard on the plan making, etc.

3) The proposal of the basic frame of the historic environmental preservation plan on the study of "village conservation system" are as follows:

① The clarification on the definition and establishment of "village conservation district".

② The clarification of technical standard on the plan making.

③ Integration of cultural property preservation system and landscape conversation system by local authorities.

④ Conversation of historic villages and the surroundings by local authorities.

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Study on Motion Control of Flexible Arm Considering Sensor Failure

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(Electrical and Electronic Engineering, Systems Engineering)

1.Introduction

In recent years, control system reliability has received much attention. In order to improve reliability, control systems need to have abilities to detect a fault (fault detection) and to maintain the stability and the control performance (fault tolerance). This paper is concerned with the vibration suppression control of a one-link flexible arm robot. In our control system, vibration suppression is realized by an additional feedback of a strain gauge sensor attached to the arm besides motor angle. However, a sensor fault may degrade a control performance and make the control system unstable at its worst. In this paper, we propose a fault-tolerant control system for a disconnection fault of a strain gauge sensor, and the effectiveness of the proposed fault-tolerant control system is examined through experiments.

2.Proposed control system

In the case of a strain gauge sensor fault, it is possible to maintain a stability of the control system by interruption of a faulty sensor signal. However, this interruption results in poor vibration suppression. In the control system of the flexible arm, it is desirable to maintain not only a stability of the control system but also a vibration suppression performance after a strain gauge sensor fault. For this purpose, we propose a new fault-tolerant control system to

- estimate a strain gauge sensor signal,
- detect a fault by monitoring an estimation error between the sensor signal and the estimated value
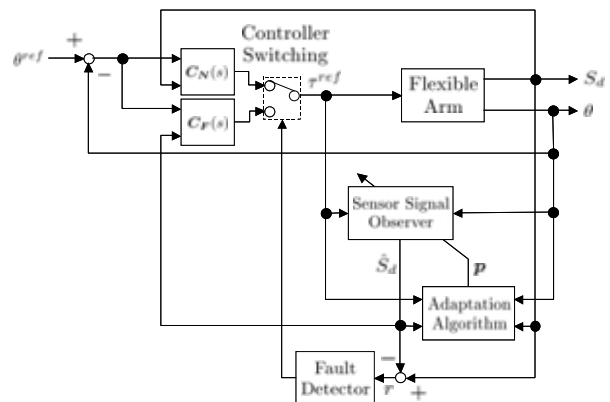- exchange a faulty sensor signal for the estimated one, and

Fig.1 Proposed control system

- maintain a stability and a control performance after switching from a faulty sensor signal to the estimated one.

Figure 1 illustrates a configuration of the proposed fault-tolerant control system. The proposed system is constructed by adding a strain gauge sensor signal observer, an adaptive algorithm, a fault-mode controller C_F, and a fault detector to the (normal) control system of the flexible arm.

3.Experimental results

In order to verify the effectiveness of the proposed fault-tolerant control system, a disconnection fault of the strain gauge sensor occurs virtually at 180.35[s]. Figures 2 and 3 show the motor angle θ and the distortion of the arm S_d, respectively, together with the no-switching case for comparison. The no-switching case means that only interruption of a faulty sensor signal is performed. The tracking performance associated with the motor angle θ has little degradation. While the vibration suppression performance much degrades in the no-switching case, the proposed case shows enough vibration suppression close to the fault-free scenario. These results show that the proposed fault-tolerant control system maintains the stability and the overall performance after the strain gauge sensor fault.

Fig.2 Motor angle θ

Fig.3 Distortion of arm S_d

4.Conclusion

In this paper, we proposed the fault-tolerant control system for the strain gauge sensor fault. In the proposed system, the strain gauge sensor fault is detected by monitoring the estimation error between the sensor signal and the estimated signal, and the control system works with the estimated signal after fault detection. From some experimental results, we confirmed that the proposed control system could maintain the stability and the control performance after the strain gauge sensor fault.

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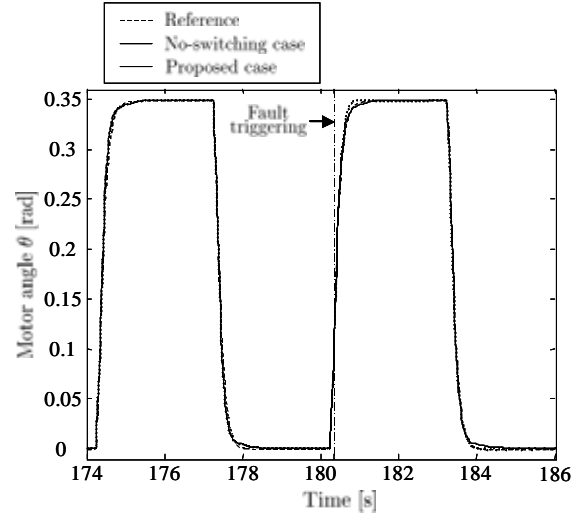
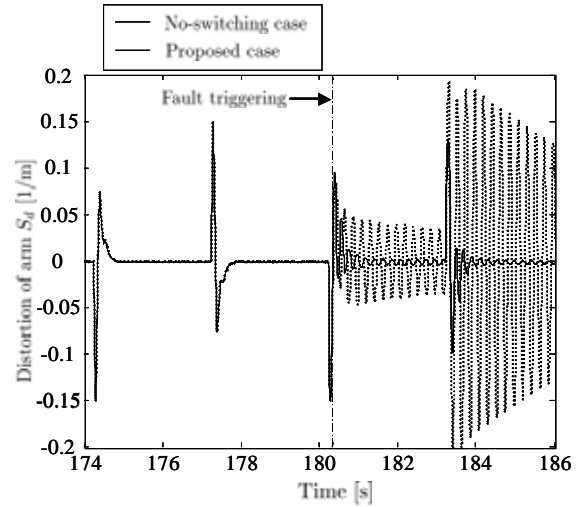# Decision Problems for Non-Linear Term Rewriting Systems

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Keywords: Term rewriting system, Decision problem, Non-linear

1. The purpose

A term rewriting system (TRS) is a set of directed equations (called rewrite rules). In this thesis, we consider the following five fundamental decision problems for TRSs:

Joinability problem

  For a TRS R and two terms s and t, can s and t be reduced to some common term by applying the rules of R?

Reachability problem

  For a TRS R and two terms s and t, can s be reduced to t by applying the rules of R?

Word problem

  For a TRS R and two terms s and t, are s and t convertible by applying the rules of R?

Unification problem

  For a TRS R and two terms s and t, are s and t unifiable modulo R?

Confluence problem

  For a TRS R, is R confluent (Church-Rosser)?

The word and unification problems are most important ones and their decision algorithms have various useful applications in computer science, e.g., logic and functional programming, automated deduction, knowledge-based systems, computational linguistics, deductive databases, and so on. These two problems are closely related to the other ones. For example, the word problem is equivalent to the joinability one if TRSs are confluent. The unification problem includes the word problem as its special case and its decision algorithm often needs an algorithm to decide joinability as its component. However, all of these problems are undecidable in general, so that many researches finding decidable subclasses for them have been made so far. In this thesis, we consider these decision problems for semi-constructor TRSs. Here, a semi-constructor TRS is such a TRS that all defined symbols appearing in the right-hand side of each rewrite rule occur only in its ground subterms. This class is a minimal subclass of non-right-linear TRSs, which include right-ground rules and collapsing rules. The class of semi-constructor TRSs was introduced by us in order to explore the border between decidable and undecidable classes of these decision problems, since few nontrivial non-right-linear subclasses of TRSs which possess these decidable properties have been known so far.

2. The joinability and reachability problems

Joinability and reachability are known undecidable even if we restrict ourselves to flat TRSs. On the other hand, these problems are decidable for some subclasses of TRSs (e.g., right-ground TRSs, right-linear semi-monadic TRSs, and right-linear finite path overlapping TRSs). Many of these decidability results have been obtained by reducing these problems to decidable ones for tree automata, so that these decidable subclasses are restricted to those of right-linear TRSs. In this thesis, we have shown that joinability is undecidable for linear

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semi-constructor TRSs, but by developing a new proof technique, we have shown that this problem is decidable for confluent semi-constructor TRSs and confluent semi-monadic TRSs. It follows that the word problem is decidable for confluent semi-constructor TRSs and confluent semi-monadic TRSs, since the joinability is decidable. We also have shown that reachability is undecidable both for linear semi-constructor TRSs and confluent monadic and semi-constructor TRSs. These results are interesting, since no subclasses of TRSs with the undecidable reachability but decidable joinability problems have been known so far.

3. The unification problem

The unification problem is known undecidable even if we restrict ourselves to either right-ground TRSs or terminating, confluent, monadic, and linear TRSs. On the other hand, it is known that this problem is decidable for some subclasses of TRSs. In this thesis, we have shown that unification for confluent semi-constructor TRSs is decidable. In order to obtain this result, we have developed a new unification algorithm obtained by refining our previous algorithm for confluent simple TRSs, which is a proper subclass of confluent semi-constructor TRSs. A main difference between the algorithms of the present thesis and of the previous works is that the previous ones were constructed using decision algorithms for joinability and reachability, but the present one using only a decision algorithm for joinability. This refinement is necessary to obtain our new result, since reachability is undecidable for confluent semi-constructor TRSs.

4. The confluence problem

We have shown that confluence is undecidable for semi-constructor TRSs. As a related result, it has been reported that confluence is undecidable for flat TRSs. However, we have found that the proof is incorrect, and succeeded in finding a correct proof.

5. Remarks

We suggest the following problems as future works.
   1. Finding subclasses of flat TRSs such that reachability is decidable.
   2. Finding decidable subclasses of TRSs for unification problem, which properly include the class of confluent semi-constructor TRSs.

Author's publications

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A Study on Energy Saving and Environmental Load Reduction Method for Air-Conditioning System

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Architectural Engineering, Division of Systems Engineering

Keywords: Heat Pump Unit, Natural Working Fluids, Energy Saving, Humidity, Two-phase Flow Nozzle

1. The purpose

Air-conditioning systems mainly consist of heat source unit, which generate chilled and hot water and air-conditioner, which handle with heating load or cooling load. From the point of energy saving and environmental load reduction, it is important to operate these facilities and keep indoor environment appropriately because its energy consumption rate to the hole building is almost 50%. Reflecting recent social situation, the social concern with environmental load reduction has been growing and we can see some researches try to solve these issues. Aiming to achieve this purpose, two methods have been developed in this study. The one is that development of heat pump unit with ice thermal storage tank using natural working fluids, that is ammonia refrigerant. The other is that indoor relative humidity improvement method during heating operation in winter and development of high efficiency humidifier system using two-phase flow nozzle. The outline of study is shown below.

2. Development and performance estimate in aging change of heat pump unit using ammonia refrigerant with ice thermal storage tank[1)2)]

As global environment problem has become an important issue, ammonia refrigerant has been watched keen interest because it dose not cause destruction of the ozone layer and global warming. We have developed an air-source and water-source heat pump units using ammonia refrigerant with ice thermal storage tank from the perspective for popularizing systems which use natural working energy and natural working fluids. To further popularizing of this system, we have to verify its reliability and safety because ammonia refrigerant is prescribed for toxic and combustible gas in ammonia gas regulations in Japan. In this part, aiming to rationalize of its design, operation and maintenance, we carried out practical study to

Table. Aging change after 5years and performance recovery between before and after overhaul of popularized air-source heat pump unit using ammonia refrigerant with ice thermal storage tank

Classification	Item	Before overhaul	After overhaul
		2002/7/3-4	2002/8/5-6
		Difference[†]	Difference[†]
Thermal storage	Ice storage capacity	+2%	+1%
Capacity	Ice packing factor	+1%	+2%
	Ice making capacity (Night time)	-2%	+4%
	Heat pump operation capacity (Day time)	+2%	+16%
Efficiency (COP)	COP during ice making	+11%	+15%
	COP during heat pump operation	+16%	+26%

[†] Compared with designed value

[†] Chubu Electric Power Co., Inc.

verify its performance both in development phase and aging change, and results of the field test for verification of its performance are presented. It was found that the heat pump unit using ammonia refrigerant can be handled as well as the heat pump unit using fluorocarbon refrigerant such as HFC.

3. Study on the improvement of indoor relative humidity for office buildings during heating operations in winter[3][4]

  Indoor relative humidity is stipulated for an important point in indoor environment regulations such as Building Control Code in Japan. Based on the findings of indoor environment studies carried out during the winter, however, relative humidity is below standards in many buildings. Aiming to clarify the actual state of indoor relative humidity and improve it during the winter, we have selected sixty-nine office buildings located in Central Japan and carried out a study. We have also investigated actual performance of popular humidifiers that are frequently used in air-conditioning systems. Throughout this study, we classified the factors that degrade indoor relative humidity into two categories. One consists of factors caused by building side such as infiltration and decreased winter loads. The other consists of factors caused by humidifier such as low performance at low indoor temperatures. Given that the winter load in office buildings has tended to decrease because of improvements of building insulation and increasing number of office equipment used in office buildings, almost all the popular humidifier except the steam type failed to maintain performance due to low indoor temperatures. For the reasons mentioned above, we developed a high-efficiency humidifier system that uses a two -phase flow nozzle for industrial use. Because its spray particles are smaller than those of popular spray types, its performance is not affected by indoor air temperature. In this part presents results of the investigation and methods of improvement including development of a high-efficiency humidifier system. Results indicated that about 80% of office buildings studied could not maintain relative humidity to standard during the winter. Relative humidity remarkably improved in office buildings which had a high-efficiency humidifier system using two-phase flow nozzle. If steps are also taken for the building, then relative humidify in office buildings will further improve.
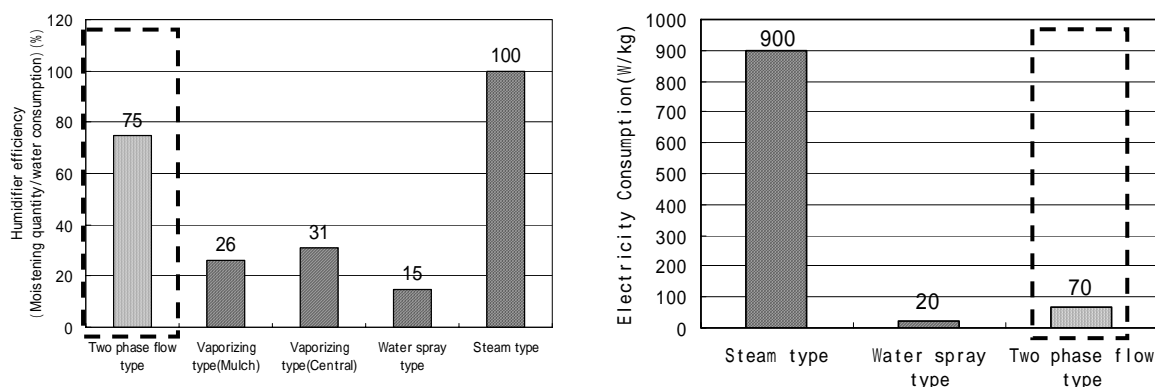
Figure. Humidity efficiency under fan operation (20 ,30% (left)) and Electricity consumption (right) compared with popularized humidifier

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1) Development and performance estimate in aging change of heat pump unit using ammonia refrigerant with ice thermal storage tank, Transactions of the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, No.96, 2005, pp51-61

2) Actual field test to assess performance of water-source heat pump unit using ammonia refrigerant with ice thermal storage tank, 9th International Conference on Thermal Energy Storage, PROCEEDINGS Vol.1 2003, pp485-490

3) Study on the improvement of indoor relative humidity for office buildings during heating operations in winter, Transactions of the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, No.100, 2005, pp27-37

4) A study on improvement of indoor humidity in office building during heating operation in winter, The 2005 World Sustainable Building Conference SB05Tokyo, 2005, pp1400-1405

Studies on Performance Improvement of Jet Pump

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Keywords: Jet pump, Single nozzle, Efficiency, Mixing process, Local skin-friction coefficient, BWR

1. Introduction

A jet pump has been widely used in the Boiling Water Reactor (BWR) plant, driven by the PLR (Primary Loop Recirculation system) pump to recirculate the reactor core coolant because of its safety aspect by minimizing the PLR piping diameter and pump flow. The improvement of the BWR jet pump efficiency brings an economic advantage because it reduces the operating power cost of the PLR pump for driving jet flow.

Recently in order to reduce the plant operating cost, improvement of the jet pump efficiency is expected for the first-generation jet pump which efficiency is about 35%. And it is also needed to obtain fundamental knowledge of the effect of surface roughness on jet pump performance in order to recover the efficiency by cleaning jet pumps which are reduced by attached crud such as iron oxide or chromium oxide inner-surface of the jet pump. Especially, it is important to specify the effect of the rough location in the throat because throat has long length to mix the driving jet and the induced flow. In order to improve and recover the efficiency of the BWR jet pump, experimental studies are performed for a typical single nozzle jet pump using water at room temperature condition and a small-scale model.

2. Experiment and Results

Figure 1 shows the experimental set-up of the jet pump performance tests. High pressure water pumped by a centrifugal pump flows into the nozzle as the driving jet flow. The driving jet and induced flow are mixed in the throat and flow out after recovering pressure in the diffuser. Figure 2 shows the normal throat for improvement test and the rough location test, and the diverging throat for improvement test.
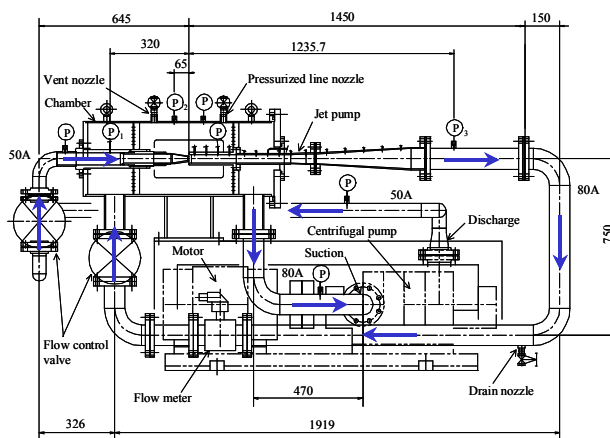

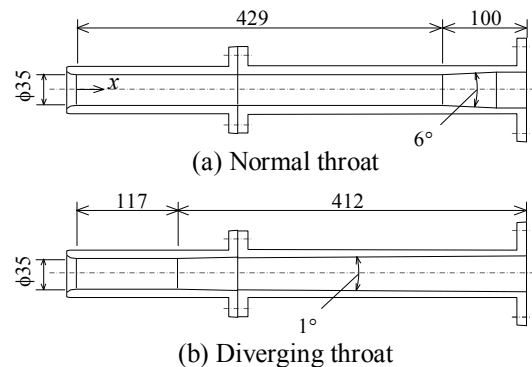Fig. 1 Experimental set-up of jet pump performance tests
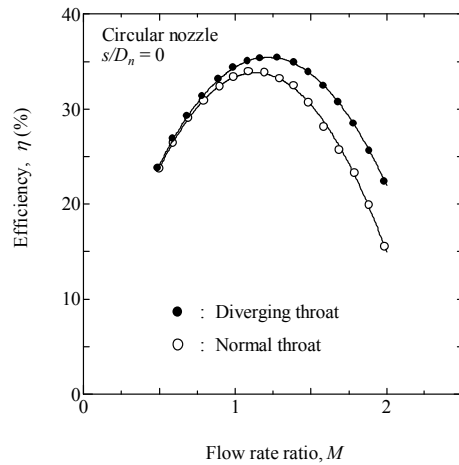

Fig. 2 Throat shapes

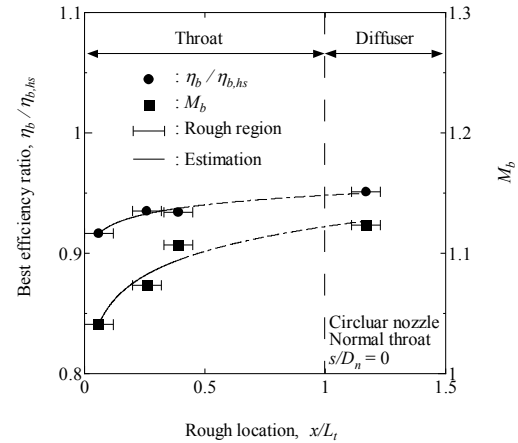Fig. 3   Effect of throat shape on efficiency

Fig. 4   Effect of rough location on the best efficiency

Figure 3 shows the effect of the throat shape on the jet pump efficiency η. The efficiency of the diverging throat is improved about 2% compared with the normal throat. The results of flow analysis (CFD) show that divergence angle of about 1 deg is optimum and almost the same improvement of efficiency is expected at BWR operating condition. Figure 4 shows the effect of rough location on the flow rate ratio M_b at the best efficiency point and the best efficiency ratio $\eta_b / \eta_{b, hs}$, where $\eta_{b, hs}$ is the best efficiency of the hydraulically smooth jet pump. M_b and η_b are decreased rapidly as rough location x/L_t is closer to the throat inlet. From the velocity profile measurement results in case of hydraulically smooth throat, local skin friction coefficient C_f tends to decrease toward the throat exit and then increase after the transition to the turbulent boundary layer. Apparently roughness in the throat inlet where C_f is larger greatly affects jet pump efficiency.

3.   Concluding remarks

i)   The efficiency of the diverging throat is improved about 2% compared with the normal throat.

ii)   The results of the flow analysis show that divergence angle of about 1 deg is optimum for diverging throat and efficiency improvement of the diverging throat is expected at BWR operating condition.

iii)   Surface roughness located nearer the throat inlet has a greater effect on the jet pump efficiency because the local skin friction coefficient nearest the throat inlet is the larger. Therefore cleaning the throat inlet is the most effective to recover the jet pump efficiency.

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A Study on Extraction Method and Waterfront Area Improvement for Designing Irrigation Reservoir as Urban Parks

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keywords: Reservoir, Parks, Extraction Method, Waterfront Area Improvement

1. INTRODUCTION

Open spaces with green and water are essential in helping to built healthy urban environment by improving air quality and providing recreational opportunities for urban lifestyle. Reservoirs are manmade lakes with the primary objective of storing water for irrigation, power generation and a host of other activities. Therefore, irrigation reservoirs have the possibility to play a significant role to enhance the urban environment. In order to find information needed to design irrigation reservoir as urban parks, the objectives of this thesis are: 1) To classify and extract irrigation reservoirs with conditions for an improvement planning, 2) To clarify characteristics of recreational activities at reservoirs waterfront area and, 3) To analyze the design of waterfront area improvement for enjoying the benefits (characteristics) of reservoir   and its surrounding(water front area).

2. EXTRACTION OF IRRIGATION RESERVOIR FOR IMPROVING AS URBAN PARKS

Chapter two describes a method of extraction of reservoir for improvement planning, especially as urban resources. The area of search is Northern Chita Peninsula.   Five common factors were extracted from 14 variables related to reservoir through factor analysis. In order to classify reservoirs, factor scores were adapted to clustering analysis. By comparing the factor score structure from reservoirs and those with improvement projects, it was possible to extract reservoirs, which has possibilities for an improvement planning. Furthermore, by checcking the relationship between reservoirs extracted from the latter classification, for an improvement planning, and from the former clustering, it was possible to indicate improvement methods from the view point of combining and enhancing the use as agricultural facility for irriagtion and as environmental resource.

3. CHARACTERISTICS OF RECREATIONAL ACTIVITIES AT RESERVOIRS' WATERFRONT AREA

In Chapter tree, characteristics of recreational activities at reservoir's waterfront area are investigated. Two sorts of survey were carried out to compare users' characteristics and recreational activities between a park with reservoir and another without reservoir. In a park with reservoir, passive recreational, active recreational and walking were observed at waterfront area, which includes the walking path and the bank. Walking was the dominat recreational activitiy in this area and the majority of this recreational activity was daily or weekly – elderly users. Users that came to walk in a park with reservoir were more and stayed longer than in a park without reservoir due to opportunities for enjoying the aesthetical quality that the reservoir and the environment provide.

4. DESIGN OF WATERFRONT AREA IMPROVEMENT FOR ENJOYING RESERVOIRS' BEFENITS

In Chapter four, relations between places to watch and places to be watched are investigated in order to clarify design improvements that attend the needs of reservoirs' (waterfront area) users. Places to watch are

located in places with good accessibility and goob visibility. Accessibility is related to the surrounding land use, such as parks, parking areas and access road. And visibility is related to the open space effect and the natural diverse edge. The design of places to watch should attend the needs of users with good visibility and attractiveness; however, a precise location is necessary to not disturb the environment at the waterfront area coexisting with the natural diversity.

5. CONCLUSION

The conclusions obtained from each chapter is as follow:

Chapter two: 1) 5 common factors (dimension, location, accessibility, aesthetical quality and maitenance condition) were extracted from 14 variables related to reservoir through factor analysis. In order to classify reservoirs, factor scores were adpted to clustering analysis. Reservoirs were classified in 5 big patterns: [big reservoirs], [irriagtion reservoirs in rural areas], [residential proximity reservoirs in rural areas], [small urban reservoir], [small rural reservoir]. 2) In the area of search, almost 20% of reservoirs were improved as parks or as 'rural improved projects'. By comparing the factor scores structure from reservoir and those with improvement projects, it was possible to extract reservoirs, which has possibilities for an improvement planning. 3) Furthermore, by checking the relationship between reservoirs extracted from 2), for an improvement planning, and from 1), it was possible to indicate improvement methods from the viewpoint of combining and enhancing the use as agricultural facility for irrigation and as environment resource.

Chapter tree:　1) Walking is the dominant recreational activity at the reservoir's waterfront area. The majority of　this recreational activity is daily or weekly elderely users. 2) Recreational activities can be classified in 7 patterns: one pattern is single purpose activity and 6 patterns are multiple purpose activities. 3) Pattern 1 (walking), pattern 6 (walking + chatting) and pattern 7 (others) are common patterns in both parks. Patterns 3,4 and 5 which are walking + watching the scenary are specific from the park with reservoir. 4) For users from patterns 3,4 and 5, richness of green, fauna anf flora, and the water surface are reasons to use the park. These are related to aesthetical quality that the reservoir and the surrounding provide.

Chapter four: 1) Places to watch can be categorized in 7 elements: walking path (circle and non-circle), deck , bridge, adjacent park, kiosk, terrace and lower terrace. Places to be watched can be categorized in 5 elements: water plant, background, decorated bank, planting and 'oasis garden'. 2) Decks, terraces and kiosks are located along the walking path, and close to places where users concentrate or easy to access, such as entrances, access road, parking area or adjacent park. 3)Furthermore, 'places to watch' are also located in places with good visibility: places where users can contemplate the open space effect and the natural diverse edge of reservoirs. And the diverse edge can be divided in preserved green area and improved green area. 4) The design of walking path should also attend the needs of users with good visibility and attractiveness; however, the location should be precise to not disturbe the environment at the waterfront area coexisting with the natural diversity.

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1)　A comparison study in users' characteristics and recreational activities between a park with reservoir and another without reservoir – Characteristics of recreatinal activities at reservoir's waterfront area　Akira Tomori, Hirotaka Suzuki and Masuro Urayama, Journal of Architecture and Planning, AIJ, No. 598, December, 2005

2)　Study on classification if irriagtion reservoirs for improvement planning　Akira Tomori and Urayama Masuro, Papers on Environmental Information Science, No.19 November, 2005

Separated Flow through Channel/Pipe with Abrupt Change of Cross-section
—— Flow Control and Drag Reduction——

Toshitake Ando*

Keywords: Abrupt contraction/expansion pipe, Forward/backward facing step, Drag reduction, Flow separation, Flow control

1. Introduction

The flow through the pipe which has an abrupt change of cross-section has an annular vortex region just after the abrupt change [Fig.1 and 2(a)]. The negative pressure in this region causes a magnificent flow resistance. Some flow control is needed to reduce the flow resistance of this kind of flow. In this study, the reduction of the flow resistance by mounting a small ring shaped obstacle on the pipe wall [Fig.1 and 2(b)] is newly shown and examined. This is a simpler method than using diffuser, especially for a large scale pipe or duct system.

Two-dimensional forward-facing step is contained in the abrupt expansion pipe. For the first, the control of the vortex region on the upper step surface of two-dimensional forward-facing step by small obstacle (rectangular column) was examined. Next, reduction of flow resistance (drag) of abrupt contraction pipe by ring shaped small obstacle was examined. Abrupt expansion pipe which has opposite shape of abrupt contraction pipe was also examined. Experiments was carried on using water.

(a) without small obstacle
(b) with small obstacle

Fig. 1   Abrupt contraction pipe
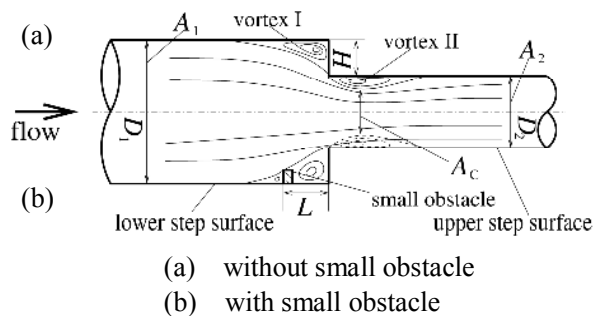
(a) without small obstacle
(b) with small obstacle
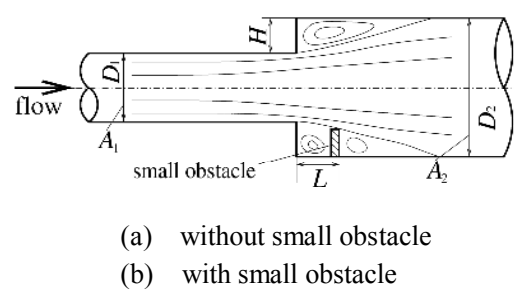
Fig. 2   Abrupt expansion pipe

2. Experimental Results

Figure 3 shows the stream lines of th flow over the forward facing step. Reynolds Number is Re = $U H / v$ = 5,000 (U: velocity, v: kinematic viscosity). The rectangular column of $h = 0.2H$ height is mounted on the lower step surface at $L / H = 3.5$. In this case, vortex region on the upper step surface is suppressed because separated flow from the rectangular column flows along the upper step surface. This simple method is applied to the abrupt contraction and expansion pipe to reduce the flow resistance (drag) ζ [= $2 \Delta p / (\rho U_1^2)$ where Δp: pressure loss at expansion, ρ: density, U_1: mean velocity in upstream pipe]. Figure 3 and 4 show the flow resistance (drag) in the cases of abrupt contraction and expansion pipe, respectively. In the case of abrupt contraction, pressure difference $|\Delta Cp|$ [= $2 \Delta p / (\rho U_1^2)$, where Δp pressure difference] takes minimal value at $L / H = 1$. In the case of abrupt expansion pipe, the flow resistance ζ takes the minimum value in the case of $L / H = 5$ and $h / H = 0.8$.

Fig. 3   Control of the separation flow on the upper step surface of forward facing-step (Re = 5,000, $L / H = 3.5$, $h / H = 0.2$)

*Mie University

Fig. 4   Flow resistance of abrupt contraction pipe
($A_1/A_2 = 4$, $h/H = 0.4$)

Fig. 5   Flow resistance of abrupt expansion pipe
($A_2/A_1 = 4$, Re=100,000)

3. Conclusion

Some major results are as follows:

(1) The vortex region on the upper step surface of forward-facing step can be suppressed by mounting a small obstacle (height: $0.2H$) on the lower step surface. The size of vortex is decreased with increasing L/H, and at $L/H = 3.5$ it disappeared almost because the separated flow from the small obstacle flows along the upper step surface.

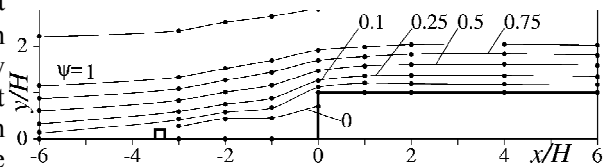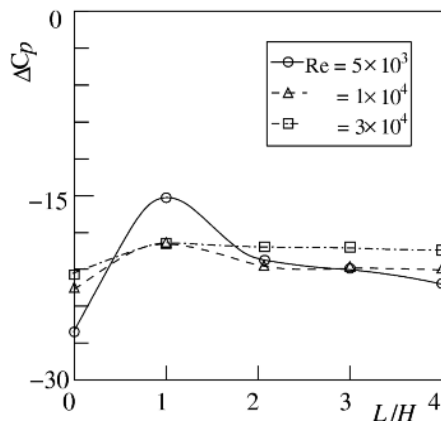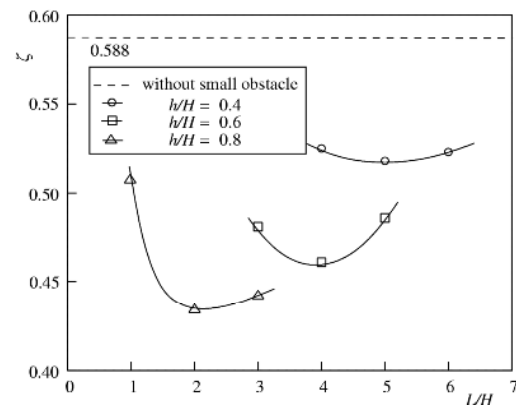(2) The flow resistance of abrupt contraction pipe takes a minimum value for mounting a ring shaped small obstacle on upstream pipe wall (lower step surface) at $L/H = 1$ because vortex region on the downstream pipe (upper step surface) is suppressed. The reduction rate of flow resistance is 16% for the pipe of contraction rate $A_1/A_2 = 4.0$.

(3) In the case of abrupt expansion pipe of expansion rate of $A_2/A_1 = 4.0$, the flow resistance takes a minimum value for mounting a small obstacle of $h/H = 0.8$ on down stream pipe wall at $L/H = 2.07$ because vortex region on the downstream pipe is make waken. The reduction rate of flow resistance is 26%.

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4. Toshitake Ando, Toshihiko Shakouchi and Keigo MiyataDrag Reduction of Abrupt Contraction Pipe (Control of Flow Separation by Small Obstacle), Journal of JSME, 70-691 (2004), 650-656.
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9. Toshitake Ando, Toshihiko Shakouchi and Keigo Miyata, Flow and Control of Abrupt Contraction Pipe Flow, Proceedings of 6th KSME-JSME Thermal and Fluids Engineering Conference (2004), CD-ROM.

Abstracts of Papers (2005)

Department of Mechanical Engineering

Influence of Containerless Solidification on Hardness in Multifunctional Titanium Based Alloys, Tomotsugu AOYAMA, Haruki KAWAMURA, Shigeo KOTAKE and Yasuyuki SUZUKI, Key Engineering Materials, 297-300, pp. 495-499, 2005.

Development of Fabricating Method of Nanoscale Pit with High Aspect Ratio Using Carbon Nanotube Probe, Norikazu ARIMA*, Tomohiko SUGIYAMA*, Yohei FUJIMOTO*, Shigeo KOTAKE and Akihito MATSUMURO*, Journal of the Japan Society for Precision Engineering. Supplement. Contributed papers, 30, pp. 867-871, 2005.

Introduction of the Basic Topics on Quantum Calculation: The Image of Quantum Calculation and Quantum Gate, Shigeo KOTAKE, Res. Rep. Fac. Eng. Mie. Univ., 30, pp.13-37, 2005.

Quantum Search Algorithm from Plural-phase Database with Single Query, Reiko MATSUMURA and Shigeo KOTAKE, ERATO Conference on Quantum Information Science '05, pp. 195-196, 2005.

A Formulization of Camera-Parameter Calibration Errors and Resultant Visual-Line Estimation Errors, Yoshihiko NOMURA,Takashi FUJIMOTO, Dili Zhang,Trans. of JSME PartC, 71(706), pp.1937~ 1945,2005

The 3-D information obtained from cameras' 2D images is given as a visual line by using calibrated parameter values, and we should evaluate the calibration accuracy with respect to the visual line direction error. In this paper, the visual line direction error was examined, based on an evaluation criterion where the calibrated principal point coordinates are taken as the references of the visual line. Many important characteristics with the calibrated parameter value errors and their resulting visual line direction errors were found out by conducting a large amount of simulations under various conditions such as the depth ratios of calibration chart, and the principal distances of cameras. Finally, the error characteristics were analytically proved, and some formulae were derived. The formulae enable us to estimate calibration errors for any calibration conditions in advance.

Direction-Indicating, Traction Manipulator to Support Mental Image Creation of Line Drawings, Yoshihiko NOMURA, Maki OMOTO, Tokuhiro SUGIURA, Hirokazu MATSUI, and Norihiko KATO, CD-ROM Proc.11th Intern. Conf. On Human-Computer Interaction, pp.1~6,2005

A mechatronics system to support mental image creation was developed. The mechanical part of the system is a 3-DOF manipulator that is composed of a 2-DOF quadrilateral parallel-link actuator and a rotational actuator embedded at arm-end of the parallel-link. A couple of servomotors of the 2-DOF manipulator control the arm-end

position. The arm-end actuator controls the direction of a knob attached to the rotational actuator axis. The person is assumed to pinch the knob by his/her fingertips. The knob is rotated to indicate the direction of the on-going stroke, and the position of the knob axis traces the strokes of the presented figures sequentially. A couple of preeminent functions are embedded in the process: one is a preparation effect by "the direction-indicating function, " and the other is the reviewal effect by "the traction function." The direction-indicating and traction functions play complementary role.

Study on the high compression processing of lecture image data, Yoshihiko Nomura, Ryutaro Matsuda, Ryota Sakamoto, Tokuhiro Sugiura, Hirokazu Matsui, and Norihiko Kato, J.of Japanes Society for Engineering Education, Vol.58(5), pp.107~111,2005

The authors proposed a high-quality and small-capacity lecture-video-file creating system for distance e-learning system. Examining the feature of the lecturing scene, the authors ingeniously employ two kinds of image-capturing equipment having complementary characteristics: one is a digital video camera with a low resolution and a high frame rate, and the other is a digital still camera with a high resolution and a very low frame rate. By managing the two kinds of image-capturing equipment, and by integrating them with image processing, we can produce course materials with the greatly reduced file capacity: the course materials satisfy the requirements both for the temporal resolution to see the lecturer's point-indicating actions and that for the high spatial resolution to read the small written letters. As a result of a comparative experiment, the e-lecture using the proposed system was confirmed to be more effective than an ordinary lecture from the viewpoint of educational effect.

High-Quality and Small-Capacity Lecture-Video-File Creating System for Distance E-Learning, Yoshihiko Nomura, Ryutaro Matsuda, Ryota Sakamoto, Tokuhiro Sugiura, Hirokazu Matsui, and Norihiko Kato, Proceedings of E-Learn 2005, pp.2264~2269,2005

The authors proposed a high-quality and small-capacity lecture-video-file creating system for distance e-learning system. Examining the features of the lecturing scene, the authors ingeniously employ two kinds of image-capturing equipment having complementary characteristics: one is a digital video camera with a low resolution and a high frame rate, and the other is a digital still camera with a high resolution and a very low frame rate. By managing the two kinds of image-capturing equipment, and by integrating them with image processing, we can produce course materials with greatly reduced file capacity: the course materials satisfy the requirements both for the temporal resolution to see a lecturer's point-indicating actions and for high spatial resolution to read small written letters. As a result of comparative experiments, an e-lecture using the proposed file creating system was confirmed to be more effective than an ordinary lecture from the viewpoint of the education effect.

High performance file compression algorithm for video-on-demand e-learning system, Yoshihiko Nomura, Ryutaro Matsuda, Ryota Sakamoto, Tokuhiro Sugiura, Hirokazu Matsui, and Norihiko Kato, Proc. Part of SPIE Conference on Intelligent Robots and Computer Vision XXIII:Algorithms,Techni ques,and Active Vision, 6006, pp.60060X-1~60060X-6,2005

Information processing and communication technology are progressing quickly, and are prevailing throughout various technological fields. Therefore, the development of such technology should respond to the needs for improvement of quality in the e-learning education system. The authors propose a new video-image compression processing system that ingeniously employs the features of the lecturing scene: recognizing the a lecturer and a lecture

stick by pattern recognition techniques, the video-image compression processing system deletes the figure of a lecturer of low importance and displays only the end point of a lecture stick. It enables us to create the highly compressed lecture video files, which are suitable for the Internet distribution. We compare this technique with the other simple methods such as the lower frame-rate video files, and the ordinary MPEG files. The experimental result shows that the proposed compression processing system is much more effective than the others.

Proposal of Serially and Dynamically Separating Genetic Algorithm and Its Application to Optimization of Robot Control Systems, Koichi NAKAYAMA, Hirokazu MATSUI, Katsunori SHIMOHARA, Osamu KATAI, Proceedings of the Tenth International Symposium on Artificial Life and Robotics, pp.467-470 2005

Impedance control for an industrial power assist device, Ryojun IKEURA, Hiroyuki KATO, Sinpei NOGUCHI, Kazuki MIZUTANI and *Hisashi NAKAMURA, Proceeding of Robotics Symposium in Japan, pp.191-196, 2005.

This paper describes a control method for a power assist device used in factories. An adaptive control scheme is employed to control the power assist device and to estimate its dynamic parameters. Using the adaptive control, the maneuverability of the system is good in free space but it is very dangerous in the task of which an object supported by system contacts on a floor or a wall. Therefore, we propose an improved system controlled by an adaptive control in which the local control method changes to a feedback or a feed forward control in the contact condition. The improved system detects collisions based on the difference between the actual input torque to the power assist device and reference input torque, which is calculated based on the estimated parameters of the manipulator dynamics. Then, the effectiveness of the system is shown.

Chaos and multiple period vibrations for a dynamic system with the piecewise linear stiffness, Kazuki MIZUTANI, *Takaaki SHIBATA, Hideki SAWAI and Ryojun IKEURA, Proceedings of the 12th International Congress on Sound and Vibration, pp.2041-2048, 2005

This paper studies the influence of the damping on chaos and multiple period for a harmonically excited dynamic system with piecewise linear stiffness. The analysis of the simulation and the experiment is based on many data processing techniques, such as, the frequency response curve, bifurcation diagram, FFT, phase plane diagram and Poincaré map. For relatively small damping, the chaos occurs suddenly after period 1, and the frequency region where the chaos occurs becomes wider as damping increases. For large damping, the chaos region becomes narrower as damping increases.

Analysis of the characteristics of human arm in cooperative motion between two humans, Nan ZHANG, Ryojun IKEURA, Kazuki MIZUTANI and Hideki SAWAI, International Conference on Mechatronics and Information Technology, pp.624232-1-7, 2005

This paper describes the characteristics of human arm in the cooperative motion by two humans. The experiment was carried out on a hypothesis that the human arm around the elbow joint was considered as a simple mass-spring-damper dynamic system with one end fixed. In the investigation of the relaxed arm in

clockwise motion from the equilibrium position by examining the physical parameters in the mathematical model of the human arm, its impedance characteristics were recognized. It was found that the damping factor was zero and the stiffness was individually linear. And besides, the friction-like force was discovered to exist.

Automatic system, Ryojun IKEURA, Encyclopedia of Ergonomics by Maruzen Co. Ltd., pp.470-471, 2005.

Cooperative control, Ryojun IKEURA, Handbook of robot engineering by Robotics Society of Japan, pp.828-830, 2005.

New Surgical Technique for Femoral Shaft Fracture with Shape Memory Alloy Intramedullary Nail [in Japanese], T. Katoh, Y. Kasai*, H. Kachi, T. Inaba, M. Tokuda, A. Uchida*: Orthopedic Surgery, Vol.56, No.5, pp.599-602 , 2005.

An Experimental Study on Shape Memory Characteristics of Casted Ti-Ni Shape Memory Alloy [in Japanese], K. Kitamura*, T. Kuchida, T. Inaba, M. Tokuda, Y. Yoshimi*: J. Japan Inst. Metals, Vol.69, No.8, pp.604-607, 2005.

Biomechanical Study for Ultimate Position of Lumbar Interbody Spacer [in Japanese], I. Nishimura, Y. Kasai*, T. Inaba, A. Uchida*, M. Tokuda: Japanese J. of Clinical Biomechanics, Vol.26, pp.109-114, 2005.

Equivalent Cross-relaxation Rate Image for Sentinel Lymph Node Biopsy in Breast Carcinoma, S. Mastsushima*, F. Sasaki*, H. Yamaura*, H. Iwata*, H. Ohsaki*, S. Era*, M. Sogami*, T. Inaba, M. Uike*, Y. Kinosada*: Magnetic Resonance in Medicine, Vol.54, No.5, pp.1300-1304, 2005.

Analysis of Elastic-Viscoplastic Deformation ofPlain-Woven GFRP Laminates Using a Homogenization Theory (Domain of Homogenization Analysis) [in Japanese], T. Matsuda*, Y. Nimiya*, N. Ohno*, M. Tokuda: Trans. of the JSME, Series A, Vol.71, No.711, pp.1421-1427, 2005.

Quantitative Evaluation of Left Ventricular Wall Motion in Patient with Coronary Artery Bypass Grafting Using Magnetic Resonance Tagging Technique [in Japanese], T. Inaba, T. Nakano, M. Tsutsumi, S. Kawasaki*, Y. Kinosada*, M. Tokuda: Trans. of the JSME, Series A, Vol.71, No.711, pp.1595-1601, 2005.

The left ventricular wall motion during systole was investigated from a mechanical point of view by using a magnetic resonance tagging technique. Subjects were seven patients with coronary artery bypass grafting (CABG). At first, in order to evaluate the cardiac contractility in each patient, the circumferential strain in myocardial wall was analyzed. It was found from the results that the circumferential strain in four patients decreased compared with that in healthy humans. Next, the paradoxical wall motion in patients with CABG was quantitatively described by calculating the displacement. The results showed that the radial displacement of septal wall in the patients was smaller than that in healthy humans, and the radial displacement of lateral wall was larger. Furthermore, anterior wall and posterior wall moved toward septal wall. Such left ventricular wall motion was recognized in even the patients with normal cardiac contractility. Therefore, it was considered that the paradoxical wall motion in the patients with CABG was not caused by

a drop of the cardiac contractility, but a rigid-body motion of the heart.

Evaluation for Al/Cu bonding by liquefaction after solid phase diffusion in the air, Hiroshi KAWAKAMI, Jippei SUZUKI, Masanori FUJIWARA, Junya NAKAJIMA, Proceedings of the 2005 Spring Annual Meeting of Korean Welding Society, pp.393-395, 2005.

Aluminum is needed as the base metal of some new products, because it has low density and electrical resistivity. However, Aluminum is known as the metal which is more difficult for bonding and welding than steel. One of reason is obstruction effect of the oxide films formed on the surface.
The simple Al/Cu bonding in the air is investigated in this study. This method includes the simple preprocessing and the heating over the eutectic temperature of Al-Cu system.

Effect of Carbon Content and Peritectic Reaction on Hot Cracking of Weld Metals of 0.3 to 0.6mass% Carbon Steels, Hiroshi KAWAKAMI, Jippei SUZUKI, Koreaki TAMAKI, Documents of International Institute of Welding, No.IX-2153-05, pp.1-23, 2005.

Effect of carbon was discussed from the view points of the metallurgical effect of impurity elements in the interdendritic zone and the growth mode of dendrite. The concentrations of phosphorus, sulfur and carbon in the final liquid was estimated by a series of micro-analyses on the particles existing in this zone. The width of dendrite was measured in detail for the weld metal of a series of carbon contents. Weld metals of 0.2 to 0.6% carbon experienced inevitably the peritectic reaction, delta-ferrite + liquid $\rightarrow$ austenite. The experimental results was analyzed in connection with this reaction. Phosphide particles were observed in the interdendritic zone. The process of producing this particle was discussed on the basis of the phase diagram of Fe-C-P system, and the temperature at which hot cracking occurs was estimated.

Capacitor Discharge precession Welding of Pure Aluminum wire to Pure Copper Sheet, Maiqun ZHAO, Jippei SUZUKI, Hiroshi KAWAKAMI, Fumihiko MATSUYAMA Proceedings of the 7th Joint Seminar of China-Japan Amity Universities on Material Science & Engineering, pp.32-40, 2005.

Percussion welding with pure aluminum wire and copper sheet discussed in this paper. The optimization condition for this joint was investigated systematically. The angle of wire end affects on tensile strength strongly. The assistance by machine oil improved the weld quality with reducing excess heating and oxidation. Rapid solidification and formation of intermetallc compounds in narrow weld are confirmed by SEM observation and EPMA analysis.

Microstructure in Al/Cu Bond with Solid Phase and Liquation, Junya NAKAJIMA, Masanori FUJIWARA, Hiroshi KAWAKAMI, Jippei SUZUKI, Proceedings of the 7th Joint Seminar of China-Japan Amity Universities on Material Science & Engineering, pp.65-70, 2005

The authors are investigating the simple Al/Cu bonding method. This bonding method is composed by the simple processing and the heating over eutectic temperature of Al-Cu phase diagram. In case of this bonding, at first, the solid state diffusion occurs at interface between aluminum and copper. When the composition of a region reaches in liquid-solid two phase area, the liquation occurs in there. Therefore, the solid state diffusion and the liquation occur in

the Al/Cu bond at same time and the unique microstructure forms. In this study, the unique microstructure in the bonded area was investigated by SEM observation and EPMA(WDS) analysis.

Improvement by SR Treatment on Creep Ductility in Welded 2 1/4Cr-1Mo Steel, Hiroshi KAWAKAMI, Koreaki TAMAKI, Jippei SUZUKI, Proceedings of National Welding Seminar NWS2K5 of Indian Welding Society, pp.8-14, 2005.

2 1/4Cr-1Mo steel is used widely for the welded constructions such as boilers and pressure vessels. However, the heat affected zone (HAZ) of this steel is very low in creep ductility[1-4]. The authors investigated this phenomenon by using the synthetic HAZ specimen in which the microstructure of HAZ was reproduced. Stress relief annealing (SR treatment) is usually given to the weldments to remove the residual stress before service. The authors believed that the SR treatment is also effective for improving the creep ductility of HAZ. In this study, the change of creep ductility of HAZ and base metal was investigated by changing the conditions of SR treatment.

Welding in Asia, Hiroshi KAWAKAMI, Journal of the Japan Welding Engineering Society, Vol. 53, No.12 , pp.109-114, 2005, (in Japanese).

Asian countries become to have the big economical power today. Japan is required the strong corporation with all Asian countries for activity related with ISO. The author introduced the friendship activity of Japan Welding Society in new age of Asia and appealed to the readers for commitment to this activity.

Delamination of A-FRP Plate during YAG Laser Drilling, Eitoku NAKANISHI, Takao YOSHIMOTO, Yutaka SAWAKI and Kiyoshi ISOGIMI: Journal of Japan Society of Advanced Production Technology, Vol.23, No.1, pp.26-32, 2005

Simulations of Fiber Deformation during Machining Aramid-FRP, Eitoku. Nakanishi, Masao Fukumori and Kiyoshi Isogimi: Proceedings of 8th CIRP International Workshop on Modeling of Machining Operations, CD-ROM, 2005

YAG Laser Drilling of Aramid FRP Laminates, S. Kohzaki, Eitoku Nakanishi, Yutaka Sawaki and Kiyoshi Isogimi: Proceedings of The 3rd International Conference on Leading Edge Manufacturing in the 21st Century (LEM21), pp.583-588, 2005

Simulations of Aramid fiber Deformation and Fracture Phenomena During Machining A-FRP", E. Nakanishi, M. Fukumori, Y Sawaki and K. Isogimi, Proceedings of 9th Japan International SAMPE Symposium & Exhibition JISSE-9, pp.875-880, 2005

Research on impact properties of Aramid FRP, Y. Sun, Jun Watanabe, Eitoku Nakanishi, Yutaka Sawaki and Kiyoshi Isogimi: Proceedings of 9th Japan International SAMPE Symposium & Exhibition JISSE-9, pp.645-650, 2005

Wind Tunnel and Field Experiments on Wake Behind Horizontal Axis Wind Turbine, Takao MAEDA, Yusuke KINPARA and Tsutomu KAKINAGA: Transaction of JSME, Series B, Vol.71, No. 701, pp. 162-170, 2005.

Measurement results of the wake velocity profile behind 0.6m–diameter wind turbine in wind tunnel and 10m- diameter wind turbine in the field are shown. The development of wind turbine wake was observed with the use of particle image velocimetry for wind tunnel measurement. Form the results of wind tunnel measurement, the wake was expanded from the position where the tip vortex was almost dissipated. The wake velocity behind field wind turbine was recorded in shorter distance than those for the turbine in the wind tunnel measurement. The wake area was shifted toward radial direction related to wind turbine rotational direction. The wake velocity at lower half area below rotor axis was not much recovered by the effect of the tower compared to those at upper half area above rotor axis.

Experimental Study on Flow around Blades of Horizontal Axis Wind Turbine in Wind Tunnel, Takao MAEDA, Yasunari KAMADA, Yusaku SAKAI and Naoki TAKAHARA: Transaction of JSME, Series B, Vol.71, No. 701, pp. 171-176, 2005.

This paper describes the measurement of the flow field around rotor blade. Three-bladed upwind rotor was tested in an open jet type wind tunnel. The rotor has a diameter of 2.4 m. Flow field around rotor blade was measured with the use of two-dimensional LDV. The flow field was measured in x-y plane and z-y plane. The circulation around the blade sections were calculated by flow vectors around the rotor blade. The velocity vectors at optimum operation show a smooth flow around the blade and the bound vortex around blade cross-section seems to be persistent. On the other hand, the velocity vectors at stall condition demonstrate significant fluctuations in the near wake and separation on the blade suction side was observed. The circulation around blade span-wise section was calculated at the certain control volume. By the observation of flow field and calculated results of circulation, it seems that the flow is separated at the blade from middle-span region to tip region at stall condition. No separation was observed at the blade root region.

Pressure Distribution on Rotating Blade of Field Horizontal Axis Wind Turbine in Yawed Condition, Takao MAEDA and Hideyuki KAWABUCHI: Transaction of JSME, Series B, Vol.71, No. 702, pp. 156-164, 2005.

This paper shows the pressure distribution at 50% radial section on a rotor blade of 10m- diameter wind turbine in yawed operation. The pressure sensors were mounted on the blade, and the local inflow angle and local dynamic pressure were measured with the use of five hole Pitot tubes at 1 chord length upwind of the blade leading edge. With the use of measured pressure distribution on the blade, the blade performances were calculated on the basis of the blade coordinate. As results of the measurements, the normal force coefficient in yawed condition decreases compare to those for non-yawed condition. Even if local angle of attack and the relative inflow velocity are the same condition, pressure distribution shows differences due to local slip angle. The tufts flows-visualization on the rotating blade was carried out by setting the video camera on the rotating system. By the observation of tufts behavior, the reduction of normal force coefficient is mainly caused by the separation.

Experimental Study on Flow around Blades of Horizontal Axis Wind Turbine in Wind Tunnel (2nd Report Studies on the flow around blade based on pressure distribution), Takao MAEDA, Yasunari KAMADA, Yusaku SAKAI and Naoki TAKAHARA: Transaction of JSME, Series B, Vol.71, No. 705, pp. 1383-1389, 2005.

This paper describes the results of the surface pressure measurements on a wind turbine rotor and the velocity measurements around the rotating blade. The experiments are carried out in a wind tunnel with a 2.4m diameter three-bladed wind turbine. The pressure taps are set at 31 positions in each of four test sections. Four radial sections at r/R=0.3, 0.5, 0.7 and 0.85 are selected for the measurements. The pressure distributions are measured for both rotating and non-rotating situation. These pressure distributions are compared and used for detecting the angle of attack for the rotating blade. The pressure distribution at r/R>0.7 shows the good agreements between rotating and non-rotating situation. The pressure distribution for the inner part of r/R<0.5 shows the stall delay. Also, by using the angle of attack estimated from the pressure distribution and the velocity distribution, the representative point for the relative velocity to the blade section is discussed. The angle of attack is compared with the designed value by the blade elements momentum theory.

Effect of wind Shear on Characteristics of Rotating Blade of Field Horizontal Axis Wind Turbine, Hideyuki KAWABUCHI and Takao MAEDA: Transaction of JSME, Series B, Vol.71, No. 708, pp. 2075-2082, 2005.

This paper shows the aerodynamic characteristics at 50% radial section on rotor blade of 10m-diameter wind turbine is exposed to wind shear. A sonic wind speed meter and six cup anemometers are installed 1D upwind of the turbine in order to measure wind profiles. The anemometers at the top, middle and bottom levels are installed at a height of 18.3, 13.3 and 8.3 meters respectively, which correspond with the height of tip at blade top position, hub height, and tip at blade bottom position, respectively. As the results of the measurement, the normal force coefficient in strong wind shear condition decreases compared to those for weak wind shear condition. Even if local angle of attack is almost same condition, the normal force coefficient shows differences due to hysteresis effect. Especially, influence is large when not only a height direction but also a horizontal direction has strong wind shear. A remarkable difference appears in the pressure distribution at that condition.

Surface Pressure Measurement on a Rotating Blade of Field Horizontal Axis Wind Turbine in Yawed Condition, Takao MAEDA and Hideyuki KAWABUCHI, JSME International Journal Series B, Vol. 48, No. 1, pp.156-163, 2005.

This paper shows the pressure distribution at the 50%radial section of a rotor blade of 10m-diameter wind turbine in yawed operation. The pressure sensors were mounted on the blade, and local inflow angle and local dynamic pressure were measured with the use of five hole Pitot tubes at 1 chord length upwind of the blade leading edge. It was found that the normal force coefficient in yawed condition decreases compared to that for non-yawed condition. Even if local angle of attack and the relative inflow velocity are the same, pressure distribution shows differences due to the local slip angle. The tufts flow-visualization on the rotating blade was carried out by setting a video camera on the rotating system. Separation in the region of middle chord to trailing edge on suction surface is thought to be the main reason of the reduction of normal force coefficients.

Surface Pressure Distribution on a Blade of a 10 m Diameter HAWT (Field Measurements versus Wind Tunnel Measurements), T. Maeda, E. Ismaili, H. Kawabuchi, and Y. Kamada, Journal of Solar Energy Engineering, Vol. 127-2, pp. 185-191, 2005.

This paper exploits blade surface pressure data acquired by testing a three-bladed upwind turbine operating in the field. Data were collected for a rotor blade at spanwise 0.7R with the rotor disc at zero yaw. Then, for the same blade, surface pressure data were acquired by testing in a wind tunnel. Analyses compared aerodynamic forces and

surface pressure distributions under field conditions against analogous baseline data acquired from the wind tunnel data. The results show that aerodynamic performance of the section 70%, for local angle of attack below static stall, is similar for free stream and wind tunnel conditions and resemblances those commonly observed on two-dimensional aerofoils near stall. For post-stall flow, it is presumed that the exhibited differences are attributes of the differences on the Reynolds numbers at which the experiments were conducted.

Development studies on a horizontal axis wind turbine with micro passive pitch-flap mechanism, Takao MAEDA, Yasunari KAMADA, Takayuki KATO and Hiroshi TAMURA: WIND ENERGY, Vol. 29, No3, pp. 81-84, 2005.

The performance of micro passive pitch-flap mechanism is experimentally evaluated. The micro passive mechanism uses the aerodynamic thrust and centrifugal force to activate the pitch motion for suppressing the rotor torque incase of high wind speed condition. The tests are performed in the wind tunnel and the filed test site. As result of measurements, the mechanism can suppress the both over power and over rotational speed in high wind condition.

Measurement of Wake behind Horizontal Axis Wind Turbine, Takao Maeda, Yasunari Kamada, Tsutomu Kakinaga and Keita Nakano: Proceedings of International Conference On Jets, Wakes and Separated Flows, ICJWSF-2005, pp. 519-524, 2005.

The wake of Horizontal Axis Wind Turbine rotor was studied with both wind tunnel and field measurements. The detail measurements were carried out in the wind tunnel with Pitot tube array, and particle image velocimetry (PIV). The field measurements were carried out with cup anemometers and wind vane for 10-m diameter rotor. From the wind tunnel measurement, the wake was expanded from the position where the tip vortex was dissipated. The wake velocity behind field wind turbine was recovered in shorter distance than that for the wind tunnel measurement. The wake area was shifted toward radial direction in rotational plane related to wind turbine rotational direction. The wake velocity below rotor axis was not much recovered by the effect of tower compared to those above rotor axis.

Experimental Study on a 100kW Wind Turbine, Takao MAEDA, Yasunari KAMADA, Ismaili EDMOND: Proceedings of EXPO WCWRF 2005, CD-ROM, p.4, 2005.

This research work was performed under a special coordination fund from the Japanese Ministry of science and education, as part of a project intended as a realistic demonstration of the coexistence and compliment of multi renewable energy sources for remote and rural applications. As part of this project, a 100kW test wind turbine is erected in Mie University experimental farm. Diameter of the wind turbine is 20m and the hub height is 30m. The wind turbine is connected to the grid via a AC-DC-AC converter system. The wind speed was measured upstream the wind turbine by a supersonic meter. In this study the performance of the experimental wind turbine is evaluated for different experimental configurations, and a large amount of data has been obtained in wind speeds averaging up to 13m/s. In addition, the velocity distribution downstream of the wind turbine was measured by the Doppler SODAR .

Relationship between Wind Profile and Terrain Configuration, Takao MAEDA, Yasunari KAMADA, Bo Yang, Ismaili EDMOND: Proceedings of EXPO WCWRF 2005, CD-ROM, p.4, 2005.

Traditionally, as a routine procedure, the measurement of the wind speed for wind energy purposes, such as site assessment, has been performed with the use of cup anemometers mounted at the top of masts. The wind speed at

hub height is estimated using power law based on the observational data obtained from the anemometers. In this paper a new method of determining the power law index taking into consideration the effect of the topographical features of the terrain, is presented. The boundary layer distribution using the new power law index is compared with the distribution obtained by the least square method. A difference less than 5% is found, which makes the new power law index very useful in estimating accurately the wind speed up to hub height.

Numerical Analysis on Performance Prediction of Horizontal Axis Wind Turbine, Takao MAEDA, Yasunari KAMADA, Ismaili EDMOND, Koma ARIGA: Proceedings of EXPO WCWRF 2005, CD-ROM, p.4, 2005.

The aerodynamic characteristics of wind turbines are closely related to the geometry of their blade airfoil sections. The innovation and the technological development of wind turbine blades airfoil sections can be classified in two groups: Improvement of the existing blade profiles and Design of new shapes of blades in order to achieve better aerodynamic characteristics. Though in recent years there has been substantial progress in the aerodynamic modeling and design of horizontal axis wind turbine, there is still a failure to accurately predict high aerodynamic loads. Attention is focused in developing CFD codes that accurately predict the performance of the wind turbine blade. This paper presents a comparative evaluation of the numerical results obtained from CFD method and experimental results obtained in the wind tunnel. The flow around rotor blade was analyzed by the CFD method and the performance of a wind turbine was predicted. The turbulence models, SST model, k-ε model, low-Reynolds number k-ε model, were used in this CFD. The predictor accuracy and problems raised with CFD modeling are discussed.

Studies on small scale woody biomass gasification system, Yasunari KAMADA, Norio WATANABE*, Takao MAEDA, Ismaili EDMOND: Proceedings of WCWRF2005, CD-ROM, p.4, 2005.

This research work is performed as part of a project intended as a realistic demonstration of the coexistence and compliment of multi renewable energy sources for remote and rural applications. In this way the project should contribute to the securing reliable power sources and ongoing reduction of CO_2. As part of the project, a small-scale woody biomass generating plant is developed. In this paper, the experimental results of a small scale reactor are presented. A real time monitoring of the temperatures and pressures (suction level) inside the reactor was recorded. Air was supplied through pipe systems from the top of the reactor, and the suction inside the reactor was controlled through a variable speed suction fan. At a first stage, the gas production from woody biomass in the small-scale reactor was achieved. The reactor control by suction fan was evaluated. The starting and stopping process were tested.

Development of a micro gate-type hydroelectric generation system(A Study of Active Gate System), Takao MAEDA, Yasunari KAMADA, Ismaili EDMOND, Yoichi YAMADA: Proceedings of WCWRF2005, CD-ROM, p.4, 2005.

Developing of alternate environmental friendly energy resources becomes an imperative in energy and environment crisis appearing on the horizon. The hydropower has long been used worldwide and is well known for its benefits. At the same time, utilization of large hydropower plants is blaming for the impact on the flora and fauna, and climate change as well. In this study, the authors propose a micro-generation system that makes use of streams and it does not need a large water head. The co-existence with aqua life passing through the gate is also investigated. In this study, an active gate system was developed and evaluated. The relationships between the performance of the system, flow rate, motor rotating speed, interval of opening and shutting of the gate have been investigated experimentally.

Relation between Surface Pressure Distribution and Coriolis Acceleration on Rotating Blade of Field Horizontal Axis Wind Turbine, Takao Maeda, Hideyuki Kawabuchi : Proceedings of The 6th KSME-JSME Thermal and fluids Engineering Conference, CD-ROM, DA.02, p.4, 2005.

In this paper are shown the surface pressure distributions acquired by testing a three-bladed upwind turbine operating in the field. Data were collected at 90% spanwise section with the rotor disc at zero yaw. Inflow velocity and inflow angle to the rotating blade is changed due to non-uniformity and unsteadiness in the field. A spanwise velocity component become large when local slip angle becomes large, since a circumferential velocity is large especially at 90% radius section. It seems that a certain influence of the Coriolis acceleration appears on the surface pressure distributions, since the spanwise flow on the blade surface is curved by the Coriolis force. The estimated Coriolis acceleration on the blade surface was found to be about ten times the gravity acceleration. By examining the relations between the Coriolis acceleration and the surface pressure distributions on the rotating blade, it became clear that the normal force coefficient decreased with increasing the Coriolis acceleration at the local angle of attack by which the stall delay begins to be observed.

Development of nosecone wind turbine in diffuser casing, Takao Maeda, Yasunari Kamada, Hiroshi Tamura : Proceedings of International Symposium on Eco Topia Scince 2005 Joind with IFSS-Nagoya05, pp. 87-88 , 2005.

Recently, the wind turbine installation has concentrated on the mountainous region where wind potential is superior, because the power output of the wind turbine is in proportion to the third power of the wind velocity. The city part has a fatal fault with low average wind velocity. If the wind can be accelerated effectively, it is possible to obtain the output power that can be practicably used. Then, we take diffuser as acceleration method. Diffuser enables acceleration by effect of sucking out that using a late internal flow and a fast external flow. In addition, it is effective to use in the city part, for the reason why safety can be secured because there is not exposing the rotor outside. The experiments are carried out with a wind tunnel. These measurements are performed with changing the open angle by equated entrance area of diffuser and exit area. Moreover, the shape of wind turbine boss part and nacelle part was aerodynamically changed to improve the performance. It was not researched so far. In addition, Diffuser surrounding flow was visualized with Particle Image Velocimetry (PIV).

Measurement of pressure distribution on oscillating airfoil, Takao Maeda, Yasunari Kamada, Shingo Suzuki: Proceedings of International Symposium on Eco Topia Scince 2005 Joind with IFSS-Nagoya05, pp. 83-84, 2005.

Generally, the airfoil characteristic in static condition where the angle of attack doesn't change in time is used for development of wind turbines blade. However, under the unsteady wind condition in which wind turbines is operated, wind velocity and a wind direction change continuously and angle of attack for airfoils of wind turbines blade is changed with large amplitude. Therefore, the airfoils for development of wind turbines blade requires high performance in wide range of angle of attack and consideration for the dynamic state of changing in time. The airfoil characteristic in static condition depends on the profile and Reynolds number, angle of attack, but in a dynamic state, it depends on rotational center and attack angle change speed, attack angle change range in addition to them.

Study of pressure distribution on a rotor blade of field horizontal axis wind turbine, Takao MAEDA, Yasunari KAMADA, Takashi SATO, Takashi KONDO: Proceedings of the 54th JSME tokai branch annual meeting, No. 053-1,

pp. 253-254, 2005.

This paper shows the experimental study on the field HAWT rotor aerodynamics. The 10m-diameeter test wind turbine is used for this study. The inflow wind conditions are measured by the cup type anemometers and 3 component sonic anemometer. The aerodynamic performance on the rotating blade is measured by the surface pressure distribution. The relation between rotor yaw angle and sectional aerodynamic forces is shown.

Numerical analysis on performance prediction of horizontal axis wind turbine, Takao MAEDA, Yasunari KAMADA, Hiroaki ITO: Proceedings of the 54th JSME tokai branch annual meeting, No. 053-1, pp. 259-260, 2005.

This paper describes the numerical analysis on the rotor blade. In this study, two types turbulence model, k-e and SST are evaluated with the experimental data. As the results, the SST model shows the better accuracy to estimate the aerodynamic force act on the rotating blade.

Studies on pressure distribution on the field wind turbine blade, Takao MAEDA, Yasunari KAMADA, Takashi KONDO, Kei TANAKA: proceedings of the 10th National Symposium on Power and Energy Systems (SPES 2005) pp. 71-72, 2005.

This report is a study to relate to pressure distribution on a field horizontal axis wind turbine. We were able to confirm that a dynamic stall occurred in a wind turbine glade by doing this study. An angle of attack – Normal force coefficient, Tangential force coefficient curve pictured a hysteria loop by a dynamic stall, but we cleared the change of Normal force coefficient is uncertain and Tangential fore efficient pictures counterclockwise.

Studies on small scale generation plant by woody biomass gasification, Yasunari KAMADA, Takao MAEDA, Norio WATANABE*, Edmond ISMAILI: proceedings of the 10th National Symposium on Power and Energy Systems (SPES 2005) pp. 225-226, 2005.

This report describes the experimental results of a small-scale generation plant by woody biomass gasification. The gasification reactor is a fixed floor type. The diameter of roaster is 0.5m. A small gasification plant was tested with woody pellet. In the experiment multi point temperatures, pressures flow rates were measured. The details of data are shown in the paper.

Studies on pressure distribution on the field wind turbine blade, Takao MAEDA, Yasunari KAMADA, Takashi KONDO, Kei TANAKA: Proceeding of JSME annual meeting 2005(MECJ-05), Vol.2, pp. 243-244, 2005.

This paper shows the experimental tests for the pressure distribution on the rotating wind turbine blade. The detail comparison between the field rotor test and the wind tunnel test is shown for the several azimuth angle and yaw angle. The diameter of field rotor is 10m and that of wind tunnel one is 2.4m. the Ct, Cn curve, shows differences between the field rotor test and the wind tunnel test. It seems that these differences caused by the effect of the atmospheric turbulence and rotational effect.

Relationship Observed wind Profile by Doppler SODAR and Terrain Configuration, Takao MAEDA, Yasunari KAMADA, Keita NAKANO, Tsutomu KAKINAGA: Proceedings of the 27th wind energy symposium, pp. 253-256, 2005.

For siting the wind park, the wind condition is the most important problem. To evaluate the wind characteristics at site , the measuring mast with anemometer is used. The height of mast is not the same as the rotor axis, so the wind speed at the rotor height is estimated with the atmospheric boundary layer profile. The vertical profile of the wind speed is highly depends on the terrain configuration. In this study the vertical profiles of the wind speed is measured by the Doppler SODAR at many sites and the relationships between terrain configuration and profiles are

discussed. As the result, the new profile parameter with the terrain configuration is proposed.

Hydrogen Energy by Water Electrolysis Using Fluctuation of Wind Power Electricity, Katsuya SASAKI*, Kenji SUGINO*, Takao MAEDA: Proceedings of the 27th wind energy symposium, pp. 161-164, 2005.

The experimental evaluation for the hydrogen production device is carried out with the 100kW filed test wind turbine. The output power of the wind turbines is not stable because of the fluctuation of the wind speed and direction. This fluctuation gives the difficulty to use the wind turbine as a local power plant. To solve this disadvantage, the author thought that the hydrogen production device could be use as the energy storage. As the result of experiment, the system performances are discussed.

Study of pressure distribution on a rotor blade of wind turbine, Takao MAEDA, Yasunari KAMADA, Hideyasu FUJIOKA: Proceedings of Fluids Engineering Conference 2005, CD-ROM, p.4, 2005.

This paper shows the experimental studies on the rotating blade of wind turbine in yaw inflow condition. The aerodynamic performance of the rotor blade is measured by the surface pressure measurement. The test is carried out in the wind tunnel. As the result, the relation between the yaw angle and power coefficient are shown. Furthermore, the blade sectional performance for 0.7R are discussed with the pressure distribution and the aerodynamic force coefficient.

Ultrasonic Computerized Tomography (CT) for Temperature Measurements with Limited Projection Data Based on Extrapolated Filtered Back Projection (FBP) Method, Ning Zhu*, Yong Jiang* and Seizo Kato: Energy, Vol.30, pp.509-522, 2005

This study uses ultrasound in combination with tomography to obtain three-dimensional temperature measurements using projection data obtained from limited projection angle. The main feature of the new computerized tomography (CT) reconstruction algorithm is to employ extrapolation scheme to make up for the incomplete projection data, it is based on the conventional filtered back projection (FBP) method while on top of that taking into account the correlation between the projection data and Fourier transformed-based extrapolation. Computer simulation is conducted to verify the above algorithm. An experimental 3D temperature distribution measurement is also carried out to validate the proposed algorithm. The simulation and experimental results demonstrate that the extrapolated FBP CT algorithm is highly effective in dealing with projection data from limited projection angle.

Analysis and Assessment of Environmental Load of Vending Machines by a LCA Method, and Eco-Improvement Effect, Yukio Kimura*, Yucho Sadamichi, Naoki Maruyama and Seizo Kato: Trans. of the JSRAE, Vol.22, No.1, pp.45-54, 2005

These days the environmental impact due to vending machines' (VM) diffusion has greatly been discussed. This paper describes the numerical evaluation of the environmental impact by using the LCA (Life Cycle Assessment) scheme and then proposes eco-improvements' strategy toward environmentally conscious products (ECP). A new objective and universal consolidated method for the LCA-evaluation, so-called LCA-NETS (Numerical Eco-load Total Standardization) developed by the authors is applied to the present issue. As a result, the environmental loads at the 5years' operation and the material procurement stages are found to dominate others over the life cycle. Further eco-improvement is realized by following the order of the LCA-NETS magnitude; namely, energy saving, materials reducing, parts' re-using, and replacing with low environmental load material. Above all, parts' re-using is specially

recommendable for significant reduction of the environmental loads toward ECP.

Life Cycle Analytical Tools and Externalities of the Fuel Gas Desulphurization System in Thailand, Sate Sampattagul, Seizo Kato, Tanongkiat Kiatsiriroat* and Anugerah Widiyanto: Chiang Mai University Journal, Vol.4, No.1, pp.1-17, 2005

The Flue Gas Desulphurization (FGD) system has been employed at Thailand's biggest lignite-fired power plant to reduce the large amount of SO_2 emission. In order to understand ecological and economic resolutions, the lignite-fired plant was studied both before and after the installation of the FGD. The focus of this study was to consider not only the Life Cycle Assessment (LCA) outcome but also the Life Cycle Costing (LCC) factors. The results can provide valuable information when selecting appropriate technologies to minimize the negative impact that lignite-fired power plants have on the environment. The Life Cycle Assessment – Numerical Eco-load Total Standardization (LCA-NETS) was used to evaluate the impact on the environment of both the lignite-fired plant and the FGD. Life Cycle Costing (LCC) was used to provide a comparison between alternatives before and after installation of FGD. The externalities model was designed to study the relationship of the life cycle environmental impacts and life cycle cost values. The results of the study are shown in the eco-load values over the entire life cycle of the lignite-fired plant which indicates that the installation of the FGD system can reduce the acidification problem, associated with lignite-fired plants, by approximately 97%. The LCC estimation shows the major costs of the FGD system: capital investment, operation and maintenance and miscellaneous costs. The externalities provide the decision-making information when considering the cost of the FGD system in terms of protecting the environment.

LCA Analysis and Evaluation of Fuel and Power Plant System (in Japanese), Seizo Kato, Yucho Sadamichi: Journal of the Japan Institute of Energy, Vol. 84, No. 3, pp.186-188, 2005

Environmental Impact Consolidated Evaluation of Energy Systems by an LCA-NETS Scheme, Seizo Kato and Anugerah Widiyanto: Energy, Vol. 30, pp.2057-2072, 2005

The issue of LCA environmental impacts produced from energy systems is presently being discussed; they are directly involved in fossil fuel depletion, global warming, air pollution, rain acidification, etc. In evaluating various kinds of energy systems from the lack concept, an identical standard measure is to be introduced, as there are many different causes for generating environmental loads to the environment and the respective causes have their respective characteristics. Consequently, the authors have proposed an integrated scheme called the ESS (Eco-load Standardization Scheme) to express the amount of environmental load from different causes, using an identical standard based on objective data. That is a 'Loader-Receiver Tolerant Balance Theory', which indicates the balance of the maximum tolerance value that the Loader can discharge or consume with the maximum tolerable value by the Receiver. This ESS employs the NETS (Numerical Eco-load Total Standard) as the unit for expressing quantitatively the integrated and standardized environmental load. This LCA-NETS scheme is applied to different energy systems such as various kinds of power plants and co-generation systems, and the LCA evaluations are discussed for further ecological improvement.

Environmental Impact Assessment from Operating Co-generation Systems and Power Plants, Naoki Maruyama, Yucho Sadamichi, Anugerah Widiyanto and Seizo Kato: Proceedings of 3rd International Energy Conversion Engineering Conference, CD-ROM, 2005

The issue of the environmental effect of energy system is presently being discussed; they are directly involved in global environmental problems. Design methodology of environmentally conscious products (ECP) or well known as design for environment (DfE) is the methodology usually followed to enhance the environmental performance. In addition, the life cycle assessment (LCA) is found to be a suitable method and a powerful tool for evaluating the environmental impacts numerically resulting from the activity through the lifecycle. The purpose of this paper is first to discuss the implementation of environmental management system (EMS) and its evaluation of environmental compatibility for power plants in the design phase. The energy flow and the environmental impacts numerically of distributed power supplies for a non-utility installation are analyzed, especially for hotels, office buildings, hospitals and houses. The LCA scheme is applied to the specified co-generation energy systems consisting of gas turbines, wasted heat boilers, steam absorption refrigerators and heat exchangers. The environmental impacts of the power generation system are shown, and then minimizing the impacts on environment due to the CGS operation. The results of this study could be useful as recommendation for the further development of sustainable eco-energy supply systems.

Influence of Photocatalyst Film Forming Conditions on CO_2 Reforming, Akira Nishimura, Nobumasa Sugiura, Mitsumasa Fujita, Seizo Kato and Shinji Kato*: Proceedings of 3rd International Energy Conversion Engineering Conference, CD-ROM, 2005

Photocatalyst can reform CO_2 into fuel-like species of CO, CH_4, C_2H_4 and C_2H_6. However, the amount of product by reforming is still low as it is reported that the reforming concentration of product is from 100 to 10000 ppmV. In this paper, we apply TiO_2, which is the best photocatalyst, film coated on Cu substrate by a sol-gel and dip-coating method. To promote reforming performance of TiO_2 film, the influence of photocatalyst film forming conditions, which are coating number of TiO_2 film, firing duration time, and amount of TiO_2 in one layer of film, on CO_2 reforming has been investigated. Additionally, the relationship between reforming performance and film surface characteristic has been examined. As a result, the reforming performance of TiO_2 film is promoted with increasing coating number and prolonging firing duration time thanks to expansion of film surface area and increase in activity point. It is necessary to adjust the amount of TiO_2 in one layer of film according to coating number for obtaining a high performance of TiO_2.

LCA-NETS Evaluation for GHG of Power Generation Plants in Thailand, Sate Sampattagul, Seizo Kato, Naoki Maruyama, Akira Nishimura, Tanongkiat Kiatsiriroat* and Anugerah Widiyanto: Proceedings of 2nd International Conference on Life Cycle Management, 2005

The research indicates the life cycle assessment (LCA) results of greenhouse gas emissions from grid-mixed

system power generation plants in Thailand. The purpose is to understand the characteristics of these systems from the viewpoint of global warming. The objective of this LCA research is to identify the environmental impacts of electricity generating from grid-mixed electric systems in Thailand. In the paper, the LC-GHG emission per kWh of electricity generated was estimated for the power generation systems using a combined method of process analysis and input-output analysis. The results of study are based on information obtained from the Electricity Generating Authority of Thailand (EGAT) and two of independent Power Producers (IPP). The sensitivity analysis of the impacts of emerging, future and uncertainties associated with some assumptions are examined to help clarifying interpretation of the results.

Life Cycle Analysis and Assessment of Vending Machines, and their Eco-Improvement, Yukio Kimura*, Sate Sampattagul, Yucho Sadamichi, Akira Nishimura, Naoki Maruyama and Seizo Kato: Proceedings of 2nd International Conference on Life Cycle Management, 2005

Vending machines are indispensable for life in Japan. The number of vending machines operated in this country in the year 2004 is about 5.55 million sets and annually consuming electricity of 0.7% of Japan's annual domestic power generation. This social fact requires us to analyze and estimate the environmental impacts of vending machines numerically and then to concretely improve them to reduce environmental stress. In the method of Life Cycle Assessment (LCA), as an environmentally based tool for Environmentally Conscious Products (EPS), & Life Cycle Management (LCM) material depletion have been found to be occupying a large part of environmental load and "reuse" is an effective method from the combined environmental and economic viewpoint. Moreover, recovery of refrigerant and the best selection of materials are the other strong measures as well.

Study on Temperature Measurement by Using Ultrasonic Wave, Yoshitaka Maeda, Akira Nishimura, Naoki Maruyama and Seizo Kato: Proceedings of the 12th Tri-University International Joint Seminar & Symposium 2005, pp.181-184, 2005

The temperature measurement is one of the important measurements in the industrial and engineering field. In general, the temperature can be measured by the temperature sensor contacting the object. However, when we measure the temperature in vessel, the temperature sensor disturbs the fluid flow in the vessel. Additionally, there is a fear of the damage of the temperature sensor when the temperature sensor is inserted in a high temperature or high acidic field. Furthermore, this method can measure the local temperature only. An ultrasonic wave is a good candidate for temperature measurement technique not to disturb the fluid flow since the temperature in the vessel can be measured from the outside of wall vessel. The purpose of this study is to establish the temperature measurement systems that uses ultrasonic wave. As the first stage in this study, the uniform temperature water in aluminum circular pipe was measured though the final purpose of this study is to measure the temperature distribution of the water that flows in the aluminum pipe. As a result, the temperature obtained by ultrasonic wave has good agreement with the temperature obtained by the thermocouple under the uniform temperature distribution in the aluminum circular pipe. It has been obvious experimentally that the temperature measurement method which uses ultrasonic wave can measure the temperature of the entire measurement field including inside of the vessel.

Evaluation of Traffic Congested Alleviation by the Restriction of Vehicles, Masaki Fukuchi, Akira Nishimura, Naoki Maruyama and Seizo Kato: Proceedings of the 12th Tri-University International Joint Seminar & Symposium 2005, pp.228-231, 2005

Nowadays, the vehicles are essential to people and can transport goods at high speed. However, an increase of the vehicle contributes to CO_2 emission exhausted from the vehicles and becomes a serious problem. Especially, CO_2 emission increases when the traffic congestion occurred. Moreover, the traffic congestion obstructs the urgent vehicle when the disaster occurred. Therefore, the traffic congested solution can decrease CO_2 emission and smooth the flow of the vehicles. In this study, we have been constructed the model that can evaluate the traffic congestion. As the result, we were evaluated the CO_2 emission, which reduced by the restriction of vehicles.

Development of Recycling Evaluation Index by Using Life Cycle Assessment, Ryuma Ito, Yucho Sadamichi, Sate Sampattagul, Naoki Maruyama, Akira Nishimura and Seizo Kato: Proceedings of the 12th Tri-University International Joint Seminar & Symposium 2005, pp.232-235, 2005

Recycling is paid attention as a tool to solve the environmental problems. However, a lot of recycling methods do not consider the life cycle environmental impacts that are generated in the other stage of life cycle in the recycling process. According to this problem, it can contribute to the environmental impact in the recycling process, too. Therefore, it is necessary to construct the environmental assessment technique of recycling, and to remove recycling that depraves environmental problems. In this paper, first of all, the evaluation technique of the environmental load that the person involved in the recycling process causes is constructed. Next, the evaluation technique that evaluates how much the material is used effectively by recycling is constructed. When the former is evaluated, the idea of LCIA (Life Cycle Impact Assessment) is taken and a potential environmental impact is evaluated. And when the latter is evaluated, the data of demand is used to. Finally, the recycling of the iron used for most industrial products is evaluated by the constructed index. And, the validity of the index is evaluated.

Design Methodology for Environmentally Conscious Energy Systems, Naoki Maruyama, Yucho Sadamichi, Sate Sampattagul and Seizo Kato: Proceedings of the 12th Tri-University International Joint Seminar & Symposium 2005, pp.257-260, 2005

Design methodology of environmentally conscious products or well known as design for environment is the methodology usually followed to enhance the environmental performance. In addition, the life cycle assessment is found to be a suitable method and a powerful tool for evaluating the environmental impacts numerically resulting from the activity through the lifecycle. The purpose of this paper is first to discuss the implementation of environmental management system and its evaluation of environmental compatibility for power plants in the design phase. Then the LCA is applied to different power generation systems and the environmental impacts of the systems are shown. The results of this study could be useful as recommendation for the further development of sustainable eco-energy supply

systems.

Producing Fuel from CO_2 by Photocatalyst –Investigation on improvement method of reforming concentration– (in Japanese), Akira Nishimura, Nobumasa Fujita, Mitsumasa Fujita, Seizo Kato and Shinji Kato*: Proceedings of SCEJ 70th Annual Meeting, CD-ROM, 2005

Optimization of Under-floor Flows to Aim at Drag and Lift Compatible Reduction of Large Commercial Vehicles –Control of Flow Fields around Wheels- (in Japanese), Masaya Tanimura, Yasushi Kato and Seizo Kato: Proceedings of 2005 JSME Annual Congress, No.68-05, pp.19-22, 2005

Larger aerodynamic drag due to the wake is loaded on large commercial vehicles running with high-speed to long distance. In this study, wind tunnel tests are performed by using a 1/16-bus model on a moving ground with the purpose of its drag and lift simultaneous reduction. The flow field around wheels is investigated, and the optimum flow is realized by installing aero-devices. As a result, drag and lift simultaneous reduction is realized by controlling the under-floor flow around wheels with the aid of aero-devices.

Environmental Impact Assessment from Operating Co-generation Systems and Power Plants, Naoki Maruyama, Yucho Sadamichi, Anugerah Widiyanto and Seizo Kato: Proceedings of 42nd National Heat Transfer Symposium of Japan, Vol.2, pp.321-322, 2005

A Life Cycle Assessment (LCA) scheme is applied to the specific gas turbine co-generation energy systems, and then minimizing the impacts on environment during the operation. The technique assesses the environmental aspects and potential impacts throughout a product's or system life. This evaluation method is able to treat the global and regional environmental issues such as the depletion of natural resources and global warming due to CO_2 emissions, etc. Fuel is also optional from oil, natural gas, and another types of fuels. The efficiencies of the respective machines are to be inputted as functions of energy demands. The electricity and heat hourly demands are estimated from the statistical data of living energy demands depending mainly on the floor spaces for the case study. The results of this study could be useful as recommendation for the further development of sustainable eco-energy supply systems.

Influence of Photocatalyst Film Forming Conditions on CO_2 Reforming, Akira Nishimura, Nobumasa Sugiura, Mitsumasa Fujita, Seizo Kato and Shinji Kato*: Proceedings of 42nd National Heat Transfer Symposium of Japan, Vol.2, pp.323-324, 2005

To promote photocatalytic reforming of CO_2 into fuel-like species of CO, CH_4, C_2H_4 and C_2H_6, the influence of photocatalyst film forming conditions, which are the number of photocatalyst film coating, firing duration time in the coating process, and the amount of photocatalyst in one coating film, on the reforming performance has been investigated. Photocatalyst film is formed on copper substrate by sol-gel and dip coating method in this study. As a

result, CO_2 reforming performance of photocatalyst is improved with increasing the number of photocatalyst film coating and the amount of photocatalyst in film. These reaction promotions are obtained by increasing reaction points and reaction surface area.

An Approach Integrating Life Cycle Assessment and Costing Model for Eco-Industrial Product (in Japanese), Yoshiyuki Izu, Naoki Maruyama, Yucho Sadamichi, Seizo Kato, Sate Sampattagul, Akira Nishimura, Ryuma Ito, Yukio Kimura* and Masaki Nakamura*: Proceedings of 2005 Symposium on Environmental Engineering, pp.133-136, 2005

Life Cycle Assessment (LCA) becomes a more critical tool for ECP (Environmentally Conscious Products) designing. At the same time, Life Cycle Costing (LCC) and Environmental Accounting (Eco-Accounting) are becoming a necessary tool to make design of WTP (willingness to pay) for avoiding certain environmental impacts. This paper proposes a conversion scheme of the environmental load reduction expressed in physical units due to countermeasures into money units based on the CO_2 emission dealing right price, which is able to be evaluated by the CO_2 equivalent NETS values. Additionally, several criteria for the environmental costs performance are proposed with case studies.

Gate to Gate Life Cycle Evaluation of Industrial Products for Eco-Production Development (in Japanese), Yuki Yamaoka, Naoki Maruyama, Yucho Sadamichi, Seizo Kato, Akira Nishimura, Yukio Kimura* and Nobuhiro Watanabe*: Proceedings of 2005 Symposium on Environmental Engineering, pp.137-140, 2005

Life Cycle Assessment (LCA) has been greatly paid attention to its effectiveness in evaluating environmental loads through the life cycle of any industrial products. The LCA method has been used to analyze the environmental loads of the processes. This paper focuses on the LCA evaluation at the manufacturing phase, especially at painting-coating process and plastic-injection process molding process. The various kinds of the inventory data of the processes are collected by measuring respective parameters. The objective of this study is to evaluate the LCA environmental loads in these two manufacturing processes based on the data analysis. It is recommended to use the here Numerical Eco-load Standard values in order to design the Eco-products.

Study on Heat Transfer Characteristics of Natural Convection in the State of Low-density Environments, Masanori Yoshimoto, Naoki Maruyama, Hirokazu Matsui and Seizo Kato: Proceedings of Thermal Engineering Conference '05, No.05-17, pp.371-372, 2005

The object of this study is to evaluate the heat transfer characteristics in low-density environments, where the pressure is given between high vacuum region and atmospheric pressure. In this study, a natural convection, affects the field of production of thin films, is analyzed by experiment using holographic interferometry. In addition, by comparing the results of the experiments, the effectiveness of numerical calculation is tested of low-density environments. After that, the various conditions are analyzed by numerical calculation instead of experiment. Finally, the characteristics of

heat transfer are evaluated by two kinds of analyses.

A study on two phase flow of hypochlorous water in narrow and parallel plate with high efficiency (in Japanese), Kazuya Kato, Naoki Maruyama, Takahiro Tatumi and Seizo Kato: Proceedings of Thermal Engineering Conference '05, No.05-17, pp.381-382, 2005

Gas and liquid two phase flow in narrow and parallel plate is investigated by experiment and numerical simulation. The experiment is performed in batch and fluid type, where the gas is generated during the experiment by chemical reactions. The purpose of this paper is to create the chlorination water considering from the standpoint of high concentration and high efficiency. These result will be applied to create the chlorination water called hypochlorous acid with high efficiency.

Life Cycle Analysis and Assessment of Vending Machines, and their Eco-Improvement (in Japanese), Yukio Kimura*, Yucho Sadamichi, Akira Nishimura, Naoki Maruyama and Seizo Kato: Proceedings of 1st LCA Conference of Japan, pp.30-31, 2005

Design for Environmentally Friendly Processing in the Manufacturing Stage of Industrial Products –Metal Processing, Plastic Injection Modeling, Painting Process- (in Lapanese), Yucho Sadamichi, Yuki Yamaoka, Naoki Maruyama, Akira Nishimura, Seizo Kato, Yukio Kimura*, Masaaki Nakamura* and Nobuhiro Watanabe*: Proceedings of 1st LCA Conference of Japan, pp.118-119, 2005

Studies on Mixing Process and Performance Improvement of Jet Pump (Effects of Nozzle and Throat Shapes), Yukitaka YAMAZAKI, Atsushi YAMAZAKI, Tadashi NARABAYASHI*, Junya SUZUKI* and Toshihiko SHAKOUCHI, Transaction of the Japan Society of Mechanical Engineers, 70-701 B, pp.147-153, 2005.

A Study of Performance of Jet Pump (Effect of Configuration of Flow Passage), Yukitaka YAMAZAKI, Atsushi YAMAZAKI, Tadashi NARABAYASHI*, Junya SUZUKI* and Toshihiko SHAKOUCHI, Proc. of the Sixth World Conference on Experimental Heat Transfer, Fluid Mechanics and Thermodynamics, ExHFT-6, CD-ROM, 2005.

Gas-Particle Two-Phase Jet Flow from Slot Nozzle and Micro-Blasting Process, Masaki SUGIMOTO, Toshihiko SHAKOUCHI, Kohei HAYAKAWA and Moriyasu IZAWA*, Transaction of the Japan Society of Mechanical Engineers, 70-710 B, pp.2450-2457, 2005.

Research on Stability of Fishing Bank made by Large Particle Size Porous Concrete placed under Sea (Experiment using large scale waterway), Akihiro MAEGAWA, Toshihiko SHAKOUCHI, Yukihisa YUASA*, Naoki MISHIMA* and Shigemitsu HATANAKA, AIJ J. Technol. Des., 22, pp.53-58, 2005.

Flow Analysis for Single and Multi-nozzle Jet Pump, Tadashi NARABAYASHI*, Yukitaka YAMAZAKI, Hidetoshi KOBAYASHI* and Toshihiko SHAKOUCHI, Proc. of the International Conference on Jets, Wakes and Separated Flows, ICJWSF-2005, pp.267-272, 2005.

Flow and Control of Vertical Upward Gas-Liquid Two-Phase Flow Through Sudden Contraction Pipe, Alexandros VOUTSINAS, Toshihiko SHAKOUCHI, Koichi TSUJIMOTO and Toshitake ANDO, Proc. of the ICJWSF-2005, pp.307-312, 2005.

Flow and Heat Transfer Characteristics of High Temperature Gas-Particle Air Jet Flow, Hirokazu NAKAMURA and Toshihiko SHAKOUCHI, Proc. of the ICJWSF-2005, pp.307-312, 2005.

Particle Laden Impinging Jet Flow from Rectangular Nozzle and Abrasive Jet Machining, Masaki SUGIMOTO, Toshihiko SHAKOUCHI, Kohei HAYAKAWA, Motoki OKAZAKI and Moriyasu IZAWA*, Proc. of the ICJWSF-2005, pp.325-330, 2005.

Effect of Surface Roughness on Jet Pump Performance, Yukitaka YAMAZAKI, Tomonori NAKAYAMA, Tadashi NARABAYASHI*, Hidetoshi KOBAYASHI* and Toshihiko SHAKOUCHI, Proc. of the ICJWSF- 2005, pp.491-495, 2005.

Flow Analysis for Single and Multi-Nozzle Jet Pump, Tadashi NARABAYASHI*, Yukitaka YAMAZAKI, Hidetoshi KOBAYASHI* and Toshihiko SHAKOUCHI, Proc. of the ICJWSF-2005, pp.267-272, 2005.

Direct Numerical Simulation of Jet Mixing Control Using Combined Jets, Koichi TSUJIMOTO, Toshihiko SHAKOUCHI, Shuji SASAZAKI and Toshitake ANDO, Proc. of the ICJWSF-2005, pp.725-730, 2005.

To develop efficient method of jet mixing, direct numerical simulations of combined jets are carried out. The Reynolds number is defined with a nozzle diameter, is Re=1500. The spatial discretization is performed with hybrid scheme in which sixth order compact scheme in streamwise direction and Fourier series in cross section are adopted. The distance between two jets is fixed at 6 times jet diameter, and the inclination angle of jet is changed from 45 to 70 deg. As a result, it reveals that the turbulence intensity is strengthened with decreasing inclination angle, and that the jet width increases via the excitation of jets. These findings suggest that the combination of jets flexibly meet the diversified needs of jet mixing control.

Direct Numerical Simulation of Mixing by Two Inclined Jets, Koichi Tsujimoto, Shuji Sasazaki and Toshihiko Shakouchi, Proc. of the 4th Int. Conf. on Computational Heat and Mass Transfer, pp.1268-1271, 2005.

To develop efficient method of jet mixing, direct numerical simulations of two inclined jets are carried out. The Reynolds number is defined with a nozzle diameter, is Re=1500. The spatial discretization is performed with

hybrid scheme in which sixth order compact scheme in streamwise direction and Fourier series in cross section are adopted. The distance between two jets is fixed at 6 times jet diameter, and the inclination angle of jet is changed from 45 to 70 deg. As a results, it reveals that the turbulence intensity is strengthened with a decreasing inclination angle, and that the jet width increases via the excitation of each jets. These findings suggest that the combination of jets flexibly meet the diversified needs of jet mixing control.

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Improvement of Robust Performance by Taking into Account Model Uncertainty Identification on GIMC Structure, K.Yubai: Proceedings of the 2005 International Power Electronics Conference, pp.1981-1984, 2005

GIMC proposed by Zhou consists of a conditional feedback structure and an outer-loop controller. A conditional feedback structure included in GIMC makes it easy to robustfy a control system or construct a fault-tolerant control system, while an outer-loop controller specifies a nominal control performance. In this paper, the design method of Youla parameter on GIMC taking into account model uncertainty is proposed and the effectiveness of the proposed design method is verified by some simulations.

Fault-tolerant Tip Position Control of Flexible Arm for Sensor Fault by Using Adaptive Sensor Signal Observer, Yu Izumikawa, K.Yubai and J.Hirai: Proceedings of SICE Annual Conference 2005 in Okayama, pp.2615-2620, 2005

In recent years, control system reliability has received much attention with increase of situations where computer controlled systems such as robot control systems are used. In order to improve reliability, control systems need to have abilities to detect a fault (fault detection) and to maintain the stability and the control performance (fault tolerance). In this paper, we address the vibration suppression control of a one-link flexible arm robot. Vibration suppression is realized by an additional feedback of a strain gauge sensor attached to the arm besides motor position. However, a sensor fault (e.g., disconnection) may degrade the control performance and make the control system unstable at its worst. In this paper, we propose a fault-tolerant control system for strain gauge sensor fault. The proposed control system estimates a strain gauge sensor signal based on the reaction force observer and detects the fault by monitoring the estimation error. After fault detection, the proposed control system exchanges the faulty sensor signal for the estimated one and switches to a fault-mode controller so as to maintain the stability and the control performance.
We apply the proposed control system to the vibration suppression control system of a one-link flexible arm robot and confirm the effectiveness of the proposed control system by some experiments.

Yu Izumikawa, K.Yubai and J.Hirai: Fault-Tolerant Control System of Flexible Arm for Sensor Fault by Using Reaction Force Observer, IEEE/ASME Transactions on Mechatronics, Vol. 10, No.4, pp.391-396

In this paper, we propose a fault-tolerant control system for a tip position control of a flexible arm robot. The proposed control system has a strain gauge sensor signal observer based on a reaction force observer and detects a fault by monitoring an estimation error. In order to improve estimation accuracy, plant parameters included in the sensor signal observer are adjusted by using the strain gauge sensor signal in normal time through adaptive laws. After fault detection, the proposed control system exchanges the faulty sensor signal for the estimated one and switches to a fault mode controller so as to maintain the stability and the control performance. We confirm the effectiveness of the proposed control system by some experiments.

Realization of Fault-tolerant Vibration Suppression Control System of Flexible Arm by GIMC Structure, T.Sakuishi, Y.Izumikawa, K.Yubai and J.Hirai: Proceedings of SICE Annual Conference 2005 in Okayama, pp.1351-1354, 2005

In recent years, control system reliability has received much attention with increase of situations where computer-controlled systems such as robot control systems are used. In order to improve reliability, control systems need to have abilities to detect a fault (fault detection) and maintain the stability and the control performance (fault tolerance). In this paper, we address the strain gauge sensor fault of a flexible arm robot. In order to achieve a fault-tolerant control system, the effect of the fault is identified as dual Youla parameter by regarding the estimation error of the faulty sensor signal as the faulty plant output. Moreover, Youla parameter is designed so as to suppress the effect of dual Youla parameter. Youla parameter is implemented in GIMC structure proposed by Zhou. Since GIMC structure includes a conditional feedback, it is suitable for achieving a fault-tolerant control system. The effectiveness of the proposed fault-tolerant control system is confirmed by some experiments.

A Joint Design Method for Achieving Nominal Performance Based on GIMC Structure, N.Wakayama, K.Yubai and J.Hirai: Proceedings of SICE Annual Conference 2005 in Okayama, pp.2621-2624, 2005

Joint design methods are based on an iterative scheme of model identification and controller design associated with each other. This paper proposes a new joint design method based on GIMC structure. The proposed joint design method evaluates the performance degradation from the nominal performance explicitly so as to achieve the nominal performance for the actual plant. The identification of dual Youla-parameter R and the design of Youla-parameter Q are related to each other under the same control objective. Youla parameter Q is implemented in GIMC structure proposed by Zhou. The effectiveness of the proposed design method is verified by an actual control system.

Joint Design Method Based on Internal Structure of 2DOF Control System, K.Yubai: Transaction of IEE Japan, Vol.125-D, No.6, pp.533-540, 2005

In many cases, control system design is formulated as minimization of some prescribed closed loop performance reflecting a control requirement. Since the closed loop performance is a function of a controlled plant and a controller, the model identification and controller design must interact with each other. This motivates us to consider the model identification and controller design simultaneously. However, most of the previous joint design methods are not applicable to unstable plants because the identified plant model is usually used as the design parameter, i.e. a weighting function in the controller design. On the other hand, we have analyzed the internal structure of 2DOF control system using coprime factorization on RH_∞ and shown that two free parameters, K and Q belonging to RH_∞, specify tracking performance and feedback performance, respectively. Also, Tay et.al have proposed a parameterization of the plant dynamics by switching the role of the controlled plant and controller, and introduced a free parameter R belonging to RH_∞. In this paper, we propose a new joint design strategy based on the identification of R and the design of Q. Since the identified plant parameter R is always stable, the proposed joint design strategy can be applied to wider class than the conventional joint design methods. Moreover, it is known that R is well approximated as a less order model than the plant itself. This leads to the advantage in designing Q with less order. Finally, the usefulness of the proposed method is verified by some simulations and experiments.

New Initial Pole Position Estimation of Surface PM-LSM Using Reference Currents, Tae-Woong Kim*, Junichi Watanabe*, Sumitoshi Sonoda*, and Junji Hirai : IEEE Trans. on Industry Applications, Vol.41, No. 3, pp.817-824, 2005

This paper proposes a new algorithm for the initial pole-position estimation of a surface permanent-magnet linear synchronous motor (PM-LSM), which is carried out under closed-loop control without a pole sensor and is insensitive to the motor parameters. This is based on the principle that the initial pole position (IPP) is calculated by the reverse trigonometric function using the two reference currents, which are received from the speed controller. Compared to published research, the proposed algorithm does not utilize the impedance ratio like the general methods and it can be widely applied without the limitation of the motor structures. The effectiveness of the proposed algorithm is verified by testing a surface PM-LSM with large cogging. Its results show the IPP is well estimated within a satisfied moving distance and a shorter estimation time, even if a large disturbance such as cogging exists.

Suboptimum condition of Fingertip arrangement decision", K. Mori, S. Komada, J. Hirai : Proc. of the 2005 International Power Electronics Conference, pp.1374-1377, 2005

Multi-finger hands are necessary for robots in order to realize many tasks. This paper proposes a grasping arrangement decision algorithm, which realizes a small tip force of multi-finger hand with feasible time. A norm of tip force for translational and rotational force for grasping objects on xy plane is derived. By the analysis of the equation, condition that realize a small norm is found. By utilizing the condition, semi-optimum fingertip force is found with a feasible time.

Chattering Free Neuro-Sliding Mode Control of DC Drives, M. G. Sarwer*, Md. A. Rafiq*, M. Datta*, B.C. Ghosh*, and S. Komada : Proc. of 2005 International Conference on Power Electronics and Drive Systems, vol.2, pp.1101-1106, 2005

In this paper, a synergistic combination of neural network (NN) with sliding mode control (SMC) methodology is proposed. The main purpose is to eliminate the chattering phenomenon in sliding mode control. The reduction of the chattering is achieved by using a distance function that measures the distance between the trajectory of state errors and the sliding surface as the corrective control term instead of discontinuous sign function. The NN is utilized to estimate the equivalent control of SMC. The network weights are adjusted using a modified online error back propagation algorithm. The proposed scheme is applied to control the speed of a DC drive. Simulation verifies that the proposed control scheme has the advantage of less chattering in SMC.

Development of a Biofeedback-Based Robotic Manipulator for Supporting Human Lower Limb Rehabilitation, N. Okuyama, S. Komada, and J. Hirai : Proc. of 36th International Symposium on Robotics, pp.1-4, 2005

We have developed a manipulator for supporting human lower limb rehabilitation that enables isokinetic muscular contraction to both knee and hip joints simultaneously. This time, we estimate muscular tensions in thigh and pelvis area of a healthy person during exercise by the manipulator to realize a biofeedback treatment without using electromyogram (EMG). The muscular tension estimate is made by employing muscular fatigue minimization methods. As a result of experiments and analysis, fairly good coincidence in the wave form is confirmed between the muscle action potential and the estimated muscular tensions.

Derivation of minimization condition of manipulating force for multi fingered robot hands and its application to decision of fingertip position, F.Nakamura, S.Komada, and J.Hirai : Proc. of 36th Int. Symposium on Robotics, pp.1-4, 2005

Many researches on decision of fingertip position of multi fingered robot hands have been performed in order to minimize fingertip force for a given task. Some of these methods, however, take much time until decision of fingertip position because nonlinear programming problem including friction condition is solved for all combinations of candidates of fingertip positions. This paper newly derives a minimization condition for fingertip force of manipulating force. By using the condition, unnecessary candidates are deleted in advance to realize fast decision of fingertip position. Lastly, numerical verification for the proposed method is performed.

Identification of Switched Systems with unknown Switch Points and Its Application, Shangchang MA, Tadanao ZANMA, Muneaki ISHIDA: Proceedings of 2005 IEEE International Conference on Systems, Man and Cybernetics, vol..3, p.p.2885-2890

System identification covers a very wide range of techniques for obtaining a system model from its input-output data. In this paper, we address the identification problem of switched systems, by focusing our attention on hinging hyperplane autoregressive exogenous models (HHARX), which can be identified efficiently via mixed-integer programming. As an example, the problem of extracting operation modes in a driving system of a small toy vehicle and their switch conditions is formulated. The formulation of the identification problem of switched systems with unknown switch points is based on the hybrid dynamical system theory. The effectiveness of HHARX model approach in switched system identification is verified by simulation.

Continuous position control by symbolic input and output, Yosuke TAKEI, Tadanao ZANMA, Muneaki ISHIDA: Proceedings of 2005 IEEE International Conference on Industrial Technology, p.p.805-810

This paper concerns a control problem for a specification which requires a finer description than the resolution of available sensors and actuators. Such a situation may arise when a given control specification is to be

achieved as accurate as possible while sensors are kind of limit switches and actuators are on/off control architecture. In this paper, a ball position control system is taken. The experimental setup is modeled with rolling friction. For the experimental setup, we propose a control algorithm based on discrete input and output and continuous state estimation. Finally, the proposed method is applied to the experimental setup to demonstrate its effectiveness as well as numerical simulation.

Designing of A Small Wind Power Generating System, Takashi NONOYAMA, Naoki YAMAMURA, Muneaki ISHIDA, Hideki FUJITA*: Proceedings of 2005 International Power Electronics Conference (IPEC 2005), S36-2, p.p.1274-1279

At present most of existing wind power systems are of large capacity (over 1MW output) and high initial cost. These systems require wide area to build. Therefore, aiming to popularize the wind turbine generation system in residential area, we proposed small capacity (about 100W-a few kW output) generation system. Moreover, we proposed simple maximum power racking control system with analog circuit and achieved over 90% output of maximum power in any circumstance. But improper design of the control parameters makes the system performance worse. Then we proposed an equivalent circuit of the wind power generation system and a design method of its control system. Usefulness of the proposed control system along with proposed design method is confirmed by experimental results of the wind power generation system. In this system, we use DC motor as the wind turbine because the output characteristic of the DC motor is similar to that of the wind turbine.

A Control Method of Prolonging the Service Life of Battery in Stand-alone Renewable Energy System using Electric Double Layer Capacitor (EDLC), Jia YAN, Ryousuke SHIBATA, Naoki YAMAMURA, Muneaki ISHIDA: 2005 International Conference on Power Electronics and Drive Systems (PEDS 2005), 1E-1, p.p.228-233

A control method for prolonging the service life of battery bank in stand-alone renewable energy system using Electric Double Layer Capacitor (EDLC) is presented. Recently, it has become one of the main problem needed to be solved urgently in future stand-alone renewable energy system that the service life of battery bank is shortened due to the fluctuant output power caused by varied weather condition, with higher cost and power loss. In this paper, to prolong the service life of battery bank by realizing smoothed power supply to battery bank, a bi-directional Buck/Boost topology and its control method using Electric Double Layer Capacitor (EDLC) is proposed, Simulation in PSIM and experiment are carried out in order to confirm the validity of the proposed method. And the simulation parameters range is identified according to the smooth level of battery current output. The experiment result is better agreed with the anticipated design and simulation results when the higher harmonic frequency varies under the appointed range of frequency and fluctuation amplitude

Direct visualization of electromagnetic microfields by superposition of two kinds of electron holograms, Akinori OHSHITA, Masaaki OKUHARA, Chiharu MATSUYA, Koichi HATA and Kazuo IIDA: European Microbeam Analysis Society 9th EUROPEAN WORKSHOP/International Union of Microbeam Analysis Societies 3rd MEETING, p.319, 2005

A new electron holographic method to visualize pure phase objects such as electromagnetic microfields, which is achieved by superposition of two kinds of electron holograms, is presented. The method is very simple and is twice as sensitive as the conventional double-exposure electron holography and the four-electron-wave interference. Using this technique, an electric field around a charged latex sphere and a magnetic field around a barium ferrite particle have been directly observed.

Electron Interference Fringes Observed in Projected Image of Earthed Multiwall Carbon Nanotube, Akinori OHSHITA, Shunsaku WAKI, Chiharu MATSUYA, Koichi HATA and Kazuo IIDA, Boklae CHO*, Tuyoshi ISHIKAWA* and Chuhei OSHIMA*: Atomic Level Characterizations, 08P15, 2005

The electron interference fringes observed in the projected image of earthed multiwalled carbon nanotube are

compared with those produced by conventional electron biprism in electron microscopy. It is found that the former interference fringes resemble the latter ones in shape.

Effect of Low Molecular Weight Fluid on the Surface Free Energy of an Alloy of EPDM/SIR, Kazuo IIDA and Reuben HACKAM*: International Symposium on Electrical Insulating Materials, pp.352-355, 2005

Ethylene propylene diene rubber (EPDM), silicone rubber (SIR) and their alloys have good performance when used as outdoor insulators. The hydrophobicity of the surface is maintained in wet conditions as a result of diffusion of low molecular weight (LMW) fluid from the bulk to the surface. The amount of LMW fluid on the surface and in the bulk of the material determines the hydrophobicity during the lifetime of the alloy of EPDM/SIR used as insulators. The surface free energy of the alloy of EPDM/SIR is determined using the harmonic-mean method by measuring the static contact angles of water and methylene iodine. The surface free energy of the cleaned surface of the alloy is estimated to be about 30 mJ/m2. The removal of LMW fluid from the surface and migration of the LMW fluid to the surface have influence on the static contact angles of water and methylene iodine, but have a small effect on the surface free energy. It comes from the change in the ratio of two components of the surface free energy due to non-polar dispersive force and polar non-dispersive force.

Handwritten Keywords Recognition on Whiteboard Using Dictionary for e-Learning , Daisuke YOSHIDA, Shinji TSURUOKA, Hiroharu KAWANAKA* and Tsuyoshi SHINOGI , Proceedings of the sixth International Symposium on advanced Intelligent Systems (ISIS2005), pp. 197-202, 2005

We have proposed an individual e-Learning system using two cameras and a pen capture tool on whiteboard. One of important problems in our learning system is that the accuracy of handwritten character recognition on whiteboard is not enough for keyword retrieval in textbook. This problem caused the low matching rate between the handwritten character strings on whiteboard and the keywords in the textbook, and the system can't link the string to the explanation in textbook. In this paper, we propose the new matching method of high accurate recognition for key word using word dictionary. We examined for handwritten character strings including 50 key words, and we obtained the key word recognition rate of 90 % (the method without word dictionary: 54 %). We confirmed the usefulness using word dictionary for handwritten strings on whiteboard.

Automatic Determination of an Active Camera View in an Image Based e-Learning System, Kenichi SHIRASAWA, Hiroharu KAWANAKA*, Shinji TSURUOKA, Tomohiro YOSHIKAWA* and Tsuyoshi SHINOGI, Proceedings of the sixth International Symposium on advanced Intelligent Systems (ISIS2005), pp. 213-217, 2005

We are interested in the education system based on the image, and we are constructing the individual learning system based on the real lecture on campus. One of important problem in an image based e-Learning system is the control of camera view for remote students to watch eagerly. The interesting camera view attracts the remote students to a lecture, and it determines the value of e-Learning. In this paper, we propose a new view control algorithm on an active network camera with high speed. We evaluate a new statistical analysis of the silhouette histogram for the lecturer behavior recognition, and a new image segmentation method for the objects on blackboard. We design a new state transition diagram for the automatic determination of the active camera view. We examined the system for some actual lectures in an actual classroom (capacity: 100 students).

Hybrid Automatic Tracking of Regional Myocardium from Ultrasonic RF Echo Signal, Akihiko KAWABATA, Shinji TSURUOKA, Hiroharu KAWANAKA*, Tsuyoshi SHINOGI, Wataru OHYAMA, Tetsushi WAKABAYASHI and Kiyotsugu SEKIOKA*, Proceedings of the twelfth International Conference on Biomedical Engineering (ICBME2005), 1B4-02 on CD-ROM, pp.1-4, 2005

In this paper we propose a new hybrid automatic tracking method (HATM) to improve tracking accuracy of FATM. In HATM, a heart cycle time is estimated using the correlation coefficient between the RF signal on an initial time (t_0) and the RF signal at each time, and the time with maximum value of the correlation coefficient is estimated as

the heart cycle time. The automatic tracking from a time to the initial time is called the backward automatic tracking method (BATM), and HATM uses FATM and BATM. We apply it eight actual RF signals to discuss the efficiency of the estimation method of heart cycle time. The experimental results show that the estimation error is less than 2% from the cycle time based on ECG. This paper also shows that the comparison of FATM and HATM using 50 actual RF signals, for regional myocardium. As the result, the correct rate of FATM was 40% and that of HATM was improved to 62%. Calculation time to acquire a result is about 2 minutes in the case of HATM, which means it takes twice time comparing with FATM. We confirmed the usefulness of HATM for some actual RF signals.

Estimation of Respiratory Rate Using Long Term ECG Recording, Toshiyuki USAMI, Wataru OHYAMA, Tetsushi WAKABAYASHI, Fumitaka KIMURA, Shinji TSURUOKA and Kiyotsugu SEKIOKA*, Proceedings of the twelfth International Conference on Biomedical Engineering (ICBME2005), 2B1-09 on CD-ROM, pp.1-4, 2005

In this paper, we propose a new method for extracting respiratory signals from long-term echocardiogram (ECG) recording. The proposed method employs some filtering techniques on frequency domain followed by the estimation of instantaneous frequency by Hilbert transform to estimate respiratory frequency. The evaluation examination, which compares the respiratory frequency estimated from ECG and the one derived from the respiratory signal measured with oronasal thermistor, shows that the proposed method has potentiality for detection and diagnosis of respiratory disorders. From this result, we conclude that temporal frequency estimation of respiration gives more detailed information on respiratory state than power spectrum of R-R interval.

Myocardial Motion Tracking by Adaptive Combination of Correlation and Phase Difference of US RF Signals, Koichi NAGATA, Wataru OHYAMA, Tetsushi WAKABAYASHI, Fumitaka KIMURA, Shinji TSURUOKA and Kiyotsugu SEKIOKA*, Proceedings of the twelfth International Conference on Biomedical Engineering (ICBME2005), 3B2-08 on CD-ROM, pp.1-4, 2005

We propose a novel method for noninvasive extraction of two dimensional regional motion of left ventricular myocardium by means of the adaptive combination of correlation and instantaneous phase difference of ultrasonic RF signals. The proposed method is motivated by the successfully achievement on the myocardial motion tracking by means of both ultrasonic Doppler and RF signals. At first, the method extracts the velocity on each sampling point by instantaneous phase differences. The next, the velocities are evaluated by the correlation. Finally, these velocities are corrected by the amount associated with the value of accuracy and accumulated into the position of tracking points for error reduction. Experimental results show the method is suitable for the evaluation of regional myocardial motion.

Edge Extraction of Heart from Ultrasonic Echo Image by Active Contour Models, Yosuke OKAYAMA, Shinji TSURUOKA, Tsuyoshi SHINOGI, Hiroharu KAWANAKA*, Fumitaka KIMURA, Tetsushi WAKABAYASHI, Wataru OHYAMA and Kiyotsugu SEKIOKA*, Proceedings of the twelfth International Conference on Biomedical Engineering (ICBME2005), 4B2-02 on CD-ROM, pp.1-4, 2005

In this paper, we propose a new edge extraction method to detect the outer and inner contours of heart simultaneously by active contour models. Our edge extraction method consists of three steps: (1) the manual specification of a central point and one edge point on the outer and inner contours respectively to determinate outer and inner initial contours; (2) the automatic determination of the series of initial edge points at regular intervals on the outer and inner contours; (3) the detection method of the edge point using the smoothness of the contours using the differential coefficients between the position of the next edge point, the distance between the temporal frames, the distance between the outer and inner contours, and the difference of grey level in the neighbor region about the edge. We confirmed the method obtain the better results than the previous method for some heart walls.

Parallel Core Testing with Multiple Scan Chains by Test Vector Overlapping, Tsuyoshi Shinogi, Yuki Yamada, Terumine Hayashi, Tomohiro Yoshikawa, Shinji Tsuruoka : 2005 IEEE VLSI-TSA International Symposium on VLSI Design, Automation and Test (VLSI-TSA-DAT), pp.205-208,2005

This paper proposes the parallel testing of cores with multiple scan chains using the test vector overlapping for reduction of SoC testing cost. Unlike conventional scan architecture for SoC testing, by introducing multiple scan chain cores, our method can reduce the test application time without increasing the number of I/O pins used in testing, and reduce the test data volume. A controller design and a new overlapping algorithm are also presented for the test vector overlapping with multiple scan chain cores. Experimental results show its effectiveness.

Test Data Sequence Generation Method for Reduced Scan Shift without Scan Chain Flip-Flop Reordering, Tsuyoshi Shinogi, Hiroyuki Yamada, Terumine Hayashi, Tomohiro Yoshikawa, Shinji Tsuruoka : IEEE 6th Workshop on RTL and High Level Testing(WRTLT05), pp.73-78, 2005

To reduce the test application time and the test data volume in full-scan testing, various methods are proposed which utilize some additional built-in circuits dedicated for testing. In contrast, a previous method, called Reduced Scan Shift, does not utilize any additional built-in hardware. However, it totally relies on scan chain flip-flop reordering, which is not always applicable. In this paper, we propose a test data sequence generation method for Reduced Scan Shift without scan chain flip-flop reordering. Our method utilizes justification technique and don't-care bits in test vectors. Experimental results show that the performance on the reduction of test application time and test data volume by our method without scan chain flip-flop reordering is even higher than the original Reduced Scan Shift utilizing scan chain flip-flop reordering.

A Test Cost Reduction Method by Test Response and Test Vector Overlapping for Full Scan Test Architecture : Tsuyoshi Shinogi, Hiroyuki Yamada, Terumine Hayashi, Tomohiro Yoshikawa, Shinji Tsuruoka, IEEE 14th Asian Test Symposium, pp.366-369, 2005

To reduce the test application time and the test data volume in full-scan testing, various methods are proposed which utilize some additional built-in circuits dedicated for testing. In contrast, a previous method, called Reduced Scan Shift, does not utilize any additional built-in hardware. However, the method relies on scan chain flip-flop reorder-ing, which is not always applicable. In this paper, we pro-pose a test data sequence generation method for Reduced Scan Shift without scan chain flip-flop reordering. Our method fully utilizes justification technique and don't-care bits in test vectors.

Correction of OFDM Signal Form in Time Domain to Reduce ICI Due to the Doppler Spread and Carrier Frequency Offset, Gagik Mkrtchyan, Mori Kazuo and Hideo Kobayashi: IEICE Transactions on Communications, Vol.E88-B, no.1 pp.122-133, Jan.. 2005.

Proposal of OFDM Channel Estimation Method Using Discrete Cosine Transform, Hideo Kobayashi and Kazuo Mori: IEICE Transactions on Communications, Vol.J88-B, no.1 pp.256-268, Jan. 2005.

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Proposal of Link Condition Estimation Scheme for MC-CDMA System with Adaptive Modulation Method, Satoshi Kominami, Kazuo Mori and Hideo Kobayashi: IEICE Transactions on Communications, Vol. J88-B, no.2 pp.383-398, Feb. 2005

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Mitigation of Non-Linear Distortion using PTS and IDAR Method for Multi-Level QAM-OFDM System, Pisit Boonsrimuang, Kazuo Mori, *Tawil Paungma and Hideo Kobayashi: Proc. of Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology Conference (ECTI-CON 2005), pp.303-306, May 2005.

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Proposal of QAM-OFDM System with DSI and IDAR Method in Satellite Channel, Pisit Boonsrimuang, Katsuhiro Naito, Kazuo Mori, *Tawil Paungma and Hideo Kobayashi: Proc. of Joint Conference on Satellite Communications (JC-SAT2005), pp.89-94, Oct. 2005.

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Maximum Doppler Frequency Spread Estimation Method Using Mean Square Derivative of the ML Time Domain Estimated Channel Impulse Response for OFDM Systems, Gagik Mkrtchyan, Katsuhiro Naito, Kazuo Mori and Hideo Kobayashi: Proc. of Joint Conference on Satellite Communications (JC-SAT2005), pp.161-166, Oct. 2005.

Diversity Acquisition from Inter-Carrier Interference in the Frequency Division Based Mobile Communication, Gagik Mkrtchyan, Katsuhiro Naito, Kazuo Mori and Hideo Kobayashi: Proc. of International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2005) pp.605-608, Dec. 2005.

Decision Aided Compensation of Residual Frequency Offset for MIMO-OFDM Systems with Nonlinear Channel, Shouyi Yang, *Jiangtao Xi, Fang Wang, *Xiaomin MU and Hideo Kobayashi: Proc. of International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2005), pp.113-116, Dec. 2005.

On Test Data Compression Using Selective Don't-Care Identification, Terumine HAYASHI, Haruna YOSHIOKA,

Tsuyoshi SHINOGI, Hidehiko KITA, and Haruhiko TAKASE: Journal of Computer Science and Technology, Vol.20, No.2, pp.210-215, 2005

This paper proposes an effective method for reducing test data volume under multiple scan chain designs. The proposed method is based on reduction of distinct scan vectors using selective don't-care identification. Selective don't-care identification is repeatedly executed under condition that each bit of frequent scan vectors is fixed to binary values (0 or 1). Besides, a code extension technique is adopted for improving compression efficiency with keeping decompressor circuits simple in the manner that the code length for infrequent scan vectors is designed as double of that for frequent ones. The effectiveness of the proposed method is shown through experiments for ISCAS'89 and ITC'99 benchmark circuits.

Problem-Posing with Making Step-by-Step Explanations and Peer Evaluation [In Japanese], Shinobu TABATA, Tsutomu SHIMOMURA, Hidehiko KITA, and Terumine HAYASHI: Journal of Science Education in Japan, Vol.29, No.1, 2005

Dynamic Construction of Fault Tolerant Multi-layer Neural Network, Haruhiko TAKASE, Ayumi NOBTO, Hidehiko KITA, and Terumine HAYASHI: Proceedings of International Joint Conference on Neural Networks 2005 (IJCNN2005), pp.995-999, 2005

We propose a new training algorithm for enhance tolerance to physical defects (faults) of multi-layer neural networks (MLNs). We aim to construct such MLNs with the minimal number of hidden units. The proposed method has two characteristics, constructing MLNs dynamically and getting high fault tolerance easily. We proposed dynamic constructive algorithm with weight minimization approach (DCWMA) based on a DCA and WMA. DCA (dynamic constructive algorithm) is a basic dynamic constructive algorithm for MLNs. WMA (weight minimization algorithm) is a training algorithm to enhance the fault tolerance of fixed structure MLNs. The effectiveness of DCWMA is shown by some experiment.

Test Modification and Compression Technique for Reducing Total Test Volume with Dictionary Data, Terumine HAYASHI, Naohiro HIRAIWA, Tsuyoshi SHINOGI, Haruhiko TAKASE, and Hidehiko KITA: Proceedings of 6th International Conference on ASIC (ASICON 2005), pp.639-644, 2005

Though a number of techniques for test data compression have been proposed until now, most of them have not taken into consideration the volume of dictionary data that specify decompression rules. This paper presents a test modification and compression technique for reducing total test volume including dictionary data. As for most test compression techniques such as Huffman coding based methods, if we determine the block size large, it results in small test volume but large dictionary volume. Therefore, it has been thought that large block sizes are ineffective for total test data volume reduction. However, if dictionary volume can be greatly reduced, large block sizes can be more effective. This paper describes a compression method for reducing total test volume, especially dictionary volume, by using a technique that produces a test set for which the number of code words is small in the case of a large block size. The effectiveness of the proposed method is shown through test data compression experiments for ISCAS'89 benchmark circuits.

Freestanding GaN substrate by advanced facet-controlled epitaxial lateral overgrowth technique with masking side facets, S. BOHYAMA, H. MIYAKE, K. HIRAMATSU, Y. TSUCHIDA* and T. MAEDA*: Jpn. J. Appl. Phys. 44, pp. L24-L26, 2005

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aligned and bundled growth. The array of the CNTs grown by TCVD gave better field emission characteristics than that with the CNTs grown by PECVD. That was presumably because the CNTs grown by TCVD gave longer and more dispersive CNT growth than PECVD and consequently gave higher field enhancement on the CNTs. It is also shown that the single growth of the CNT is successfully performed using this process.

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Second Harmonic Generation of Thermally Poled $ZnCl_2$-B_2O_3-TeO_2 Glasses and Its Mechanism, Hiroyuki NASU, Yuki NAGAIKE, Hirofumi TAKEDA, Tadanori HASHIMOTO, Kanichi KAMIYA: Jpn. J. Appl. Phys., Part 2, 44 (30), pp. L964-L965, 2005

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Influence of Matrix on Third Order Optical Nonlinearity for Semiconductor Nanocrystals Embedded in Glass Thin Films Prepared by Rf-Sputtering, Hiroyuki NASU, Akimasa TANAKA, Kenji KAMADA*, Tadanori HASHIMOTO: J. Non-Cryst. Solids, 351 (10-11), pp. 893-899, 2005

Second Harmonic Generation from Thermally Poled PbO-Bi$_2$O$_3$-Ga$_2$O$_3$ Glasses, Hiroyuki NASU, Hirofumi TAKEDA, Tadanori HASHIMOTO, Kanichi KAMIYA: J. Ceram. Soc. Japan, 113 (8), pp. 555-557, 2005

Sol-Gel Preparation and Properties of TiO$_2$-P$_2$O$_5$ Bulk Glasses, Anjiang TANG, Tadanori HASHIMOTO, Hiroyuki NASU, Kanichi KAMIYA: Mater. Res. Bull., 40 (1), pp. 55-66, 2005

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Urban Design of Civic Center in prefectural capital Cities based on Japanese Castle-Towns in the early Showa era.[in Japanese], Kenjiro MATSUURA, Satoshi KUSAKABE , Yoshihiro YOKOTA , Yosuke YAMAGUCHI and Masuro URAYAMA : Jounal of Architecture and Planning , Transactions of Architectural Institute of Japan, No. 588, p.p. 87-94, 2005.2

This paper aims to clarify how to form Civic Center in Castle area in relation to Castle-Towns basis analyzing cases of prefectural capital 17 Cities based on Japanese Castle-Towns in the early Showa era.
Findings are as follows : 1) Government and municipal offices tended to be dispersed from Meiji and Taisho era to the early Showa era, 2)The whole government and municipal offices tended to be located outside Castle area,but those which formed Civic Center tended to be located inside Castle area,   3)Paying attention to "Class" and "Axis" as space elements of making Castle area , as a result of analyzing relationship between those and Civic Center , we discover various Urban Design method of Civic Center such as Discrimination by locating Prefectural office in the site of the main enclosure of a castle and making identified and symbolic Urban Space   by locating government and municipal offices   along moat or skirts of a mountain or main streets.

STUDY ON HISTORIC ENVIRONMENT CONSERVATION PLAN OF DA-DAO-CHENG DISTRICT IN TAIPEI [in Japanese], Meiyin LIN, Satoshi ASANO and Masuro URAYAMA, Journal of Architecture Planning of AIJ, No.592, pp.123-133, 2005

Da-Dao-Cheng district, with various kinds of historic shop-houses, is located in Metropolitan of Taipei. The conservation movement by the citizen, NPOs, and experts began with the road-widening urban plan on the main street, Di-Hwa Street, and led to the change of policies to conservation. The conservation plan was officially announced in 2000 after varions discussions, by designated as a special district with the use of system of Transfer of Development Rights. This paper discusses the achievement and issues of the conservation plan, by analyzing the process of plan making, changing of conservation proposals, and the current operations.

An Economical Evaluation of Greenery Townscape composed by Trees on Housing Lots - A Study on Possibility of Co-Managing the Common Benefit of Private Spaces in Cooperate with Local Residents - [in Japanese], Naoki HAYASHI, Shiro KAWAI and Masuro URAYAMA, Journal of the City Planning Institute of JAPAN, No.40-3, pp.841-846, 2005

This paper evaluates the environmental values that residents will pay for enjoying greenery townscape composed by trees on housing lots. Two questionnaires were carried out; one is to compare the residents' consciousness of 3 neighborhoods which have various green covered area ratio on their greenery townscape, another is to evaluate the economical values of greenery townscape using Contingent Valuation Method (CVM). Conclusions are as followings: Residents in greenery neighborhood think that their and surrounding lots contribute to make greenery townscape rich. Therefore many residents will pay a part of the cost to maintain the greenery

townscape formed by trees on surrounding housing lots that makes them feel common green.

Study on Classification of Irrigation Reservoirs for Improvement Planning [in Japanese], Akira TOMORI and Masuro URAYAMA, Papers on Environmental Information Science, No.19, pp.77-82, 2005

This paper presents an improvement guideline of irrigation reservoir as environmental resources. In order to classify reservoir for improvemnt planning, five common factors were extracted from factor analysis of fourteen indicators. Through cluster analysis, reservoirs could be classified in five groups: big reservoirs, irrigation reservoirs for agricultural propose, rural reservoirs adjacent to residential area, small reservoirs in urban areas and small reservoirs in rural areas. Also, characteristics of reservoir improved as urban parks and as rural improvement project were analyzed, and compared with those groups to see conditions for selection for improvement planning. The selection method shows that the improvement planning emphasizes the use of reservoir as irrigation facility or as environmental resources.

A COMPARISON STUDY ON USERS＇ CHARACTERISTICS AND RECREATIONAL ACTIVITIES BETWEEN A PARK WITH RESERVOIR AND ANOTHER WITHOUT RESERVOIR −Characteristics of recreational activities at reservoir＇s waterfront area− [in Japanese], Akira TOMORI and Masuro URAYAMA, Journal of the City Planning Institute of JAPAN, No.598, pp. 87-94, 2005

Abstract: Reservoirs are artificial lakes built as agricultural facilities, and play a significant role as urban resources. A comparison study through observation and questionnaire survey between a park with reservoir and another without reservoir was conducted to examine the characteristics of recreational activities at reservoir＇s waterfront area. In a park with reservoir, passive recreational, active recreational and walking were observed at waterfront area, which includes the walking path and the bank. Walking was the dominant recreational activity in this area and the majority of this recreational activity was daily or weekly‐elderly users. Users that came to walk in a park with reservoir were more and stayed longer than in a park without reservoir due to opportunities for enjoying the aesthetical quality that the reservoir and the environment provide.

A Study on the applying Circumstances and Roles of the Landscape Administrative Measures in the Landscape Ordinance about the Total Developmnt Type, The present condition of the Prefectures＇ landscape administrative measures centered on the landscape ordinances Part 1, Yoshio BANDO, Satoshi ASANO and Shoji IMAI, Journal of Architecture and Planning, No.597, pp.109-118, 2005

City Planning Stdies "Presents Situation and Prospects, Foregin Countries", Satoshi ASANO, City Planning Review, No.262, pp.83-88, 2005

A Study on the Successive Change Condition of Management of Condominiums Including Many Units in Tokai Area–Management Rules and Countermeasures to Pets Breeding Problem– [in Japanese], Hiroyuki Takai, Urban Housing Sciences, No.51, pp.95-100, 2005

The aim of this research is to make clear the actual condition on successive change of the management of condominiums including many units in Tokai area, especially focused on the management rules and countermeasures to pets breeding problem. The research was made for 9 housing estates by the way of hearing to the chief of homeowners association or the management staff. Many changes are surely occurred. For example, management rules and the organization of homeowners association are changed because of physical aging, residents' aging and short of the association's budget. The countermeasures to the pets breeding problem are various in each condominium in spite of almost all residents' much dissatisfaction.

A Study on the Successive Change Condition of Common Spaces and facilities in Condominiums Including Many Units [in Japanese], Ch. Hiroyuki Takai; Mem. Hiroko Saito, Mitsuo Takada , Nishido Hirotaka , Yuki Miyauchi and Takahiro Moki, Journal of Housing Research Foundation, No.31, pp.241-250, 2005

Common spaces and facilities have taken root as a way of planning for condominiums including many units in Japan.　The aim of this study is to make clear the actual condition on successive change of these common spaces and facilities in early condominiums, and make suggestions to make them work well.　The researches were conducted by way of questioners to the chief of homeowners association or the management staff by mail and hearing on 8 housing estates.　Some interesting changes have already occurred and they can be arranged by three factors.　From the actual conditions of these changes 8 suggestions to make them work well could be made.

Experimental Study on Behavior of Free Water in Dewatered Concrete Using Visible Evaluation Method [in Japanese], Toshitsugu INUKAI, Shigemitsu HATANAKA, Naoki MISHIMA and Minsu JANG, Proceedings of the Japan Concrete Institute, Vol.27, No.1, pp.595-600, 2005.7

Behavior of Air Bubbles in Mortar and Concrete during Vacuum-processing [in Japanese] Eisuke SAKAMOTO, Shigemitsu HATANAKA, Hiroki HATTORI and Naoki MISHIMA, Proceedings of the Japan Concrete Institute, Vol.27, No.1, pp.1021-1026, 2005.7

Fundamental Study on Exfoliation Damage Properties of Porous Concrete by Wear Test [in Japanese] Takeshi NAKAGAWA, Toshitsugu INUKAI, Naoki MISHIMA and Shigemitsu HATANAKA, Proceedings of the Japan Concrete Institute, Vol.27, No.1, pp.1261-1266, 2005.7

Fundamental Study on Distribution of Compressive Strength of Porous Concrete [in Japanese]

Takamasa YAMAMOTO, Shigemitsu HATANAKA, Sachio KOIKE* and Naoki MISHIMA, Proceedings of the Japan Concrete Institute, Vol.27, No.1, pp.1267-1272, 2005.7

Fundamental Study on Bending Fracture Properties of Large Particle Size Porous Concrete [in Japanese] Akihiro MAEGAWA, Shigemitsu HATANAKA, Naoki MISHIMA and Moe KURODA, Proceedings of the Japan Concrete Institute, Vol.27, No.1, pp.1273-1278, 2005.7

Axial Compression 3-D FEM Analysis on Confined Concrete with Bleeding Layers [in Japanese] Yukio YOSHIDA, Eiji MIZUNO* and Shigemitsu HATANAKA, Proceedings of the Japan Concrete Institute, Vol.27, No.2, pp.103-108, 2005.7

Effect of Piles on Rotating Criteria of Shear Walls in Seismic Evaluation of Existing RC Buildings [in Japanese] Toyofumi TAKADA, Shigemitsu HATANAKA and Kenzo KUBOTA, Proceedings of the Japan Concrete Institute, Vol.27, No.2, pp.1183-1188, 2005.7

Compressive Failure 3-D FEM Analysis of Cylindrical Confined Concrete with the Drucker-Prager Model [in Japanese] Yukio YOSHIDA, Shigemitsu HATANAKA and Eiji MIZUNO*, J. Struct. Constr. Eng. AIJ, No.587, pp.155-162, 2005.1

Main purpose of the present study is to discuss the effect of parameters (e.g. internal friction angle and dilatancy angle) of the constitutive law of Drucker -Prager type on the result of simulation analysis of confined concrete under compression. Two series of 3-D FEN analyses have been carried out. Firstly, the optimum values of the internal friction angle and dilatancy angle, used in the Drucker-Prager type plasticity model with the strain softening effect, have been discussed for a set of compressive strength data of concrete specimens with different shapes. As a result, reasonable value as the internal friction angle has been found to be approximately 30 degrees for a condition of rather high equivalent lateral pressure. Secondly, simulation analyses have been carried out for the compressive behavior of cylindrical concrete specimens confined by steel tubes or reinforcing bars, introducing interface element and different values of the internal friction angle. As a result, it has been pointed out that the distribution of equivalent confining pressure along the longitudinal direction of a specimen and the progress of the degree of damage in horizontal sections differ to a large extent by the value of internal friction angle applied.

Experimental Study on Influence of Pore Water Pressure on Shear Deformation of Fresh Concrete [in Japanese] Gun-Cheol LEE*, Yasuo TANIGAWA*, Hiroshi MORI*, Yoshiyuki KUROKAWA* and Naoki MISHIMA, J. Struct. Constr. Eng. AIJ, No.588, pp.7-12, 2005.2

In this study, the rheological properties of fresh mortar and concrete were investigated experimentally by shear box test. The pore water pressure in fresh mortar and concrete was measured as an influence factor of rheological properties of fresh concrete. The cohesion and the coefficient of dynamic internal friction were represented from pore water pressure and shear

stress measured in the experiment. As the result, it was clarified that the rheological properties is affected by the pore water pressure in fresh mortar and concrete. Moreover, the correcting method of shear stress in case of shear box test was obtained, and the cohesion and the coefficient of dynamic internal friction were quantified.

Effect of Mesh Size of Filter Mats and Vacuum Pressure Ratio on Quality of Vacuum Processed [in Japanese] Shigemitsu HATANAKA, Hiroshi WATO, Naoki MISHIMA and Akio MURAMATSU*, J. Struct. Constr. Eng. AIJ, No.588, pp.13-19, 2005.2

The strength and hardness of concrete slab surface is considered significantly affected by bleeding of concrete. It has been reported that vacuum processing is quite effective to obtain high density of concrete. The method, however, has not been successfully used for the concrete work in the field of building construction, compared with that of civil engineering works in Japan. In the present study, as the sequence of the earlier experiment, two series of experiments have been carried out in order to examine the effect of mesh size of a filter mat and vacuum pressure ratio. As a result, the internal strength distribution of concrete slab gets to be more preferable as the mesh size becomes smaller and vacuum pressure ratio higher. Further, discussion has been conducted, based on the experimental results including the earlier ones, in order to find more reasonable and effective way in the application of the proposed vacuum processing method.

Fundamental Study on Manufacturing Method of Large Particle Size Porous Concrete Using Concrete Rubble and Applicability as Fishing Bank [in Japanese] Akihiro MAEGAWA, Shigemitsu HATANAKA, Naoki MISHIMA and Yukihisa YUASA, J. Struct. Constr. Eng. AIJ, No.589, pp.43-48, 2005.3

To expand the usage of porous concrete, the authors have examined manufacturing method of large particle size porous concrete using concrete rubble. In the manufacture of large particle size porous concrete, in stead of manufacturing with a mixer, the binder mortar was sprayed on the upper surface of the concrete rubbles of every layer. The results obtained from the present study are as follows.

1. Recycling type large particle size porous concrete was producible by spraying method.

2. Void diameter located outside of the large particle size porous concrete can be presumed by using a simple theoretical formula. Moreover, the void diameter can be controlled by adjusting aggregate diameter, adhesion thickness of binder mortar, and number of aggregates.

3. Applicability of the large particle size porous concrete to the fishing bank for lobster was sufficiently confirmed.

Experimental Study on Bleeding Behavior of Free Water in Mortar Based on the Visible Evaluation Method [in Japanese] Toshitsugu INUKAI, Shigemitsu HATANAKA, Naoki NISHIMA and Rinji KANEKO*, J. Struct. Constr. Eng. AIJ, No.590, pp.1-7, 2005.4

Main purpose of the present study is to examine the rising behavior (bleeding) of free water in mortar by using a proposed visible evaluation method. A series of experiments of exp.1

to 3 was carried out. In exp.1, rising path of colored liquid as free water injected into mortar was observed. In exp.2, effect of the volume of the injected colored liquid on its rising distance was examined, and the behavior of the internal bleeding was idealized for modelling. In exp.3, applicability of the proposed model was verified through the 2-dimensional visualization experiment, using model materials. Consequently, it was shown by the devised visible evaluation method that the internal bleeding behavior of mortar can be checked qualitatively. Moreover, the rising process of the modeled free water showed clearly that the proposed method is applicable to actual mortar and concrete.

Fundamental Study on Rotating Criteria of Seismic Walls in Seismic Evaluation of Existing RC Buildings [in Japanese] Shigemitsu HATANAKA, Yoshiyuki KATOU, Kenzo KUBOTA and Yoshiro KOHAMA*, J. Struct. Constr. Eng. AIJ, No.590, pp.79-86, 2005.4

    Evaluation (screening) of the seismic performance of RC buildings has been widely carried out in various ways mainly based on the manual issued by Japan Disaster Prevention Association. According to results of the evaluation to date, failure mode of aseismic walls are apt to be estimated as "rotation", in spite of the fact that such failure mode has been hardly recognized in the past disasters, except for the case of collapses due to uneven settlement or liquifation of ground. In the present study, firstly the resisting mechanism of a structure against rotating internal walls is analysed, using the result by "the 3rd-step aseismic evaluation method" for a typical old building of 3 stories. Secondly, the effect of foundation piles on the rotation bearing capacity of seismic walls is discussed. As a result, it is pointed out that the main factors affecting the bearing capacity are resisting forces due to dead load, coupling beams, transverse walls, and foundation piles. In order to change the failure mode of rotation into another one (bending or shear), however, combination of two or more resisting forces due to the above factors is required.

Experimental Study on Effects of Binder Strength and Aggregate Size on Relationship between Compressive Strength and Void Ratio of Porous Concrete [in Japanese] Shigemitsu HATANAKA, Naoki MISHIMA and Yukihisa YUASA, J. Struct. Constr. Eng. AIJ, No.594, pp.17-23, 2005.8

    The authors have proposed an empirical formula for predicting the relationships between compressive strength and void ratio of porous concrete in the earlier paper. Main purpose of the present study is to discuss the effects of binder strength and aggregate size on the strength-void ratio relationships, based on the experimental data. Two series of experiments have been carried out, and the followings have been found. 1)The compressive strength of porous concrete at a constant void ratio is dependent on the binder strength and the aggregate size, while independent on the flow value of binder. 2)The earlier proposed formula for the prediction of compressive strength-void ratio relationships is found to be applicable to porous concrete tested in the present study.

Study on Mechanism of Strength Distribution in Vacuum Processed Concrete Based on the Consolidation Theory [in Japanese] Shigemitsu HATANAKA, Hiroki HATTORI, Eisuke

SAKAMOTO and Naoki MISHIMA, J. Struct. Constr. Eng. AIJ, No.596, pp.1-8, 2005.10

The strength and hardness of concrete slab surface is considered significantly affected by bleeding of concrete. It has been reported that dewatering by vacuum processing is quite effective to make concrete high density and high strength. In the earlier report, the authors have already pointed out that there is a strong relationship between the strength distribution and density distribution in the vacuum processed concrete, both gradually decreasing from the top surface to about 15 cm depth of concrete. Main purpose of the present study is to discuss the mechanism of the occurrence of such distribution of strength and density, based on consolidation theory. The present paper reports the results of the investigation on the distribution of ingredients in mortar and concrete. Further, a prediction method for the strength improvement of concrete by vacuum processing is also discussed.

Uniaxial Compression FEM Analysis of Cylindrical Concrete with Strength Variation Due to Bleeding [in Japanese] Yukio YOSHIDA, Eiji MIZUNO* and Shigemitsu HATANAKA, J. Struct. Constr. Eng. AIJ, No.596, pp.71-78, 2005.10

Purpose of the present study is to discuss the compressive failure state and the effectiveness of internal friction angle used in the Drucker-Prager model, based on the uniaxial compression 3-D FEM analysis of plain concrete with the strength variation due to bleeding. As a result of analyses, which introduced the different values of internal friction angle (30 and 53 degree), it has been pointed out that 1) the failure zone along the longitudinal direction of specimen shows tendency of proportional reduction with the increase in the size of a specimen, and 2) the distribution of equivalent strain inside a specimen obtained from the analysis with internal friction angle of 53 degree can represent the ordinary failure pattern.

Research on Stability of Fishing Bank Made by Large Particle Size Porous Concrete Placed Under Sea [in Japanese] Akihiro MAEGAWA, Toshihiko SHAKOUCHI, Yukihisa YUASA, Naoki MISHIMA and Shigemitsu HATANAKA, AIJ Journal of Technology and Design, No.22, 53-58, 2005.12

In this report, the stability and applicability of fishing bank made by large particle size porous concrete was examined in the large-scale waterway where wave and current can be generated. It has been found that void of fishing bank decreases power of current and wave, and the effect on wave energy is especially large.

Three-dimensional predictive analysis of ground vibrations produced by construction work, Toshikazu HANAZATO, Norio TAGUCHI, Yoshiaki NAGATAKI and Yoshio IKEDA, Environmental Vibrations：Prediction, Monitoring, Mitigation and Evaluation, pp381-384,2005

Construction of high-tech facilities that must be protected against vibrations by machine, traffic and construction vibrations has been in great demand. In order to satisfy the requirement of performance of these facilities, it is needed to control the vibrations within the

allowable limit being strict for precision instruments in buildings. This implies necessity for development of 3-dimensional dynamic soil-structure analysis that makes it possible to accurately predict the vibrations transmitting from sources to structures via soils, as well as, to employ it to develop the most suitable measures for reduction of vibrations. Therefore, we have developed the analysis technique that combines 3-D FEM with thin layer method to predict the ground vibrations produced by traffics, machines and construction operations. In the present technique, 3-D finite element and thin layer models represent near-field including structure and far-field, respectively.

Experimental Study on the Load-Deformation Characteristics of Concrete Filled Circular Steel Tube Short Columns under Axial Compression Considering Size Effect, Takamasa YAMAMOTO, Jun KAWAGUCHI and Shosuke MORINO [in Jaoanese], Journal Structural Construction Engineering, AIJ, No. 592, 2005.6, pp. 193-200.

Behavior of a circular concrete-filled steel tube (CFT) short columns under axial compression is influenced by the interactive effects between steel and concrete. This paper first derives the constitutive equations of the concrete considering the triaxial stress state under the incremental lateral stresses. Second, the numerical formulas for predicting stress-strain behavior of steel tube are proposed based on the experimental   results. By using the obtained numerical formulas, the load-deformation behavior of a circular CFT short column under uniaxial compression is predicted, considering the size effect.

Study on the Size Effect on Compressive Strength of Concrete Filled Square Steel Short Tube [in Japanese], Takamasa YAMAMOTO, Jun KAWAGUCHI, Shosuke MORINO and Sachio KOIKE, Journal of Constructional Steel, Vol. 13, 2005.11, pp. 509 - 514.

Compression tests of square concrete filled steel tube (CFT) short columns have been conducted to clarify the size effect on the compressive strength of square CFT columns. The experimental variables were as follows: size of specimen, strength of filled concrete, wide thikness ratio and loading methods (applying the compression load only on the plain concrete, the filled concrete and on the overall cross-section). This paper first presents the test results concerning compressive strength and discusses of the strength of square CFT short columns considering the size and confining effects.

Study on the Improvement of Indoor Relative Humidity for Office Buildings during Heating Operations in Winter [in Japanese], Shigehiro ICHINOSE, Kazunobu SAGARA,Yukio ISHIKAWA, Toshifumi KOBAYASHI, Genzaburou FUKAYA and Ikuya KAWAKAMI,Transactions of the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan,No.100, pp.27-37, 2005

Study on Mixing Model for Temperature-stratified Thermal Storage Tank under Variable Input Conditions in Actual Operation, Hiroaki KITANO, Takeshi IWATA and Kazunobu SAGARA*,

Transactions of the Society of Heating, Air-Conditioning and Sanitary Engineers of Japan, No.96, pp.31-40, 2005.1

Thermal performance of a solar cooker based on an evacuated tube solar collector with a PCM storage unit, Someshower Dutt Sharma*, Takeshi IWATA, Hiroaki KITANO, Kazunobu SAGARA*, Solar Energy, Vol.78, No.3, pp.416-426, 2005.3

Verification of Simple Design Method for Air-based Solar Heating System by System Simulation, Hiroaki KITANO, Takeshi IWATA and Kazunobu SAGARA*, Journal of Japan Solar Energy Society, Vol.31, No.4, pp.37-47, 2005.7

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Dependency Pairs for Simply Typed Term Rewriting, Takahito AOTO* and Toshiyuki YAMADA: Proceedings of the 16th International Conference on Rewriting Techniques and Applications (RTA 2005), Lecture Notes in Computer Science 3467, pp.120-134, 2005

Simply typed term rewriting proposed by Yamada (RTA, 2001) is a framework of higher-order term rewriting without bound variables. In this paper, the dependency pair method of first-order term rewriting introduced by Arts and Giesl (TCS, 2000) is extended in order to show termination of simply typed term rewriting systems. Basic concepts such as dependency pairs and estimated dependency graph in the simply typed term rewriting framework are clarified. The subterm criterion introduced by Hirokawa and Middeldorp (RTA, 2004) is successfully extended to the case where terms of function type are allowed. Finally, an experimental result for a collection of simply typed term rewriting systems is presented. Our method is compared with the direct application of the first-order dependency pair method to a first-order encoding of simply typed term rewriting systems.

The Reachability and Related Decision Problems for Semi-Constructor TRSs, Ichiro MITSUHASHI, Michio OYAMAGUCHI and Toshiyuki YAMADA; KOKYUROKU of Research Institure for Mathematical Sciences Kyoto University, Theoretical Computer Science and its Applications, vol.1426, pp.101-105, 2005

This paper shows that reachability is undecidable for confluent monadic and semi-constructor TRSs, and Joinability and confluence are undecidable for monadic and semi-constructor TRSs. Here, a TRS is monadic if the height of the right-hand side of each rewrite rule is at most 1, and semi-constructor if all defined symbols appearing in the right-hand side of each rewrite rule occur only in its ground subterms.

An Improved Approximation Ratio for Task Scheduling Algorithm using Maximum Matching [in Japanese], Shinnosuke NIIMI, Michio OYAMAGUCHI, Yoshikatsu OHTA and Kohei YAMAMOTO: KOKYUROKU of Research Institure for Mathematical Sciences Kyoto University, Theoretical Computer Science and its Applications, vol.1426, pp.184-188, 2005

Papadimitriou et al. (1990) showed that the scheduling problem which allows making copies of tasks and takes communication delay into account is NP-complete. They also presented an algorithm of approximation ratio 2 by introducing the notion of e-value, which gives a lower-bound of the optimal solution. Kato et al. (2004) introduced an improved lower bound, called low-value, and gave an approximation algorithm. This result is the best result known so far.

We further improve the results by Kato et al. and present an algorithm of approximation ratio 26/17 when c is 1 and 2-1/1.67c when c is greater than 1 where c is the least integer which does not exceed low-value/(communication delay)+1. Moreover, we give an approximation algorithm which allows arbitrary natural number as execution time by relaxing the requirement that execution time to be constant.

Widely-distributed implementation of Task Parallel Script Language MegaScript [in Japanese], Takehiko NISHIKAWA, Yuji TAKAGI, Kazuhiko OHNO, Takahiro SASAKI, Toshio KONDO and Hiroshi NAKASHIMA*: Symposium on Advanced Computing Systems and Infrastructures SACSIS2005, pp.251-252, 2005

We are developing a task parallel script language MegaScript for megascale computing. MegaScript regards independent programs as tasks, and executes them in parallel. Single scheduler controls all tasks in current implementation, but it will cause large overhead in megascale environment. In this paper, we describe the design of the scheduler and runtime for widely-distributed environment.

A Design of Prototype Low Energy Processor by Variable Stages Pipeline Technique, Yuji ICHIKAWA*, Takahiro SASAKI, Tetsuo HIRONAKA*, Kazuya TANIGAWA*, Toshiaki KITAMURA* and Toshio KONDO: Proc. of International Technical Conference on Circuits/Systems Computers and Communications (ITC-CSCC2004), Vol.2, pp.561-562, 2005

Recently, in the field of mobile computing specially, the simultaneous achievement of low energy and high performance computing is required rather than just low power computing. We propose the VSP (Variable Stages Pipeline) as low energy technique with logic cell called LDS-cell (Latch D-FF Selector - cell) which is key technology to satisfy the above requirements. We show that VSP can reduce more energy than DVS and PSU (Pipeline Stage Unification).

Chip size and performance Evaluations of Shared Cache for On-Chip Multiprocessor, Takahiro SASAKI, Tomohiro INOUE*, Nobuhiko OMORI*, Tetsuo HIRONAKA*, Hans J. MATTAUSCH*, Tetsushi KOIDE*: Systems and Computers in Japan, Vol.36, No.9, pp.1-13, 2005

Recent semiconductor technology makes on-chip multiprocessor, with several CPU s and cache memories on a single chip, realistic. Generally, the conventional multiprocessor systems with shared memory offer simple programming model, but needs cache coherency mechanism that may become the bottleneck of the systems. Furthermore, same data may be cached on two or more caches, and it prevents effective cache utilization. Multiport cache is one solution, but by using the conventional multiport memory architecture, the chip size of multiport cache will proportion to the square of the number of ports. On the other hand, with our proposing hierarchical multiport memory architecture, the multiport memory can be implemented with less chip size than the conventional methods. This paper proposes the shared cache with hierarchical multiport memory architecture that does not need coherency mechanism. This paper also shows the results of performance evaluations and chip size estimations.

Telecommunications tunnel monitoring system based on distributed optical fiber strain measurement, Hiroshi NARUSE, Koji KOMATSU*, Kazuhiko FUJIHASHI* and Masaru OKUTSU*: Proceedings of the 17th International Conference on Optical Fiber Sensors (OFS-17), SPIE Vol.5855, pp.168-171, 2005

We have developed a system for monitoring telecommunications tunnels to improve the reliability of telecommunication and to reduce maintenance costs through early damage detection. Core components of the system are a Brillouin optical time-domain reflectometer (BOTDR), which allows distributed and long-distance strain measurement, and optical fiber sensors installed in tunnels. Experimental results show that this system can detect tunnel deformation with a measurement error of 0.1 mm from a contraction of 1 mm to an elongation of 6 mm over a span of 10 km. The system used in practice at present is introduced.

Telecommunications Tunnel Monitoring System Employing BOTDR, Hiroshi NARUSE, Kazuhiko FUJIHASHI* and Masaru OKUTSU*: Proceedings of the 1st International Workshop on Opto-electronic Sensor-based Monitoring in Geo-engineering (OSMG-2005), pp.57-65, 2005

We have developed a system for monitoring the state of telecommunications tunnels. This system detects deformation and damage by measuring the strain produced in the tunnels. Core components of the system are a Brillouin optical time-domain reflectometer (BOTDR), which allows distributed and long-distance strain measurement, and optical fiber sensors installed in tunnels. Basic performances of the system were confirmed by experiments in a laboratory. For example, the system can detect tunnel deformation with a measurement error of 0.1 mm from a contraction of 1 mm to an elongation of 5 mm over a span of 10 km. And earthquake resistance was confirmed. A system used in practice at present is introduced in detail.

Design of digital polarity correlators in a multiple user sonar ranging system, K. NAKAHIEA*, T. KODAMA, T. FURUHASHI* and H. MAEDA*: IEEE Trans. Instrum. Meas. vol.54, pp.305-310, 2005

Pulsed ultrasonic distance measurement systems are frequently used in robotics applications, thanks to their low cost and small size. The pulse compression techniques, originally developed by radar engineers, were adopted to eliminate frequent misreadings caused by crosstalk or external ultrasound sources. However, a few problems become apparent when implementing the pulse compression techniques in robotics applications. First, due to the implementation of correlation functions, the complexity of the total system may significantly increase. Second, if the piezoelectric transducer is excited by a chirp signal, efficiency is reduced due to the narrow bandwidth. In this paper, we present a digital polarity correlator designed for binary coded frequency shift keyed signals which increase the number of different sequences having the same length in a restricted band. The digital signal processing system is integrated into a single programmable logic device. Experimental measurements have been made and a good agreement with reference data has been obtained with noise added.

Evolutionary computation applied to the reconstruction of 3-D surface topography in the SEM, Tetsuji KODAMA, Xiaoyuan LI*, Kenji NAKAHIRA* and Dai ITO*: J. Electron Microsc. Vol. 54, pp. 429-435, 2005

A genetic algorithm has been applied to the line profile reconstruction from the signals of the

standard secondary and/or backscattered electron detectors in a scanning electron microscope (SEM). The topographical surface reconstruction problem is treated as one of combinatorial optimization. To reconstruct three-dimensional (3-D) surface topography using the optimization approach, we must examine a number of string coding alternatives for mapping a finite-length string to the 3-D surface topography. In this paper the 3-D surface topography is represented by a set of coordinates of vertices and we introduce the Delaunay triangulation which attains the minimum roughness for any set of the height data to capture the fundamental features of the surface being probed by the electron beam. Experimental results on secondary electron images are presented using a class of hybrid algorithms based on a combination of the genetic algorithm and simulated annealing.

Estimatiors for Conditional Expectations under Asymmetric and Heteroscedastic Error Distribution, Takafumi KANAMORI* and Ichiro TAKEUCHI: Proceedings of International Symposium on The Art of Statistical Metaware (CD-ROM), 2005

We propose a new estimator for regression problems in the form of the linear combination of quantile regressions. The proposed method is helpful to estimate the conditional expectation especially when the error distribution is asymmetric or/and heteroscedastic, where conventional robust regressions yield considerable bias to the conditional expectation. Numerical experiments on real data are shown to illustrate the usefulness of the proposed estimator.

Conditional mean estimation under asymmetric and heteroscedastic error by linear combination of quantile regressions, Takafumi KANAMORI* and Ichiro TAKEUCHI: Computational Statistics and Data Analysis, vol.50, pp. 3605-3618, 2006, Available online 18 August 2005

In this paper we propose a new estimator for regression problems in the form of the linear combination of quantile regressions. The proposed estimator is helpful for the conditional mean estimation when the error distribution is asymmetric and heteroscedastic. It is shown that the proposed estimator has the consistency under heteroscedastic regression model: $Y = \mathcal{M}(X) + \sigma(X) e$, where X is a vector of covariates, Y is a scalar response, e is a zero mean random variable independent of X and $\sigma(X)$ is a positive value function. When the error term e is asymmetric, we show that the proposed estimator yields better conditional mean estimation performance than the other estimators. Numerical experiments both in synthetic and real data are shown to illustrate the usefulness of the proposed estimator.

Motion sickness susceptibility associated with visually induced postural instability and cardiac autonomic responses in healthy subjects, Y. YOKOTA*, M. AOKI*, K. MIZUTA*, Y. ITO, N. ISU: Acta Oto-Laryngol. 125, pp. 280-285, 2005

This study assessed the relationship between postural and autonomic responses to a simulated visual motion environment and reported susceptibility to motion sickness. Fifteen healthy subjects were exposed to sinusoidally oscillating visual motion in roll at frequencies of 0.1-0.4 Hz. Recordings were taken of postural sway, respiratory frequency and ECG from which heart rate variability (HRV) was computed to probe cardiac sympathetic and parasympathetic activity. In subjects rating low

susceptibility to motion sickness on a standardised questionnaire, there was no significant effect of visual stimulus on postural sway and HRV at any frequency of motion. Subjects with high susceptibility to motion sickness showed significant postural instability induced by the visual stimuli (p<0.01). The visual stimuli of 0.1 Hz significantly increased the low frequency power (LF) and LF/HF, and decreased the high frequency power (HF) of HRV in these subjects (p<0.05). This study supports a hypothesis that the postural sway and autonomic responses to moving visual stimuli may be associated with motion sickness susceptibility. Characteristics of the cardiac sympathovagal balance during exposure to provocative stimulation may be a marker for individual susceptibility to motion sickness.

Improvement of compression characteristic of LSP parameters by cascading sandglass type neural network [in Japanese], Masaya KIMOTO*, Tadaaki SHIMIZU*, Hiroki YOSHIMURA*, Naoki ISU, Kazuhiro SUGATA*: Transactions of Information Processing Society of Japan, 46, pp. 845-848, 2005

We proposed a new scheme that derives the characteristics of Japanese five vowels out of LSP parameters by compressing information in terms of cascaded five-layer-sandglass-type neural network (CSNN (NL5)). We have verified the ability of CSNN (NL5) by using five vowels pronounced by a male speaker. The followings were clarified, 1) the distribution of LSP parameters compressed by CSNN (NL5) is similar to the distribution of F_1-F_2 formants, 2) CSNN (NL5) can reproduce the LSP parameters from the compressed parameters usable for speech synthesis.

Are Open-domain Question Answering Technologies Useful for Information Access Dialog?, Tuneaki KATO*, Jun-ichi FUKUMOTO*, Fumito MASUI and Noriko KANDO*: ACM-TALIP, No.3, pp.243-262, 2005

There are strong expectations for the use of question answering technologies in information access dialogues such as for information gathering and browsing. In this paper, we empirically examine what kinds of abilities are needed for question answering systems in such situations, and propose a challenge for evaluating those abilities objectively and quantitatively. We also show that existing technologies have the potential to address this challenge. From the empirical study, we found that questions that have values and names as answers account for a majority in realistic information-gathering situations and that those sequences of questions contain a wide range of reference expressions and are sometimes complicated by the inclusion of subdialogues and focus shifts. The challenge proposed is not only novel as an evaluation of the handling of information access dialogues, but also includes several valuable ideas such as categorization and characterization of information access dialogues, and introduces three measures to evaluate various aspects in addressing list-type questions and reference test sets for evaluating context processing ability in isolation.

Three Systems and One Verifier -- HOKUM's Participation in QAC3 of NTCIR-5, Yasutomo KIMURA*, Kenji ISHIDA, Hirotaka IMAOKA, Fumito MASUI, Marcin SKOWRON*, Rafal RZEPKA* and Kenji ARAKI*: 2005

This paper is a report from collective participation in NTCIR-5 Question Answering Challenge

between researchers from Mie University, Hokkaido University and Otaru University of Commerce. Although our results were not impressive, we would like to share our experiences with everyone who think about participating in the challenge but is afraid of his or her lack of experience in the field. Understanding the problems of QA from the practical side was very instructive and gave us a stronger base for future trials. We briefly introduce our preparations and participation then conclude with analysis what can be simply done with freely available tools.

An Overview of NTCIR-5 QAC3, Tsuneaki KATO*, Jun-ichi FUKUMOTO* and Fumito MASUI: In Proceedings of fifth NTCIR Workshop(QAC3), 2005

This paper provides an overview of NTCIR-5 QAC3 (Question Answering Challenge 3). QAC3 is a series of challenges for evaluating question answering technologies in Japanese. QAC3 follows the same course as QAC based on the success of the previous two workshops, with its task limited to that corresponding to QAC2 Subtask 3 aiming at the convergence of research resources for novel subjects. This task assumes interactive use of QA systems and evaluates, among other things, the abilities needed under such circumstances, i.e. proper interpretation of questions under a given dialogue context; in other words, context processing abilities such as anaphora resolution and ellipses handling (hereafter we refer to the task as the IAD task, where IAD stands for Information Access Dialogue, and to the whole workshop as QAC3). The IAD task in QAC3 is based on QAC2 Subtask 3 with several questions and answers and introduction of multi-grade evaluation and the concept of a correct answer set. In addition, a new WoZ method was devised and applied in the QAC3 test set construction. QAC3 has as many participants as QAC2 Subtask 3, and new trials and advances in existing methods were observed from the submission results.

Recognizing Article Errors Using Prepositional Information [in Japanese], Ryo NAGATA, Tatsuya IGUCHI, Kenta WAKIDERA, Fumito MASUI, Atsuo KAWAI, Naoki ISU: IEICE Transactions on Information & Systems, PT.1 (Japanese Edition), Vol.J88-D-I , No.4, pp.873-881, 2005

A Statistical Model Based on the Three Head Words for Detecting Article Errors, R. Nagata, T. IGUCHI, F. MASUI, A. KAWAI and N. ISU: IEICE Transactions on Information and Systems, Vol.E88-D, No. 7, pp.1700-1706, 2005

Mass Count Distinction of English Nouns [in Japanese], Ryo NAGATA, Fumito MASUI, Atsuo KAWAI, Naoki ISU: Natural Language Processing, Vol.12, No.4, pp.227-243, 2005

An unsupervised method for distinguishing mass and count nouns in context, R. NAGATA, F. MASUI, A. KAWAI and N. ISU: 6th International Workshop on Computational Semantics IWCS-6, 2005

This paper proposes an unsupervised method for distinguishing mass and count nouns in context using decision lists. The mass count distinction is particularly important in detecting errors

concerning the articles　and the singular/plural usage in the writing of learners of English. In general, decision lists require manually tagged training data. In this method, however, training data can be automatically generated from a raw corpus by some rules based on linguistic knowledge. Decision lists trained on the British National Corpus achieves an accuracy of 79.7%, an improvement of 4.8% over the baseline.

Detecting article errors based on the mass count distinction, R. NAGATA, T. WAKANA, F. MASUI, A. KAWAI and N. ISU: Proc.of the 2nd Int. Joint Conf. on Natural Language Processing, pp.815-826, 2005

This paper proposes a method for detecting errors concerning article usage and singular/plural usage based on the mass/count distinction. Although the mass count distinction is particularly important in detecting these errors, it has been pointed out that is is hard to make heuristic rules for distinguishing mass and count nouns. To solve the problem, first, instances of mass and count nouns are automatically collected from a corpus exploiting surface information in the proposed method. Then, words surrounding the mass(count) instances are weighted based on their frequencies. Finally, the weighted words are used for distinguishing mass and count nouns. After distinguishing mass and count nouns, the above errors can be detected by some heuristic rules. Experiments show that the proposed method distinguishes mass and count nouns in the writing of Japanese learners of English with an accuracy of 93% and that 65% of article errors are detected with a precision of 70%.

Extracting collocations for determining articles in English writing, R. NAGATA, T. IGUCHI, Y. FURUICHI, F. MASUI, A. KAWAI and N. ISU: Proc. of the Conf. Pacific Association for Computational Linguistics (PACLING 2005), pp.264-268, 2005

There are a lot of phrases or collocations that are useful for determining proper articles in English writing. For example,　it has been reported that the phrase chemistry of almost always takes the definite article　in the domain of organic chemistry. These collocations are especially useful for people whose mother tongue does not have an article system. This paper proposes a method for extracting such collocations from a corpus. This method extracts collocations based n-gram statistics. N-gram statistics are computed using KWIC (Key Word In Context) and surrounding contexts. Experiments show that the proposed method extracts 560 collocations from a half million words of corpus data.

Automatic Text Classification of Engilish Newswire Articles Based on Statistical Classification Techniques, Guowei ZU, Wataru OHYAMA, Tetsushi WAKABAYASHI and Fumitaka KIMURA: Electrical Engineering in Japan Vol.152, No.1, pp 50-60, 2005

The basic process of automatic text classification is learning a classification scheme from training examples and then using it to classify unseen textual documents. It is essentially the same as the process of graphic or character pattern recognition. Thus, the pattern recognition approaches can be used for automatic text categorization. In this research several statistical classification techniques that include Euclidean distance, various similarity measures, linear discriminant function, projection distance, modified projection distance, and SVM, have been used for automatic text classification.

Principal component analysis was used to reduce the dimensionality of the feature vector. Comparative experiments have been conducted using the Reuters-21578 test collection of English newswire articles. The results illustrate that the overall efficiency of modified projection distance is better than the other methods and that principal component analysis is suitable for reducing the dimensionality of the text features.

Machine Learning with Transformed features in Automatic Text Classification, Busagala, L.S.P., Wataru OHYAMA, Tetsushi WAKABAYASHI, Fumitaka KIMURA: Proceedings of ECML/PKDD-05 workshop on Sub-symbolic Paradigms for Learning in Structured Domains (Relational Machine Learning), pp. 11-20, 2005

Automatic text classification (ATC) is the task of automatically assigning a set of documents into appropriate categories (or classes, or topics). One of the feature generation techniques is extracting absolute word frequency from textual documents to be used as feature vectors in machine learning techniques. One of the limitations of this technique is the dependency on text length leading into lower classification rates. Another problem in ATC is the
high dimensional space. We present a performance evaluation of feature transformation techniques and regularized linear discriminant function (RLD) in automatic text classification. Moreover we provide experimental evaluation of Principal Component Analysis (PCA) in reducing the high dimensionality. Feature transformation techniques used considerably improved the classification accuracy, and RLD outperformed all classifiers used. Experimental results showed effective dimension reduction.

Myocardial Motion Tracking by Adaptive combination of Correlation and Phase Difference of US RF signals, K. NAGATA, W. OHYAMA, T. WAKABAYASHI, F. KIMURA, S. TSURUOKA and K. SEKIOKA*: The 12th International Conference on BioMedical Engineering, sessionID: 3B2-08, 2005

In this paper, we propose a novel method for noninvasive extraction of 2-dimensional regional motion of left ventricular myocardium by means of the adaptive combination of correlation and instantaneous phase difference of ultrasonic RF signals. The proposed method is motivated by the successfully achievement on the myocardial motion tracking by means of both ultrasonic Doppler and RF signals which are backscattered from myocardium. The proposed method moreover employs an adaptive combination of these methods. At first, the method extracts the velocity on each sampling point by instantaneous phase difference of the digitized ultrasonic signals. Next, the velocities on each sampling point are evaluated for the accuracy by the correlation of amplitude of ultrasonic RF signals. Finally, the velocities are corrected by the amount associated with the value of accuracy and accumulated into the position of tracking points for error reduction. Experimental results show the proposed method is suitable for the evaluation of regional myocardial performance.

Estimation of Respiratory Rate Using Long Term ECG Recording, T. USAMI, W. OHYAMA, T. WAKABAYASHI, F. KIMURA, S. TSURUOKA and K. SEKIOKA*: The 12th International Conference on BioMedical Engineering, sessionID: 2B1-09, 2005

In this paper, we propose a new method for extracting respiratory signals from long-term echocardiogram (ECG) recording. The proposed method employs some filtering techniques on frequency domain followed by the estimation of instantaneous frequency by Hilbert transform to estimate respiratory frequency. The evaluation examination, which compares the respiratory frequency estimated from ECG and the one derived from the respiratory signal measured with oronasal thermistor, shows that the proposed method has potentiality for detection and diagnosis of respiratory disorders. From this result, we conclude that temporal frequency estimation of respiration gives more detailed information on respiratory state than power spectrum of R-R interval.

Oriya handwritten Numeral Recognition System, K. ROY*, T. PAL*, U. PAL* and F. KIMURA: Proc. 8th International Conference on Document Analysis and Recognition, Vol.2, pp. 770-774, 2005

This paper deals with recognition of off-line unconstrained Oriya handwritten numerals. To take care of variability involved in the writing style of different individuals, the features are mainly considered from the contour of the numerals. At first, the bounding box of a numeral is segmented into few blocks and chain code histogram is computed in each of the blocks. Features are mainly based on the direction chain code histogram of these blocks. Neural Network (NN) classifier and Quadratic classifier are used separately for recognition and the results obtained from these two classifiers are compared. We tested the result on 3850 data collected from different individuals of various background and we obtained about 94.81% recognition accuracy from Quadratic classifier with a rejection rate of about 1.31%.

Two-stage Recognition of Handwritten Bangla Alphanumeric Characters using Neural Classifiers, U. BHATTACHARYA*, S. K. PARUI*, M. SHRIDHAR* and F. KIMURA: Proc. 2nd Indian International Conference on Artificial Intelligence (IICAI-05) pp. 1357-1376, 2005

No significant research work towards recognition of handwritten Bangla characters has yet been done. Only a few works in this area are found in the literature which are based on small databases collected in laboratory environments. Recently, a large and representative database of Bangla character images has been developed. The first part of this article is devoted to shape analysis of samaples of this database vis-a-vis shapes of the respective printed characters. The next part describes a to-stage scheme for recognition of handwritten Bangla alphanumeric characters. This is a 57 class problem (shapes of 3 numerals are not distinguishable from shapes of 3 basic characters among 10 numerals and 50 basec characters). In the first stage of this recognition scheme, an input character is identified in one of 11 smaller groups of characters. In the second stage, classification is performed within the particular smaller group as determined by the first stage. In both the stages of the proposed approach, local chain code histograms of character skeleton are used as the feature vector and multilayer perceptron (MLP) as the classifier. Recognition accuracies obtained by the proposed approach on the training and test sets of the present handwritten Bangla alphanumeric character database are respectively 91.45% and 84.65%.

English Multi-oriented Character Recognition, K. ROY*, U. PAL* and F. KIMURA*: Proc. Thirteenth International Conference on Advanced Computing and Communications- ADCOM, 2005

There are many printed artistic documents where text lines of a single page may have different orientations or they may be curved in shape. For the OCR of such documents we have to extract individual text lines from the documents. Extraction of individual text lines from multi-oriented and/or curved text document is a difficult problem. In this paper, we propose a bottom-up approach to extract individual text lines from English artistic document pages and the method is based on the foreground and background information of the characters of the text lines. Here at first, individual components are detected and grouped into *candidate clusters* using the positions of the center of gravity (CG) of the components and the background information obtained from the components using *water reservoir* concept. From each candidate cluster we find some *candidate points* based on the *water flow level* of the reservoirs obtained from the components of the cluster. Finally, based on these candidate points, individual clusters are grouped to extract different text lines from a document.

A system for Bangla Handwritten Numeral Recognition based of Directional Feature, K. ROY*, T. PAL*, U. PAL* and F. KIMURA: Proc. Int. Conf. on Cognition and Recognition, pp.497-505, 2005

In this paper a lexicon driven segmentation-recognition scheme for unconstrained Bangla handwritten word recognition is proposed for Indian postal automation. In the proposed method, at first, binarization of the input document is done and slant correction of the individual words is performed. Next, using water reservoir concept words are pre-segmented into possible primitive components (characters or its parts). In order to merge these primitive components into characters and to find optimum character segmentation, dynamic programming (DP) is applied using total likelihood of characters as the objective function. To compute the likelihood of a character, modified quadratic discriminant function (MQDF) is used for the purpose. The features used in the MQDF are mainly based on the directional features of the contour points of the components. We tested our system on Bangla city name images and at present an overall accuracy of 87.21% is obtained from the proposed system.

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4D Equivalence Theorem and Gauge Symmetry on an Orbifold, Yoshikazu Abe, Naoyuki Haba, Katsuhiro Hayakawa, Yasunori Matsumoto, Mamoru Matsunaga and Kenta Miyachi1: Prog Theor. Phys., 113, pp.199-213, 2005.

We investigate high-energy behavior of the scattering amplitudes in extra dimensional gauge theory where the gauge symmetry is broken by the boundary conditions. We study, in particular, the 5D $SU(5)$ grand unified theory whose 5th-dimensional coordinate is compactified on S^1/Z_2. We pay attention to the gauge symmetry compatible with the boundary conditions on an orbifold and present the BRST formalism of the 4D theory that is obtained through integration of the 5D theory along the extra dimension. We derive the 4D equivalence theorem on the basis of the Slavnov-Taylor identities. We also calculate the amplitudes of the process including four massive gauge bosons in the external lines and compare them with those for the connected reactions in which the gauge fields are replaced by the corresponding would-be Nambu-Goldstone (NG) fields. We explicitly confirm that the equivalence theorem holds.

Influences of Homeotropic Anchoring Walls upon Nematic and Smectic Orderings, Masashi Torikai

and Mamoru Yamashita: J. Phys. Soc. Jpn., 74, pp. 955-959, 2005

McMillan liquid crystal model sandwiched between strong homeotropic anchoring walls is studied. Phase transitions between isotropic, nematic, and smectic A phases are investigated for wide ranges of an interaction parameter and of the system thickness. It is confirmed that the anchoring walls induce an increase in transition temperatures, dissappearance of phase transitions, and an appearance of non-spontaneous nematic phase. The similarity between influence of anchoring walls and that of external fields is discussed.

Change of Order of Nematic Phase Transition in Uniaxially Anchored Systems, Muniriding Yasen, Masashi Torikai and Mamoru Yamashita: Mol. Cryst. Liq. Cryst., 438, pp. 77-90, 2005

Nematic phase transition with both uniaxial and biaxial order parameters is studied in the two kinds of external fields which are conjugate to the order parameters, respectively.   A global phase diagram on the fields versus temperature space is obtained in the mean field theory, which is similar topologically to the phase diagram of the three-state Potts model in three dimension.   From this phase diagram, the phase diagram of the system in the uniaxial filed is derived, and the result is applied to the phase transition of the thin system anchored uniaxially, i.e., by the homeotropic and planer walls.

Similarity and dissimilarity between Influences of Anchoring Walls and External Fields on Nematic and Smectic A Phases, Masashi Torikai and Mamoru Yamashita: Mol. Cryst. Liq. Cryst., 441, pp. 59-67, 2005

The McMillan liquid crystalline models under the influence of homeotropic anchoring walls and

of external fields are investigated. For thin systems, the existence of the critical thickness, below which the system does not undergo a discrete phase transition, is confirmed. Apparent differences between the influence of the anchoring walls and of external fields are elucidated by investigating the order parameters and a temperature vs external field phase diagram for the bulk systems.

Biaxial Field and Crossover between Homeotropic and Homogeneous Structures in the System Anchored by Biaxial Walls, Masaki Ito, Masashi Torikai and Mamoru Yamashita: Mol. Cryst. Liq. Cryst., 441, pp. 69-85, 2005

Landau free energy with both of uniaxial and biaxial order parameters is derived in the framework of Maier-Saupe model, based on which a phase diagram in two types of external fields is obtained.   The free energy is generalised to be applied to the thin system sandwiched by parallel boundary walls of biaxial anchoring, and nematic ordering occurring therein is studied, where the biaxiality is introduced by the fixed orientation of molecules on the boundary walls.   The first order phase transition becomes critical behaviour at a critical thickness, and the system thinner than this has no transition as the case of homeotropic structure, and biaxiality dependence of the critical thickness is evaluated.   A crossover between homeotropic and homogeneous structures is shown to occur at a certain biaxial condition, where the first order transition changes to the second order one as the thickness decreases.

MD Simulation of Bent Gay-Berne Molecule Systems; Molecular Shape and Flexibility, Toshikuni Miyazaki* and Mamoru Yamashita: Mol. Cryst. Liq. Cryst., 441, pp. 329-338, 2005

Molecular dynamics simulation is carried out at the system of bent molecules to study the effects of a molecular bend and flexibility to the liquid crystalline ordering.   The molecule is a dimer of two types of Gay-Berne particles connected by a harmonic spring at each ends and makes a given angle in the energy minimum at an isolated state.   A decrease of clearing temperature with an increase of the bend angle is depicted.   By changing a strength of the spring constant, an influence of flexibility to the ordering is studied, where the clearing temperature shows a sigmoidal curve for the spring constant and the nematic ordering is hardly observed in the soft limit.   To see the another effect of molecular shape to the ordering, two types of different combinations of length of the constituent Gay-Berne particles are introduced and ordering behaviours are tested.

Superconductivity in the CuO Double Chain of $Pr_2Ba_4Cu_7O_{15-\delta}$ on the basis of Tomonaga-Luttinger Liquid Theory, Kazuhiro SANO,   Yosiaki ONO*,   Yuh   YAMADA*:   J. Phys. Soc. Jpn. 74, pp. 2885-2888

Recently, Matsukawa *et al.* discovered a new superconductor, $Pr_2Ba_4Cu_7O_{15-\delta}$, in which metallic CuO double chains are responsible for the superconductivity. To investigate its superconductivity, we employ the d- p double chain model where the tight-binding parameters are determined so as to fit a band structure in the local density approximation (LDA). On the basis of the Tomonaga-Luttinger liquid theory, we obtain a phase diagram that includes the superconducting phase in the weak coupling limit. We also calculate the Luttinger liquid parameter K_ρ as a function of the electron

density n using the Hartree-Fock approximation. With increasing n from quarter filling, K_ρ increases and then exceeds 1/2 when the superconducting correlation becomes most dominant. K_ρ has a maximum at an optimal density between quarter- and half-filling. These results are consistent with the experimental observation.

An empirical potential approach to structural stability of GaN_xAs_{1-x} thin films on GaAs(111), Tomonori ITO, Takashi SUDA, Toru AKIYAMA, Kohji NAKAMURA : Applied Surface Science 244, pp. 170-173, 2005.

Structural stability of GaN_xAs_{1-x} thin films coherently grown on GaAs(111) is systematically investigated based on an empirical potential, which incorporates electrostatic energies due to bond charges and ionic charges. Using the empirical potential, the system energies of zinc blende (ZB) and wurtzite (W) structured GaN_xAs_{1-x} thin films are calculated over the entire concentration range. The calculations for interface structures between ZB- or W-GaN_xAs_{1-x} thin films and GaAs(111) substrate reveal that ZB-type stacking sequence is more favorable than W-type stacking sequence at the interface. Consequently, ZB-GaN_xAs_{1-x} thin films can be fabricated in the concentration range of $x<0.5$ on the GaAs(111), whereas W-GaN_xAs_{1-x} thin films are formed with ZB-type stacking interface in the concentration range of $x\geq0.5$.

An ab initio-based approach to Ga adatom migration on GaAs(n11)A-(001) non-planar surfaces, Tomonori ITO, Koichi ASANO, Toru AKIYAMA, Kohji NAKAMURA, Kenji SHIRAISHI*, Akihito TAGUCHI* : Applied Surface Science 244, pp. 178-181, 2005.

The behavior of Ga adatoms on GaAs(n11)A (n=2, 3, 4), (001)-(2x4)β2 and non-planar surfaces consisting of the (211)A and (001) are systematically investigated by ab initio–based approach and the Monte Carlo (MC) method. The ab initio total energy calculations clarify strong dependence of Ga adsorption energies on the surface index, where adsorption energies of Ga on the (211)A and (311)A are larger by 1.0~1.4 eV than those on (001) and (411)A. Furthermore, the MC simulations reveal that diffusion coefficient of Ga adatoms across the (001) surface is larger than that on the (211)A surface. This is because Ga migration potential energies on the (001) surface are smaller than those on the (211)A surface. Reflecting these results, Ga adatoms on the (211)A-(001) non-planar surface migrate on the (211)A side surface beyond ~1100 K, whereas Ga adatoms mainly diffuse across the (001) surface below ~1100 K.

An empirical potential approach to dislocation formation and structural stability in GaN_xAs_{1-x}, Keiichi KAWAMOTO, Takashi SUDA, Toru AKIYAMA, Kohji NAKAMURA, Tomonori ITO : Applied Surface Science 244, pp. 182-185, 2005.

We study the feasibility of our empirical potential to dislocation formation and its contribution to the structural stability in GaN_xAs_{1-x}. The feasibility of our empirical potential to dislocation formation is exemplified by the calculation of dislocation core energy and core radius for various dislocation core structures in wurtzite structured GaN such as those described by eight coordinated channels, four coordinated channels and five- and seven-coordinated channels (5/7 core). The calculated results imply that the most stable core structure in the GaN is the 5/7 core structure. Moreover, GaN_xAs_{1-x} changed its structure from zinc blend to wurtzite at the concentration of x_c=0.3 with dislocation and x_c=0.4 without dislocation. This is because 5/7 dislocation core favors the wurtzite structured GaN_xAs_{1-x} with lower core energy than that in zinc blend structured GaN_xAs_{1-x}.

Theoretical investigation of phase transition on GaAs(001)-c(4×4) surface, Hirotoshi ISHIZAKI, Toru AKIYAMA, Kohji NAKAMURA, Kenji SHIRAISHI*, Akihito TAGUCHI*, Tomonori ITO : Applied Surface Science 244, pp. 186-189, 2005.

Surface phase transition between GaAs(001)-c(4×4) and -(2×4)β2 surfaces is systematically investigated by using our ab initio-based approach. The phase diagram of the c(4×4) surfaces is clarified as functions of temperature and As pressure, when the c(4×4) periodicity is kept. The phase diagram calculations reveal that three kinds of c(4×4) surfaces consisting of Ga-As dimers and/or Ga-Ga dimers become stable near the phase transition temperature. Based on this finding, the electron counting Monte Carlo simulation and ab initio pseudopotential calculations are performed to investigate the structural change of the c(4×4) surface after predepositing a 0.5 monolayer of Ga on the three kinds of c(4×4) surfaces found near the phase transition temperature. The calculated results suggest that the c(4×4) surfaces possibly change their structures to (2×4)β2 structures with Ga-As surface dimers.

Magnetic domain wall structures in free-standing Fe(110) monolayers, Yoshifumi TAKEDA, Kohji NAKAMURA, Toru AKIYAMA, Tomonori ITO : Applied Surface Science 244, pp. 485-488, 2005.

We performed first principles calculations for magnetic domain wall structures in free-standing Fe monolayers with lattice constants matching with those of bcc Fe(110) and W(110) substrates by using the FLAPW method that incorporates intra-atomic noncollinear magnetism. The self-consistent calculations predict atomically narrow domain walls with widths of about 8 and 14 Å for the monolayers with the lattice constants of the Fe and W, respectively. These results are qualitatively consistent with and support domain walls having a 6 Å width in the Fe monolayers on a W(110) substrate recently observed in spin-polarized scanning tunneling microscopy experiments.

Role of exchange interaction and spin-orbit coupling in magnetic domain walls in bulk and thin film Fe. Kohji NAKAMURA, Tomonori ITO, A. J. Freeman* : Journal of Applied Physics 97, pp. 10A315-1-10A315-3, 2005.

We investigate magnetic domain wall structures in bulk Fe and a thin film Fe(110) monolayer with the first principles full-potential linearized augmented plane-wave method including intra-atomic noncollinear magnetism. In the bulk case, the exchange interaction favors the slower variation of the magnetization and the wall width is determined by a competition between the exchange interaction and the magnetic anisotropy arising from the spin-orbit coupling (SOC)-as expected from phenomenological theory. In the thin film, however, the magnetization in the domain wall changes rapidly within a width of 8 Å. This narrow domain wall arises from the exchange interaction while the SOC favors the ferromagnetic state. Importantly, we find that the SOC effects give rise to not only the magnetic anisotropy but also to a breaking of the degeneracy of the Bloch and Néel walls, which plays a minor role in the bulk but a major role in the thin film.

Microscopic theory of oxygen reaction mechanism at SiO_2/Si(100) interface, Toru AKIYAMA, Hiroyuki KAGESHIMA*, Tomonori ITO : Proceedings of the 27th International Conference on the Physics of Semiconductors, pp. 393-394, 2005.

Microscopic mechanisms of reaction of oxygen at SiO_2/Si(100) interface are studied based on first-principles calculations. It is found that in the SiO_2 region of the interface the most stable configuration of reaction species is

molecular-type oxygen which does not form any bonds with SiO_2-network forming atoms, while the O_2 in the Si substrate dissociates and forms two Si-O-Si bonds. The calculated energies indicate that the incorporation of O_2 molecules into the Si substrate dominates the interfacial reaction of the oxidant. The cooperative reaction of each O atom of the O_2 with each Si atoms at the interface leads to the low energy barrier compared with that of the O atom.

First-principles study of excess Si-atom stability around Si-oxide/Si interfaces, Hiroyuki KAGESHIMA*, Masashi UEMATSU*, Kazuto AKAGI*, Shinji TSUNEYUKI*, Toru AKIYAMA, Kenji SHIRAISHI : Proceedings of the 27th International Conference on the Physics of Semiconductors, pp. 389-390, 2005.

The stability of excess Si around the Si-oxide/Si interfaces is studied using the first-principles calculation. The excess Si is suggested to flow into the oxide from the substrate. The excess Si flowing into the oxide becomes SiO interstitials with the O-vacancy-like structure, which can be one of the sources of the E'-centers or the charge traps in the oxide. This Si flow is expected to be rather easier because SiO interstitials can be created via a simple rebonding procedure in the oxide.

Half-metallic ferrimagnetism in zinc blende Mn-doped transition metal chalcogenides, Kohji NAKAMURA, Tomonori ITO, A. J. Freeman* : Physical Review B 72, pp. 064449-1-064449-6, 2005

First principles full-potential linearized augmented plane wave (FLAPW) calculations and Monte Carlo simulations were performed to determine the magnetic structure in Mn-doped transition metal chalcogenides, $Cr_{1-x}Mn_xSe$ and $Cr_{1-x}Mn_xTe$, with the zinc blende structure. A ferrimagnetic structure with excellent half-metallicity appears in the Mn 0.25 composition, where the Mn moments tend to align in an opposite orientation to the Cr moments so as to retain the half-metallicity, and the half-metallic gap is enhanced. Here, the $Cr_{0.75}Mn_{0.25}Se$ alloy is is predicted as a promising candidate as a high Curie temperature half-metallic ferrimagnet, with the tendency toward an atomic ordering of Cr and Mn atoms, that may be feasible in epitaxial growth that is thick enough for spintronic applications.

Theoretical investigation of oxygen diffusion in compressively strained high-density α-quartz, Toru AKIYAMA, Hiroyuki KAGESHIMA*, Masashi UEMATSU*, Tomonori ITO : Japanese Journal of Applied Physics 44, pp. 7427-7429, 2005.

The microscopic mechanisms of oxygen diffusion in compressively strained high-density α-quartz are investigated on the basis of first-principles total-energy calculations. It is found that both the incorporation energy of oxygen into SiO_2 and the energy barrier for its diffusion are dependent on the density of SiO_2. The activation energies show that molecular-type oxygen is the dominant diffusion species over the entire density range. Furthermore, the activation volumes estimated from the results of the present first-principles calculations imply that the retardation of oxygen diffusion in the high-density region.

An ab initio-based approach to phase diagram calculations for GaAs(001) surfaces, Tomonori ITO, Hirotoshi ISHIZAKI, Toru AKIYAMA, Kohji NAKAMURA, Kenji SHIRAISHI*, Akihito TAGUCHI* : e-Journal of Surface Science and Nanotechnology 3, pp. 488-491, 2005.

Surface phase diagram of GaAs(001) is systematically investigated by using our ab initio-based approach. The phase diagrams of the c(4×4) and (2×4) surfaces are clarified as functions of temperature and As pressure. The calculated results reveal that c(4×4)β and (2×4)γ surfaces are strongly affected by As-molecular species such as As_2 and As_4. The c(4×4)β surface consisting of As dimers disappear under As_4 because of small desorption energy of As dimers. The (2×4)γ surface appears only at high As pressure and low temperatures buried in the stable region of c(4×4)β under As_4. These results are compared with experimental results to check the versatility of our approach to the

surface phase diagram calculations.

Theoretical investigation of indium surface segregation in InGaN thin films, Shingo INAHAMA, Toru AKIYAMA, Kohji NAKAMURA, Tomonori ITO : e-Journal of Surface Science and Nanotechnology 3, pp. 503-506, 2005.

Surface segregation of In atoms in InGaN thin films on GaN(0001) substrate is investigated by using Monte Carlo simulations based on an empirical potential, which incorporates electrostatic energy due to bond charges and ionic charges. The calculated In composition of the surface monolayer (ML) x_s in $In_{0.1}Ga_{0.9}N$ thin films ranging from 1 to 31 ML predicts that In atoms segregate at the topmost layer even in the film thickness t being larger than 3ML. The x_s at the topmost layer saturates when t reaches ~15 ML, in which x_s is much larger (x_s ~0.7) than the normal alloy composition (x~0.1). Furthermore, analysis of x_s with respect to the bulk composition x up to 0.2 reveals that the propensity of In atoms for being segregated at the surface corresponds to the bond energy difference between InN and GaN. These calculated results imply that not only the release of elastic strains due to lattice mismatch between InN and GaN but also the presence of Ga-N bonds over In-N bonds in the bulk region contributes the segregation of In atoms at the surface in InGaN thin films.

Theoretical investigation of the structural stability of zinc blende GaN thin films, Tatsuya ARAKI, Toru AKIYAMA, Kohji NAKAMURA, Tomonori ITO : e-Journal of Surface Science and Nanotechnology 3, pp. 507-510, 2005.

The structural stability of zinc blende (ZB) structured GaN thin films on ZB-GaN(001) and ZB-SiC(001) substrates is systematically investigated based on an empirical potential, which incorporates electrostatic energy due to covalen bond charges and ionic charges. The calculated energy difference between pure ZB-GaN and mixed structure of wurtzite (W) and ZB-GaN (ZB-W-GaN) on ZB-GaN(001) implies that ZB-GaN is stabilized up to the film thickness of 554 ML. Furthermore, similar calculations incorporating misfit dislocations (MDs) on ZB-SiC(001) show that ZB-GaN pseudomorphically grown on ZB-SiC(001) initially changes its structure to ZB-GaN with MD at 28 ML in good accordance with cirtical thickness of misfit dislocation generation of 32 ML estimated by People-Bean formula. The ZB-GaN with MD is successively transformed into ZB-GaN with MDs at 294 ML and finally ZB-W-GaN at 865 ML. These results suggest that MD generation crucially affects the stability of ZB-GaN.

Reaction mechanisms of oxygen at SiO_2/Si(100) interface, Toru AKIYAMA, Hiroyuki KAGESHIMA* : Surface Science 576, pp. 65-70, 2005.

First-principles total-energy calculations are performed to clarify the reaction mechanisms of O atoms and O_2 molecules at SiO_2/Si(100) interface. The calculated energies reveal that the incorporation of O_2 molecules into the substrate dominates the interfacial reaction of the oxidant. The low energy barrier for O_2 incorporation (0.2 eV) corresponds to the hybridization of oxygen-2p orbitals of O_2 and the valence band states of the Si substrate, while that for O atom incorporation corresponds to the O-O bond dissociation and the formation of Si-O-Si bonds. The cooperative reaction of each O atom in the O_2 molecule with each Si atom at the interface leads to the low energy barrier.

Fabrication of Compensation System for 2nd Order Chromatic-Dispersion Distortion in Lightwave CATV Transmission Systems, Takashi TAKEO, Tomohiko TANIE*: The Transactions of The IEICE, Vol.J88-C, 574-575, 2005

Compensation system for 2nd order chromatic-dispersion in lightwave CATV transmission systems has been proposed. The system utilizes a push-pull transmission scheme and consists of two identical optical transmission lines. Two RF signals whose phases are inverted each other through a push-pull transformer are input into two laser diodes, and after an optical transmission through optical fibers these signals are combined again through another push-pull transformer to obtain the undistorted signals. Improvements of about 15dB in the 2nd order distortion were obtained

with the present system.

Synchronous Averaging for Asynchronouse Sampling Data, Yuichi Noro and Kazuhiro Kuno: T.IEE Japan, 125-C, 12, pp. 955-959, 2005.

The progress of digital audio technology enabled the familiar use of the products such as CD and DAT in the acoustic measurement. For example, a signal reproduced with CD player is inputted into a subject of measurement and DAT recorder records its response. However, the sampling cannot be synchronized completely with the input signal although both nominal sample rates are set up equally, because player and recorder work independently. It is the most popular software solution to perform the synchronous addition after converting the recorded signal into the original sampling rate. However, the rate conversion also has the error due to the windowing in the high frequency region of processed signal. This paper proposes a new method for averaging asynchronous sampling data to solve these problems.

Damping Parameter and Wall Velocity of RE-TM Films, Tadashi KOBAYASHI, Hideaki HAYASHI, Yuji FUJIWARA, Shigeru SHIOMI: IEEE Trans. Magn., 41, pp.2848-2850, 2005.

The temperature dependence of the Gilbert damping parameter and domain wall velocity of ferrimagnetic rare earth-3d transition metal alloy (RE-TM) films are discussed. The Gilbert damping parameter is assumed to be inversely proportional to the net angular momentum of the RE-TM. Under this assumption, wall velocity is simulated. In the case of wall motion utilizing the temperature gradient of wall energy, the wall velocity reaches a maximum in the vicinity of the angular momentum compensation temperature of the RE-TM.

Exchange-Coupling in Magneto-optical Recording, Tadashi KOBAYASHI, Yuji FUJIWARA, Shigeru SHIOMI: J. Magn. Soc. Jpn., 29, pp.1027-1034, 2005.

Exchange-coupling in magneto-optical recording is reviewed. Exchange-coupling has been widely used for improving the S/N ratio of the readout signal, overwriting by light intensity modulation or readout of tiny marks, and other purposes. Although the strength of the exchange-coupling is characterized using the interface wall energy σ_w or the exchange-coupling energy J, σ_w and J should be distinguished. A relatively large value of σ_w can be easily obtained, using a conventional sputtering apparatus. Exchange-coupling in rare earth-3d transition metal films and methods of controlling it are summarized. The value of σ_w can be reduced by inserting an intermediate layer. Control of the temperature dependence of σ_w is somewhat difficult. In the case of switching of the exchange-coupling, the thickness as well as Curie temperature of the switching layer is an important parameter.

High-Pressure Viscosity Measurements of Traction Oils up to 2 GPa at up to 200 ℃ [in Japanese], Yuichi NAKAMURA, Kazuyuki SANDA* and Hideki MATSUBO*: Journal of Japan Society of Tribologists, 50-4 pp. 354-359, 2005

High-pressure viscosity was measured for synthetic traction oils including a CVT oil up to 2 GPa at elevated temperature up to 200 ℃ employing a falling sphere method in a diamond-anvil pressure cell (DAC) with appropriate heating system. The obtained results almost showed the linearity between logarithmic viscosity and pressure at all temperature (40℃～200℃) with some data

scattering. The accuracy of this high pressure viscometry was confirmed with the existing data at low pressure. Viscosity-pressure coefficient α decreased to 1/3～1/4 at 200℃ of that at 40℃. Simple experimental expression of temperature depending α was suggested referring to Eyring viscosity formula. Pressure temperature phase diagrams of liquid-solid transition were plotted from the obtained high pressure viscosity, which predict traction feature.

Micro-Rheometry of Pressurized Lubricants and Micro-Nanorheology, Yuichi NAKAMURA, Yasushi KUROSAKI: Microsystem Technologies, Special Issue: JSME-IIP/ASME-ISPS Joint Conference 2003 Yokohama, 11, pp. 1127-1131, 2005

In the present study, micro-rheometry of pressurized lubricants employing a diamond-anvil pressure cell and a laser confocal displacement sensor of 0.4μ m resolution was shown. High pressure viscosity was obtained up to 2 GPa at 200 ℃ for traction oils and PFPE oils. Viscosity-pressure coefficient α at room temperature was almost twice larger than that at 100 ℃. α for hard disk oil, Zdol2000, was 13 /GPa at 24 ℃ ～ 5 /GPa at 150 ℃ and was similar to that of paraffinic mineral oil. The feature of the obtained high pressure volume was different for each oil up to 6 GPa. Zdol2000 was the most compressible of all the sample lubricants and its high pressure refractive index increased about 10 % at 4.8 GPa. Zdol2000 remained transparent up to 4.8 GPa under isothermal loading. Some considerations for lubricant's micro-nanorheology were also mentioned with high pressure lubricant's rheology.

Evaluation of Quasi-Static Density and Elastic Modulus for Pressurized Lubricant Oils up to 5 GPa Considering Volume Viscoelasticity, Yuichi NAKAMURA, Yasushi KUROSAKI and Nobuyoshi OHNO*: Book of Synopses International Tribology Conference Kobe 2005, pp. 171, 2005

Quasi-static pressure-dependence equations of density and elastic modulus for lubricant oils were derived up to 5 GPa based on the experimental data from both quasi-static pressure vessel apparatus up to 1.2 GPa and dynamic sound velocity data by Brillouin light scattering measurements up to 5 GPa. Dynamic data were analyzed by applying a viscoelastic model for volume change and quasi-static data were obtained. Examined lubricant oils were 3 naphthenic oils such as traction oils, 5P4E (five-ring polyphenyl ether) and DOS (dioctylsebacate). Lubricant oils whose solidified pressure is lower than 1 GPa were resulted to show almost the same pressure-dependence characteristics of density and bulk modulus over solidified pressure. Temperature-dependence of these equations found out to be small up to 155 ℃.

Plastic Deformations of Micro-spheres by Solidified Lubricants and Lubricants' Shear Stress under Very High Pressure, Yuichi NAKAMURA, Masanori SHIMAOKA, Yutaka ISHIBASHI* and Masahito MATSUI: Proceedings of WTC2005 World Triborogy congress III, CD, 63099, 2005

In order to grasp the possibility of evaluating shear properties for solidified lubricants under high pressure, plastic deformations of metal micro-spheres (about 0.07mm) in solidified lubricants were evaluated by employing a diamond- anvil pressure cell (DAC). Large deformations (2-5 times larger than the original sphere dimensions) were observed for CVT oil and ester oil up to 6 GPa at

23-25℃. Deformation starting pressure agreed with the solidified pressure. These deformations were caused by the non-hydrostatic pressure in the solidified lubricants. Shear stresses of the solidified lubricants were tentatively and roughly estimated from the plastic deformations of the spheres based on some assumptions. They almost agreed with the mean shear stress (traction force / hertzian contact area) from traction test.

High-Pressure Viscometry and Dilatometry for Lubricant Oils in a Diamond Anvil Cell Up to 6 GPa, Yuichi NAKAMURA, Kazuyuki SANDA* and Hideki MATSUBO*: Proceedings of WTC2005 World Triborogy congress III, CD, 63100, 2005

To measure the properties of lubricant under high pressure, a diamond–anvil pressure cell was employed. With a falling sphere viscometry, viscosities were measured up to 2 GPa at up to 200 ℃ for traction oils. The results showed linearity between logarithmic viscosity and pressure at any temperatures. At 200℃, lubricant viscosity-pressure coefficient fell to between 1/4 and 1/3rd of the value at 40℃. A simple expression for the dependence of high pressure viscosity on temperature has been suggested. Pressure temperature phase diagram of liquid-solid transition was plotted from the obtained viscosity. The change in volume due to solidification was estimated up to 6 GPa.

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Department of Mechanical Engineering

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Jets, Wakes and Separated Flows (ISMN4-944068-75-1, 820p), Edited by Toshihiko SHAKOUCHI, Franz DURST* and Kuniaki TOYODA*, Mie Univ. Press, 2005.

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Department of Chemistry for Materials

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Preparation of Poly(diazo) Compounds as Precursors of Organo-Magnetic Materials by Utilizing Diazo Compound as Building Blocks, Tetsuji ITOH, Katsuyuki HIRAI, Hideo TOMIOKA: Yuki Gosei Kagaku Kyokaishi 63 (3), pp. 232-241, 2005

Material for Batteries, Yasuo TAKEDA: Funtai oyobi Funmatsu Yakin, 52 (8), 588, 2005

Fluorometry with FRET [in Japanese], Tetsuro YOSHIMURA, Kanta Tsumoto: New perspectives on Liposome Applications toward Developments of Artificial Cells (Kazunari AKIYOSHI, Kaoru TSUJII, Eds.), NTS Inc., pp.84-89, 2005

Control of Dispersion Stabilities of Suspensions by Addition of Polymers [in Japanese], Masami KAWAGUCHI: J. Jpn. Soc. Colour Material, 78 (6), pp. 276-282, 2005

Handbook of Up-to-Date Dispersions of Pigments [in Japanese], Masami KAWAGUCHI: Control and Estimation of Dispersion Stabilities of Pigments by Addition of Polymers, Technical Information Assoc. (Tokyo), Section 3 in Chapter 3, pp. 142-150, 2005

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Titanophosphate Glasses as Ecologically Sustainable Optical Glasses, Tadanori HASHIMOTO, Hiroyuki NASU, Kanichi KAMIYA: Recent Research Developments in Non-Crystalline Solids, 5, pp. 31-50, 2005

Department of Architecture

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Consensus Building in a Road Planning Process of the Citizen Participating Road Planning Project of Akame-taki Prefectural Road [in Japanese], Masuro URAYAMA:, Journal of Real Estate of JAPAN, No.2 Vol.19, pp.68-73, 2005.11

This paper reports a consensus building process of the Citizen Participating Road Planning Project of Akame-taki prefectural road, Nabari city in Mie Prefecture. The project tackled for local residents, advertised citizens and some members of the Akame District Promotion Conference to participate and work on road planning at a design work-shop (WS). The participants of WS were possible to propose multiple routes, however, had a difficulty to select the last on a stage of the planning process. This was due to difference of opinion that some participants felt to avoid house relocation, another thought important to contribute the road to community revitalization. Therefore, they hesitated to agree the final. By an effort to adjust participants' interests, they reached agreement. The lesson from this case is to clarify the interests of participants, and to provide with proper information that participants can evaluate validity of proposal routes.

Influence of Windmills Arrangement on Visual Evaluation [in English], Masuro URAYAMA and Shinjiro SAKAMOTO:, Papers on EXPO World Conference on Wind Energy, Renewable Energy, Fuel Cell & Exhibition 2005, CD-ROM, No.1056, 2005.9

Some wind farms have been constructed in Japan in these years. Visual impacts of wind farms on landscape cannot be disregarded, because they have dozens of huge windmills. There are two ways to moderate the visual impacts of wind farms on landscape, first is to set windmills in invisible area from important viewpoints, second is to operate windmills arrangement to moderate their impacts. This study was tackled from the latter viewpoint. This paper reports visual influences of windmills arrangement on landscape. Firstly, some computer graphic pictures were prepared, that have windmills on the various position of forms, the distances from viewpoint and the width of them. Next, 48 students evaluated these pictures with 10 adjective words in Semantic Deferential method. Measure findings were as follows: (1) The visual factors of seeing windmills are feeling of oppression, balance and density; (2) these three factors of visual evaluation have the relation to the windmills arrangement; (3) This finding shows the possibility to moderate the visual impacts of windmills by operating their arrangement.

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Fundamentals of Concrete Technology [in Japanese], Shigemitsu HATANAKA, Japan Concrete Institute, 439p., Chap.2 Properties of Concrete (pp.49-72), Chap.8 Design of Concrete Structures

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Clarification and Quantification of Quality Improvement Mechanism of Concrete by Vacuum Processing Dewatering System [in Japanese], Naoki MISHIMA, Shigemitsu HATANAKA, Hiroshi WATO, Hiroki HATTORI and Eisuke SAKAMOTO, Cement and Concrete, Japan Cement Association, No.702, pp.36-43, 2005.8

Behavior of Water in Concrete and Its Control (Part 1) Behavior of Free Water in Bleeding [in Japanese], Toshitsugu INUKAI and Shigemitsu HATANAKA, Concrete Techno, 24(9), pp.24-30, 2005.9

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On Simple Methods for Finding Out Poor Quality Concrete -Feasibility of Application of A Scratching Test- [in Japanese], Shigemitsu HATANAKA, Cement and Concrete, Japan Cement Association, No.705, pp.42-50, 2005.11

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