Department of Electrical and Electronic Engineering

*nonmember

Visual Servo of Active Camera and Manipulator with Simple On-line Calibration for Estimated Image Feature, Itsushi Kinbara, Satoshi Komada, and Junji Hirai : Proceedings of the 9th IEEE International Workshop on Advanced Motion Control AMC'06, vol.2, pp.636-640, 2006

In visual servo system, there are problems on time delay by image processing and difference between image processing period and control period. In order to overcome these problems, the estimated image feature applied to a fixed camera has been proposed. Since the compensation of delay utilizes image Jacobian matrices which represent geometric models of manipulator and camera, it is affected by their calibration error. Therefore, this paper proposes a new visual servo system for active camera using estimated image feature with a simple on-line calibration. In order to reduce estimation error of image feature, the proposed method is calibrating each element of image Jacobian matrices from error of the estimated image feature. It is simple algorithm and few calculation amount compared to calibrating each parameters correctly such as internal camera parameters and orientation of manipulator and camera. The effectiveness of the proposed strategy is confirmed by a moving object tracking by a manipulator and an active camera.

Study on parameters identification of dynamic equation of human lower limb for improved estimation of muscular tensions, Shohei Oda, Noboru Okuyama, Satoshi Komada, and Junji Hirai : Proceedings of the 9th IEEE International Workshop on Advanced Motion Control AMC'06, vol.1, pp.356-361, 2006

We have proposed a new rehabilitation support equipment that estimates the muscular tensions of lower limbs in order to offer it to the PTs and the patients in a comprehensible form to realize a biofeedback therapy. The muscular tension is estimated by solving the optimization problem from joint torque of each examinee's joint during training. This paper reports comparison and its discussion of joint torque of each joint derived by an examinee's identified parameters of dynamic equation and parameters determined by the average of about 100 peoples. The accuracy of the joint torque is improved by the identified parameters.

Visual Servo of Active Cameras and Manipulators by Time Delay Compensation of Image Features with Simple On-line Calibration, Itsushi Kinbara, Satoshi Komada, and Junji Hirai : Procdeedings of SICE-ICASE International Joint Conference 2006, pp.5317-5322, 2006

In visual servo system, there are problems on time delay caused by image processing and difference between image processing period and control period. In order to overcome these problems, an estimation method of image features has been applied to a fixed camera, which realizes visual servo with control period. Since the compensation of delay utilizes image Jacobian matrices, it is affected by calibration error. Therefore, this paper proposes a new visual servo system for manipulators and active cameras using the estimated image features with a simple on-line calibration. In order to reduce estimation error of image feature, the proposed method is calibrating each element of image Jacobian matrices from error of the estimated image feature. It is simple algorithm and few calculation amount compared to calibrating each parameters correctly such as internal camera parameters, orientation of manipulator and camera, and so on. The effectiveness of the proposed strategy is confirmed by tracking simulation of a moving object by a manipulator and an active camera.

Development of a Biofeedback Therapeutic Exercise Supporting Manipulator for Lower Limbs, Yosuke Hashimoto, Satoshi Komada, and Junji Hirai : Proceedings of International Conference on Industrial Technology ICIT 2006, vol.2, pp.352-357, 2006

Although equipments that support physical therapy have been developed, there are few types of equipment to improve quality of physical therapy. This paper proposes a new concept of robotic biofeedback exercise equipment that displays human muscle force during training. The concept tries to have therapeutic value through grasping of condition for trainee during exercise and giving an incentive to perform training. The machine is not only for convalescent

patients but also for athletes and ordinary persons with a physical trouble. The manipulator is designed to support lower limb rehabilitation of knee and hip joints in sagittal plane where a three-degree-of-freedom manipulator is adopted in order to realize low height equipment. Since the manipulator has redundant degree-of-freedom, collision avoidance is performed based on acceleration control by disturbance observer. Moreover, simultaneous isokinetic movement for knee and hip joints that has an adjustment capability of maximum speed and acceleration degree is realized in order to realize safe training by isokinetic muscular contraction. Desired motion of the proposed manipulator is confirmed experimentally.

A Realization Method of Fault-tolerant Control of Flexible Arm under Sensor Fault by Using an Adaptive Sensor Signal Observer, Yu Izumikawa, Kazuhiro Yubai, and Junji Hirai : Journal of Power Electronics, vol.6, no.1, pp.8-17, 2006

In this paper, we propose a fault-tolerant control system for the position control and vibration suppression 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 estimated error. In order to improve the estimation accuracy, the plant parameters included in the sensor signal observer are updated by using the strain gauge sensor signal in normal time through the adaptive law. 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 confirmed the effectiveness of the proposed control system through several experiments.

A Fundamental Study on Reconfigurable Robot System Construction with Central- and Local Intelligence, Nobuyasu Miwa, Kazuhiro Yubai, and Junji Hirai : Proceedings of the 9th IEEE International Workshop on Advanced Motion Control AMC'06, vol.1, pp.90-93, 2006

This paper deals with a study on reconfigurable robots. Firstly, the concept of the reconfigurable robot is described. Secondly, construction of the distributed robot control system consisting of Local- and Central Intelligence is explained. Then the authors propose Virtual Velocity Transmission Algorithm (VVTA) as the best-suited control scheme for this system, and finally confirm the effectiveness of the proposed algorithm by simulations.

A Joint Design Method for Achieving Robust Performance -Experimental Study in 2-mass System-, Naoya Wakayama, Kazuhiro Yubai, and Junji Hirai : Proceedings of the 9th IEEE International Workshop on Advanced Motion Control AMC'06, vol.2, pp.467-471, 2006

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.

Fault-Tolerant Control of Flexible Arm Based on Dual Youla Parameter Identification, Tsubasa Sakuishi, Kazuhiro Yubai, and Junji Hirai : Proceedings of the 9th IEEE International Workshop on Advanced Motion Control AMC'06, vol.2, pp.452-455, 2006

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 faults (fault detection) and maintain the stability and the control performance (fault tolerance). In this paper, we address the stain 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.

Design of Gain-Scheduling Controller Based on Interpolation of Loop Shaping H_∞ Controller, Yuki Maekawa, Kazuhiro Yubai, and Junji Hirai : Proceedings of the 9th IEEE International Workshop on Advanced Motion Control AMC'06, vol.1, pp.29-32, 2006

In this paper, we propose a design method of gain-scheduling controller. We extend LSDP to gain-scheduling version. The controllers designed according to LSDP consist of a state observer and a regulator. The observer-gain and regulator-gain at each design point determine the control performance, and they are interpolated by polynomial. The gain-scheduling controller varies these gains according to the operating point. We apply the design method of gain-scheduling controller to an inverted pendulum and confirm the effectiveness of the proposed controller by some experiments.

Stabilization of Rotary Inverted Pendulum by Gain-scheduling of Weight and H_∞ Loop Shaping Controller, Kazuhiro Yubai, Kazunori Okuhara, and Junji Hirai : Proceedings of the 32nd Annual Conference of the IEEE Industrial Electronics Society, pp.288-293, 2006

Gain-scheduling control is one of effective methods for plants whose dynamics changes significantly according to its operating point. A frozen parameter method is known to be a practical gain-scheduling controller synthesis, which interpolates the controllers designed at the prespecified (frozen) operating points according to the current operation point. Hyde et al. proposed a gain-scheduling control that H∞ loop shaping procedure is adopted as a controller synthesis at each operating point. H∞ loop shaping procedure is based on loop shaping of an open loop characteristic by frequency weights and is known to be effective for plants with bad condition number. However, weight selection satisfying control specifications is a hard job for a designer. This paper describes the design of a suboptimal weight and a controller by means of algorithm that maximizes the robust stability margin and shapes the open loop characteristic into the desired shape at each operating point. Moreover, we formulate a weight optimization problem as a generalized eigenvalue minimization problem, which reduces the designer's burden of weight selection. Finally, we realize robust and high performance control system by scheduling both weights and controllers. The effectiveness of the proposed control system is verified in terms of the achieved robust stability margin and experimental time responses of a rotary inverted pendulum, which involves strong nonlinear dynamics.

Gain-scheduling Control of Rotary Inverted Pendulum by Weight Optimization and H_∞ Loop Shaping Procedure [in Japanese], K. Yubai, K. Okuhara and J. Hirai: IEEJ Transactions on Electronics, Information and Systems, Vol.126, no.12, pp.1504-1513, 2006

Gain-scheduling control is one of effective methods for plants whose dynamics changes significantly according to its operating point. A frozen parameter method is kown to be a practical gain-scheduling controller synthesis, which interpolates the controllers designed at the prespecified (frozen) operating points according to the current operation point. Hyde et al. proposed a gain-scheduling control that $H\infty$ loop shaping procedure is adopted as a controller synthesis at each operating point. $H\infty$ loop shaping procedure is based on loop shaping of an open loop characteristic by frequency weights and is known to be effective for plants with bad condition number. However, weight selection

satisfying control specifications is hard job for a designer. This paper describes the design of a suboptimal weight and a controller by means of algorithm that maximizes the robust stability margin and shapes the open loop characteristic into the desired shape at each operating point. Moreover, we formulate a weight optimization problem as a generalized eigenvalue minimization problem, which reduces the designer's burden of weight selection. Finally, we realize robust and high performance control system by scheduling both weights and controllers. The effectiveness of the proposed control system is verified in terms of the achieved robust stability margin and experimental time responses of a rotary inverted pendulum, which involves strong nonlinear dynamics.

Abstraction and Implementation of Human Skill by Hybrid Dynamical System Theory - Application to an Automatic Driving System -, ShangChang Ma, Tadanao Zanma, Muneaki Ishida: Vol.126-C, No.12, pp.1524-1530, 2006

In this paper, we propose a modeling method for drivers' driving skill with which automatic driving of the vehicle is realized. The method is to formulate the automatic driving system of a vehicle as a switched system with unknown switch points by using HHARX model, which can extract driving operation modes and their switch conditions simultaneously. To verify the effectiveness, we apply the proposed method to an automatic driving system of a small remote-controlled vehicle, instead of a real vehicle. Simulation results illustrate that obtained models can achieve functions such as start acceleration, normal traveling, stop deceleration and auto steering in the automatic driving system.

Automatic driving system using identification of switched systems with unknown switch points, ShangChang Ma, Tadanao Zanma, Muneaki Ishida: IEEJ Transactions on Electrical and Electronic Engineering, Vol.1, No.4, pp.426-437, 2006

In this paper, we propose an approach to abstract human manipulation skill, which can be useful in systems of machine intelligence and human operator assistance. Because of the lack of good physical models for human skill, it is impossible to model it by traditional methods - from physical or chemical principles of a system. Our approach is to consider human manipulation skill as a hybrid dynamical system (HDS). For the purpose, a hinging hyperplane autoregressive exogenous (HHARX) model is utilized as it is able to deal with manipulation modes and their switches simultaneously. We obtain the HHARX model by system identification via mixed-integer linear programming (MILP). As a typical example, we apply our approach to an automatic driving system of a small radio-controlled vehicle. Both simulation and experimental results illustrate the effectiveness of the proposed method.

Optimal control of DC-DC converter using mixed logical dynamical system theory, Nobuhiro Asano, Tadanao Zanma and Muneaki Ishida: Proceedings of 2006 IEEE International Conference on Industrial Technology, (ICIT), pp. 110-115, 2006

This paper presents an optimal control method of dc-dc converters. The method is based on hybrid dynamical system theory. Specifically, the input of the considered system is confined to discrete value whereas the output to be controlled is continuous value. The system is modeled as a mixed logical dynamical system. Then, the optimal control law is obtained by means of model predictive control. To illustrate the effectiveness of the proposed method, some numerical simulations are shown.

Simultaneous vibration suppression control of PMSM using repetitive control with Fourier series, Kenji Kawai, Tadanao Zanma and Muneaki Ishida: Proceedings of 2006 IEEE International Conference on Industrial Technology, (ICIT), pp. 854-859, 2006

This paper proposes a suppression control method of the motor frame vibration caused by the torque ripple of PMSM. The method utilizes the feedforward compensation signals by the repetitive control and the Fourier series expansion using a vibration signal obtained by an acceleration sensor which is attached to the motor frame. In order to realize on-line generation of the feedforward compensation signals to reduce the vibration, a novel parameter auto-tuning method for the repetitive control is proposed. The method enables to shorten time to suppress the torque ripple since simultaneous vibration suppression control can be achieved. The effectiveness of the proposed method is illustrated through some experimental results.

Speed Estimation Method utilizing Rotor Slot Harmonics Detected from Line Current for Speed Sensorless Drive of Ultra High Speed Induction Machine, Koichi Nishibata, Muneaki Ishida, Shinji Doki, Takashi, Masuzawa, Masami Fujitsuna: Proceedings of 2006 IEEE International Conference on Industrial Technology, (ICIT), pp. 1591-1596, 2006

Recently, development of power electronics technology has made it possible to realize ultra high speed machine and it has been expected in various applications. This research aims at sensorless control drive of induction machine in the ultra high speed region by utilizing rotor slot harmonics caused by structure of induction machine. In this paper, we proposed a novel speed estimation method utilizing rotor slot harmonics detected form line current for speed sensorless drive of ultra high speed induction machine. It is possible to detect the rotor slot harmonics with high signal-noise ratio by utilizing a harmonics model of IM and fast fourier transform (FFT) with limitation of a detection band. Moreover, the effectiveness of the proposed method is confirmed by experimental result.

Study for Small Size Wind Power Generating System Using Switched Reluctance Generator, Kazutoshi Ogawa, Naoki Yamamura, Muneaki Ishida: Proceedings of 2006 IEEE International Conference on Industrial Technology, (ICIT), pp. 1510-1515, 2006

Recently, problems such as air pollution and global warming become serious because of increasing consumption of the fossil fuel. Therefore, there have been many studies related to the natural energy generation system effective to cope with these problems. The small size wind power generating system is one of the most useful generation systems utilizing natural energy. Now, Permanent Magnet Type Synchronous Generator or Induction Generator is used for the wind power generating system. However, material cost of the Permanent Magnet Type Synchronous Generator is high, though the generation efficiency is high, and the efficiency of the Induction Generator is low, though it is tough and requires little maintenance. Therefore, we focus attention on SRM (Switched Reluctance Motor) which is characterized by simple structure, toughness, and high efficiency. And we studied a small size wind power generating system which uses the SRM as a SRG (Switched Reluctance Generator). In this paper, configuration of the small size wind power generating system using a SRG, the generation principle and an experimental set up and results are presented. We also propose a power control method by calculated the magnetization energy of the SRG. Also, we propose MPPT (Maximum Power Point Tracking) control method based on foregoing control method and constant resistance control method. And we show validity of the proposed control method by experimental results.

Identification of human skill and its application to an automatic driving system --an approach from hybrid dynamical

system-- Shangchang Ma, Tadanao Zanma, Muneaki Ishida: Proceedings of The 32nd Annual Conference of the IEEE Industrial Electronics Society (IECON06), pp. 400-405, 2006

In this paper, we propose an approach to model human skill, which can be useful in systems of machine intelligence and human operator assistance. The approach is to consider the model of human manipulation skill as a hybrid dynamical system (HDS), where, each continuous submodel deals with its related manipulation mode, while a discrete event model represents the switches between all the submodels. In particular, we express the HDS model as a hinging hyperplane autoregressive exogenous (HHARX) model as it is able to deal with manipulation modes and their switches simultaneously. Based on experimental data manipulated by an expert human operator, HHARX parameters are identified via mixed-integer linear programming (MILP). As a typical example, we apply our approach to an automatic driving system of a small radio-controlled vehicle. Both simulation and experimental results illustrate the effectiveness of the proposed method.

Smoothed-Power Output Supply System for Battery of Stand-alone Renewable Power System Using EDLC, Jia Yan, Ryosuke Shibata, Naoki Yamamura and Muneaki Ishida, Proceedings of Power Electronics and Motion Control Conference, Vol. 3, pp 1-5, 2006

A smoothed-power output topology for battery of stand-alone renewable power system (SARPS) using EDLC (electric double layer capacitor) is presented. To prolong the service life of battery, decrease maintenance cost and power loss of SARPS by realizing smoothed-power output supply, an EDLC is paralleled with battery as a part of storage system, and connected by a bi-directional buck/boost compensation topology. The EDLC stores fluctuant component and compensate battery current through proposed topology and switch control. Whereas the changeful natural condition and initial power condition, an appointed fluctuant power condition as an example to analyze the validity of proposed method in simulation and real-time experiment example firstly. The results show that smoothed-power output for battery can be obtained through proposed topology and satisfy the criterion of smooth precision. And then, the experiment result carried out in actual stand-alone wind power system further shows the feasibility of proposed topology.

Keywords Recognition of Handwritten Character String on Whiteboard Using Word Dictionary for e-Learning, Daisuke YOSHIDA, Shinji TSURUOKA, Hiroharu KAWANAKA, Tsuyoshi SHINOGI: Proc. of International Conference on Hybrid Information Technology (ICHIT 06), Vol.1, pp.140-145, 2006

We are developing an individual e-Learning system using two communication cameras and a pen capture tool on whiteboard for university students. In this research, keywords recognition for the written characters by the lecturer on the whiteboard is important for indexing the scene database. We are considering the handwritten keyword recognition. The whiteboard image captured by the pen capture tool is recognized to character strings and the string corresponds to keywords in a textbook to link to the explanation of the keyword in textbook. One of important problems in our learning system is that the accuracy of handwritten character recognition on whiteboard is not enough for keyword recognition. In this paper, we propose the new matching method of high accuracy keyword recognition using word dictionary and the distance of character recognition. We confirmed the usefulness using word dictionary for handwritten keyword recognition on whiteboard.

Heart Motion Evaluation Indexes Using Ultrasonic RF Signal, Yosuke.MIZUTANI, Shinji TSURUOKA, Hiroharu

KAWANAKA, Tsuyoshi SHINOGI, Wataru OHYAMA, Kiyotsugu SEKIOKA*: Proc. of International Conference on Hybrid Information Technology (ICHIT 06), Vol.2, pp. 62-67, 2006

Our research group has developed the tracking method of regional myocardium from ultrasonic radio frequency (RF) signal. The tracking method employs a hierarchical correlation method. In addition, we regarded the correlation coefficient as the confidence coefficient. If it is not high, the tracking position is corrected by neighbor points. The tracking method can detect the movement of myocardium very well if the RF signal is clear. In this research, we investigate the moving distance based on the tracking position that includes less error. As a result, the contributions of the distance are different between normal example and abnormal example. We propose three indexes defined by amounts of statistics for the evaluation of a heart motion. We compared the accuracy between indexes and thickening rate by ROC analysis. As a result, one of proposed indexes has higher accuracy than thickening rate.

3-D Display of the Wall Motion for Regional Cardiac Muscle from Ultrasonic B-mode Image –Wall Motion of Thickness, Thickening Rate using Contour of Inner and Outer Wall—, Soohyo YANG, Shinji TSURUOKA, Tsuyoshi SHINOGI, Hiroharu KAWANAKA, Wataru OHYAMA, Fumitaka KIMURA, Tetsushi WAKABAYASHI, Kiyotsugu SEKIOKA*: Proc. of International Conference on Hybrid Information Technology (ICHIT 06), Vol.2, pp.6-12, 2006

In this paper, we propose a new 3-D display method of the motion function on the endocardium to evaluate the motion of the myocardium objectively. Its method displays cardiac wall motion during one cardiac cycle or more, and it is colored the thickness or the thickening rate of the myocardium on the surface of the 3-D endocardium object. The endocardium and epicardium of the heart are extracted from a set of ultrasonic B-mode Images. We implemented 3-D display system using C language and DirectX 3D in MS-Windows. We determine the position of the points for 3-D display from the contour lines of the cardiac muscle. We define the thickness by the shortest distance between the endocardium and the epicardium, and we calculate the thickness rate from the obtained thickness. And in Experimental 3-D display, We confirmed the usefulness of our 3-D display.

Modeling Error Estimation of Mobile Robot Using Co-Evolutionary Computation and Image Processing, H. Chinthaka. N. PREMACHANDRA, Hiroharu KAWANAKA, Shinji TSURUOKA, Tsuyoshi SHINOGI: Proc. of Joint 3rd International Conference on Soft Computing and Intelligent Systems and 7th International Symposium on advanced Intelligent Systems (SCIS & ISIS 06), TH-E3-4, pp. 361-366, 2006

Recently, Evolutionary Computations (ECs) have been employed to minimize modeling errors between robotic movements on the computer simulation system and the trajectories of an actual mobile robot. Generally, this task is important but it is so difficult. In this paper, we propose the method to minimize the modeling error of between robotic movements and simulation results using co-evolutionary computations with image processing technique. In the proposed method, we employ the video camera system on the ceiling for capturing the robot movements, and the trajectories of the actual mobile robot are detected from captured images by image processing technique and the modeling error is estimated. We experimented using an actual mobile robot to validate the effectiveness of the proposed method, and the results shows that modeling errors are reduced effectively by the proposed method. Finally, this paper describes the problem and future works of this study.

3-D Display of the Wall Motion for Regional Cardiac Muscle from Ultrasonic B-mode Image –Wall Motion Display of Thickness, Thickening Rate—, Soohyo YANG, Shinji TSURUOKA, Tsuyoshi SHINOGI, Hiroharu KAWANAKA,

Wataru OHYAMA, Fumitaka KIMURA, Tetsushi WAKABAYASHI, Kiyotsugu SEKIOKA*, Fumio OKUYAMA*: Proc. of Proc. of Joint 3rd International Conference on Soft Computing and Intelligent Systems and 7th International Symposium on advanced Intelligent Systems (SCIS & ISIS 06), SA-D3-3, pp.1848-1853, 2006

We have developed extracting the inner and outer walls of the cardiac muscle from a set of ultrasonic B-mode images. In this paper, we propose a new 3-D (radius, angle and time) display method of the motion function on the inner wall to evaluate the motion of the myocardium objectively. Its method displays the time transition of a cardiac wall during one cardiac cycle, and it is colored the thickness or the thickening rate of the myocardium on the surface of the 3-D object. The inner and outer walls of the heart are extracted from a set of ultrasonic B-mode Images. We implemented 3-D display system using C language and DirectX 3D in MS-Windows. We calculate the position of the points for 3-D display from the contour lines of the cardiac muscle by the cubic spline curve. The curve connects smoothly between one point and the other one point. And we found the thickness and thickening rate by using the contour lines of the cardiac muscle. We define the thickness by the shortest distance between the outer wall and the inner wall, and we calculate the thickness rate from the obtained thickness. We add the rotation view of the 3-D object to see the every side of myocardium. We confirmed the usefulness of our 3-D display.

New Indexes on Heart Motion Evaluation Using Ultrasonic RF Signal, Yosuke MIZUTANI, Shinji TSURUOKA, Hiroharu KAWANAKA, Tsuyoshi SHINOGI, Wataru OHYAMA, Kiyotsugu SEKIOKA*: Proc. of Joint 3rd International Conference on Soft Computing and Intelligent Systems and 7th International Symposium on advanced Intelligent Systems (SCIS & ISIS 06), SA-D4-2, pp.2001-2006, 2006

Our research group has developed the tracking method of regional myocardium from ultrasonic radio frequency (RF) signal. The tracking method employs a hierarchical correlation method. In addition, we regarded the correlation coefficient as the confidence coefficient. If it is not high, the tracking position is corrected by neighbor points. The tracking method can detect the movement of myocardium very well if the RF signal is clear. In this research, we investigate the moving distance based on the tracking position that includes less error. As a result, the contributions of the distance are different between normal example and disorder example. We propose three indexes defined by the amounts of statistics for the evaluation of a heart motion. The error rates for diagnosis with the proposed index (FP=4.8[%], FN= 9.5[%]) is lower than that with thickening rate (FP=13.6[%], FN=14.3[%]).

Telemedicine Imaging Collaboration System with Virtual Common Information Space, Fumio OKUYAMA*, Takenori HIRANO*, Yuusuke NAKABAYUASHI*, Hirohito MINOURA*, Shinji TSURUOKA, Yousuke OKAYAMA: Proc. of the Sixth IEEE International Conference on Computer and Information Technology (CIT'06), pp.1-6, 2006

The computerization of the clinical record and the realization of the multimedia have brought improvement of the medical service in medical facilities. It is very important for the patients to obtain comprehensible informed consent. Therefore, the doctor should plainly explain the purpose and the content of the diagnoses and treatments for the patient. We propose and design a Telemedicine Imaging Collaboration System which presents a three dimensional medical image as X-ray CT, MRI with stereoscopic image by using virtual common information space and operating the image remotely. This system can offer a comprehensible three-dimensional image of the diseased part. Therefore, the doctor and the patient can easily understand it, depending on their demand. In this paper, we described the examination situation of the system design.

Scan Chain Flip-Flop Reordering Method Considering Wiring Length for Test Response Test Vector Overlapping Testing, Tsuyoshi SHINOGI, Tadao KYOTANI, Masakazu TOKAIRIN, Terumine HAYASHI, Hiroharu KAWANAKA, Shinji TSURUOKA : Proceedings of IEEE 7th Workshop on RTL and High Level Testing(WRTLT'06), pp.63-68, 2006

To reduce the test cost in full-scan testing, a method of "Test Response Test Vector Overlapping" without any additional built-in hardware has already been proposed. In this paper, we propose a method of restricted scan flip-flop reordering considering the wiring length of scan chain for reducing test cost of the Test Response Test Vector Overlapping testing further.

Test Data Sequence Generation Method for Test Response - Test Vector Overlapping [in Japanese], Hiroyuki YAMADA, Tsuyoshi SHINOGI, Tadao KYOTANI, Terumine HAYASHI, Shinji TSURUOKA : The IEICE Transactions on Information and Systems [in Japanese], Vol.J89-D No.8, pp.1654-1662, 2006

To reduce the LSI testing cost 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 hardware. However, the method 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. It fully utilizes justification technique and don't-care bits in test vectors. Two rescue methods against fault coverage degradation are also discussed. Experimental results show its effectiveness.

Proposal of Residual Frequency Offset Compensation Method for OFDM Systems, Fang WANG, Masaaki YAMAMOTO, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Journal of IITE, vol.60,No.5, pp.773-780, May 2006

Complexity Reduced Maximum Likelihood Detection for SDM-OFDM System, Yuanrun TENG, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: IEICE Transactions on Communications, vol.E89-B, No.7, pp2084-2087, July 2006

Doppler Spread Estimation Method for OFDM Signal Using Mean Square of Channel Impulse Response's Time Derivative, Gagik MKRTCHYAN, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: IEICE Transactions on Communications, vol.E89-B, No.10, pp2961-2966, Oct. 2006

Evolutional Algorithm Based Learning of Time Varying Multipath Fading Channels for Software Defined Radio, Gagik MKRTCHYAN, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: IEICE Transactions on Communications, vol.E89-B, No.12, pp.3269-3273, Dec. 2006

PAPR Reduction Method for OFDM Signal by Using Dummy Sub-carriers, Pongsakorn BOONSRIMUANG, Pisit BOONSRIMUANG, Kazuo MORI, Tawil PAUNGMA*, Hideo KOBAYASHI: Proc. of 1st International Symposium

on Wireless Pervasive Computing (ISPWC'2006), pp.70-74, Jan. 2006

Prediction of Time-Varying Multipath Fading Channel for Pre-Equalization of the Signal in Uplink Mobile MC-CDMA Communications, Gagik MKRTCHYAN, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE The 8th International Conference on Advanced Communication Technology (ICACT2006), pp. 204-209, Feb. 2006

Downlink Packet Transmission Control Based on Handoff Status in CDMA Cellular Packet Networks, Kazuo MORI, Abubaker KHUMSI, Katsuhiro NAITO, Hideo KOBAYASHI, Hamid AGHVAMI*: Proc. of IEEE 2006 International Zurich Seminar on Communications (IZS2006), pp.62-65, Feb. 2006

Proposal of QAM-OFDM System with IDAR Method for Non-Linear Satellite Channel, Pisit BOONSRIMUANG Katsuhiro NAITO, Kazuo MORI, Tawil PAUNGMA*, Hideo KOBAYASHI: Proc. of IEEE Vehicular Technology Conference (VTC 2006-Spring), May 2006

Asymmetric Traffic Accommodation Using Cell Sizing in CDMA/FDD Cellular Packet Communication Systems, Kazuo MORI, Katsuhiro NAITO, Hideo KOBAYASHI, Hamid AGHVAMI*: Proc. of IST Wireless & Mobile Communications Summit 2006, CD-ROM, Mykonos, Greece, June 2006

Proposal of Demodulation Method for OFDM System under Multi-path Fading Environment with Delay Spread Greater than Guard Interval , Kazuya MORIWAKI, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE VTS Asia Pacific Wireless Communications Symposium (APWCS06), Aug. 2006

Proposal of Non-Linear Distortion Mitigation Method for MC-CDMA System, Naoki SAWADA, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE VTS Asia Pacific Wireless Communications Symposium (APWCS06) , Aug. 2006

Study of Media Access Control Protocol for Ad Hoc Networks under Slow Fading Channel, Shoko UCHIDA, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE VTS Asia Pacific Wireless Communications Symposium (APWCS06) , Aug. 2006

Study of Site Diversity System for Roadside to Vehicle Communication, Kouichi TERADA, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE VTS Asia Pacific Wireless Communications Symposium (APWCS06) , Aug. 2006

Simple PAPR Reduction Method for OFDM System By Using Dummy Sub-carriers, Pisit BOONSRIMUANG, Kazuo MORI, Tawil PAUNGMA*, Hideo KOBAYASHI: Proc. of 3rd International Conference on

Telecommunications and Computer Networks (IADAT-tcn 2006), Portsouth, United Kingdom, pp.110-114, Sept. 2006

Dynamic Subband and Code Channel Assignment for Multicast Band Division MC-CDMA Systems, Kazuo MORI, Katsuhiro NAITO, Hideo KOBAYASHI, Hamid AGHVAMI*: Proc. of IEEE International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC2006), Helsinki, Finland, Sept. 2006

TCP Based Resource Allocation Method for Base Station Diversity System, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IARIA International Conference on Systems and Networks Communications (ICSNC 2006), Tahiti, French Polynesia, Oct.. 2006

Adaptive Transmission Window Control for Downlink Packet Transmission in CDMA Cellular Networks, Abubaker Faraj KHUMSI, Kazuo MORI, Katsuhiro NAITO, Hideo KOBAYASHI: Proc. of IEEE International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2006), Dec. 2006

Adaptive Slot and Bit Allocation Method for OFDMA Transmission Systems, Fang WANG, Yuanrun TENG, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2006), Dec. 2006

Study of local alternative ad hoc routing protocol for the exposed terminal problem, Takanori WATANABE, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2006), Dec. 2006

Evaluation of base station diversity system for reliable multicast delivery, Katsuhiro NAITO, Kazuo MORI, Hideo KOBAYASHI: Proc. of IEEE International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS2006), Dec. 2006

Fault Tolerant Training Algorithm for Multi-Layer Neural Networks Focused on Hidden Unit Activities, Takase Haruhiko, Kita Hidehiko and Hayashi Terumine : Proceedings of International Joint Conference on Neural Networks 2006, pp. 2849-2854, Sheraton Vancouver Wall Centre Hotel, Vancouver, Canada, July 16-21, 2006

We propose a new training algorithm that enhances fault tolerance of multi-layer neural networks (MLNs). Faults mean physical defects or noise in MLNs. Some studies on fault tolerance pointed out that faults on the connections that connected to an output unit bring worse damage than other faults, and proposed training algorithms that enhance fault tolerance of MLNs based on this idea. In this paper, we reveal that it is not always true. Based on this idea, we improved our previous method (weight minimization algorithm).

Low Power Oriented Test Modification and Compression Techniques for Scan Based Core Testing, Terumine Hayashi,

Naotsugu Ikeda*, Tsuyoshi Shinogi, Haruhiko Takase, and Hidehiko Kita : Proceedings of the fifteenth Asian Test Symposium (ATS2006), pp.327-332, Nov. 2006

This paper proposes effective techniques for reducing not only test data volume but also scan-in transitions that are closely related to power dissipation. First, we adopt a new test smoothing algorithm that can reduce scan-in transitions through test vector modification. Second, we propose a test compression method that can reduce test data volume while keeping down the increase of transitions as small as possible. The effectiveness of the proposed techniques is shown through experiments for ISCAS'89 benchmark circuits.

Programming Exercise System with Automatic Test for Novice Programmers, Kenji KAWAMOTO, Hideyuki KANZA, Hidehiko KITA, Haruhiko TAKASE and Terumine HAYASHI : the 14th International Conference on Computers in Education (ICCE2006), Beijing, China, 2006

Programming exercises are essential for learning programming skills. However, they take a lot of time for teachers. So they cannot give their students enough advices on their programs. We have developed a programming exercise system assisting teachers. It checks students' programs syntactically and tests them automatically.

Influence of Si doping on the optical and structural properties of InGaN films, Da-bing LI, Takuya KATSUNO,Masakazu.AOKI, Hideto MIYAKE and Kazumasa HIRAMATSU: Journal of Crystal Growth 290, pp.374-378, 2006

Simulation of InGaP Liquid Phase Epitaxy Incluuding Convention, HiromotoSUGAWA*, Toshihiro TSUJI*, Kazumasa HIRAMATSU, Takashi JINBO*, and Tetsuo SOGA*: THEORETICAL AND APPLIED MECHANICS JAPAN 55, pp.279-284, 2006

Enhanced emission efficiency of InGaN films with Si Doping, Da-bing LI, Yu-huai LIU, Takuya KATSUNO, Keisuke NAKAO, Kazuya NAKAMURA, Masakazu.AOKI, Hideto MIYAKE and Kazumasa HIRAMATSU: Physica Status Solidi (c) 3, pp.1944-1948, 2006

Fabrication of thick AlN film by low pressure hydride vapor phase epitaxy, Yu-huai LIU , Tomoaki TANABE , Hideto MIYAKE , Kazumasa HIRAMATSU , Tomohiko SIBATA* and Mitsuhiro TANAKA*: Physica Status Solidi (c) 3, pp.1479-1482, 2006

n-type conductivity control of AlGaN with high Al mole fraction, Takuya KATSUNO , Yu-huai LIU , Dabing LI , Hideto MIYAKE , Kazumasa HIRAMATSU, Tomohiko SHIBATA* and Mitsuhiro TANAKA*: Physica Status Solidi (c) 3, pp.1435-1438, 2006

Enhancement of blue emission from Mg-doped GaN activated at low temperature in O_2/N_2 mixture, Da-Bing LI,

Katsuya NAKAMURA, Hideto MIYAKE, Kazumasa HIRAMATSU, Masaaki KOBAYASHI* and Shigeki KIKUTA*: Physica Status Solidi (c) 3, pp.2750-2753, 2006

Growth characteristics of carbon nanotubes on nanotip-formed substrate, Hideki SATO, Mai MATSUBAYASHI, Takamichi SAKAI, Koichi HATA, Hideto MIYAKE, Kazumasa HIRAMATSU, Akinori OSHITA and Yahachi SAITO*: Journal of Vacuum Science & Technology B 24, pp.1004-1007, 2006

Fabrication of high-quality nitride semiconductors by facet control technique, Hideto MIYAKE and Kazumasa HIRAMATSU: OYO BUTURI 75, pp.467- 472, 2006 [in Japanese]

Fabrication of LSMO Single Layers and LSMO/YBCO Double Layers, Hong Zhu, Masanori Okada, Atsushi Kamiya, Ajay K. Sarkar, Masahito Matsui, Md. Motin Seikh, Tamio Endo: International Journal of Nanoscience Vol.5, No.4-5, pp.511-515, 2006

Interaction between Abrikosov and Josephson Vortices Induced by Microwave Magnetic Field in Bi2212 Crystal: Vortex Dynamics under Crossing Field, Tamio Endo, Ajay K. Sarkar, Hong Zhu, Ken-ichi Nakanishi, Ayumu Nishio, Masanori Okada, Kazuhiro Endo*: Progress in Electromagnetics Research Symposium (Cambridge, USA), pp.583, 2006

Fabrication of YBCO and LBMO, and YBCO/LBMO Double Layers, Tamio Endo, Atsuya Akiba, Atsushi Kamiya, Hirokazu O-oka, tatsuo Morimoto, Hong Zhu, Hirofumi Yamasaki*, Kazuhiro Endo*: Beijing International Materials Week - International Conference on Superconducting Materials (Beijing, China), pp.79, 2006

Re-entrant Phase and Vortex Dynamics in Hi-Tc Superconducting Bi2212 Single Crystal, Tamio Endo, Ajay K. Sarkar, Ken-ichi Nakanishi, Ayumu Nishio, Atsuya Akiba, Hong Zhu, International Conference on Composites/Nano Engineering (Boulder, USA), CDROM, 2006

Microwave Absorption in LCMO/YBCO Superlattice, Hong Zhu, Atsuya Akiba, Atsushi Kamiya, Hirokazu O-oka, Tatsuo Morimoto, Hirofumi Yamasaki*, Kazuhiro Endo*, Tamio Endo, Jacobo Santamaria*, Axel Hoffmann*, Suzanne te Velthuis*: International Conference on Composites/Nano Engineering (Boulder, USA), CDROM, 2006

Tunneling Spectroscopy of Metallic Manganites with a Colossal Magnetoresistance Effect, Vladimir M. Svistunov*, V. N. Leonova*, M. A. Belogolovskii*, Yu. V. Medvedev*, Yu. F. Revenko*, Yuri M. Strzhemechny*, Tamio Endo: International Conference on Composites/Nano Engineering (Boulder, USA), CDROM, 2006

Microwave Properties on Hi-Tc Superconductors, Tamio Endo, Hong Zhu, Ajay K. Sarkar, Atsuya Akiba, Atsushi Kamiya, Hirokazu O-oka, Tatsuo Morimoto, Progress in Electromagnetics Research Symposium (Tokyo, Japan),

pp.263, 2006

Temperature Dependence of Microwave Absorption in Bi2212 Single Crystal, Hirokazu O-oka, Ajay K. Sarkar, Atsushi Kamiya, Ken-ichi Nakanishi, Tamio Endo, Md. Shahabuddin*: Progress in Electromagnetics Research Symposium (Tokyo, Japan), pp.264, 2006

Microwave Power Dependence of Microwave Absorption in Bi2212 Single Crystals, Tatsuo Morimoto, Ajay K. Sarkar, Atsuya Akiba, Ayumu Nishio, Tamio Endo, Md. Shahabuddin*: Progress in Electromagnetics Research Symposium (Tokyo, Japan), pp.265, 2006

Field Sweep-rate Dependence of Microwave Absorption in a-Oriented YBCO Superconductors: Atsuya Akiba, Hong Zhu, Tamio Endo, Masashi Mukaida*: Progress in Electromagnetics Research Symposium (Tokyo, Japan), pp.329, 2006

Microwave Absorption in Superconducting/Ferromagnetic YBCO/LCMO Superlattice, Hong Zhu, Atsuya Akiba, Tamio Endo, Jacobo Santamaria*, Axel Hoffmann*: Progress in Electromagnetics Research Symposium (Tokyo, Japan), pp.330, 2006

Magnetic Properties and FMR in LBMO and LSMO Thin Films, Atsushi Kamiya, Hong Zhu, Jose Colino*, Josep Nogues*, Tamio Endo: International Colloquium on Magnetic Films and Surfaces (Sendai, Japan), pp.50, 2006

Magnetoresistance and Magnetostriction of LBMO Thin Films, Hong Zhu, Ajay K. Sarkar, Hidetaka Nakashima, Atsuya Akiba, Ken-ichi Nakanishi, Josep Nogues*, Jose Colino*, Tamio Endo: International Colloquium on Magnetic Films and Surfaces (Sendai, Japan), pp.52, 2006

Fabrication of Single Layers of YBCO and LBMO, and Double Layers of YBCO/LBMO, Tamio Endo, Hong Zhu, Atsuya Akiba, Atsushi Kamiya, Hirokazu O-oka, Tatsuo Morimoto, IUMRS – International Conference in Asia (Jeju, Korea), pp.92, 2006

Effects of Substrate Surface Exposure to Oxygen-Plasma on a-c Orientation Growth of YBCO: Verification of Surface Migration Mechanism, Tamio Endo, Atsuya Akiba, Hong Zhu, Tatsuo Morimoto, Makio Ishikawa: International Conference on Solid Films and Surfaces (Bariloche, Argentina), Fr-Gro-1000, 2006

Fabrication of Nanostructured LBMO/YBCO Double Layers, Tamio Endo, Atsuya Akiba, Atsushi Kamiya, Hirokazu O-oka, Daichi Ashida, Tatsuki Machida, Hirofumi Yamasaki*, Kazuhiro Endo*: International Conference on Recent Trends in Nanoscience and Technology (Kolkata, India), pp.32, 2006

Growth Mechanism of Non c-axis Oriented Bi-2223 Superconducting Thin Films by MOCVD <Invited Talk>, Kazuhiro Endo*, Peter Badica*, Tamio Endo, Hisashi Kado*: International Conference on Recent Trends in Nanoscience and Technology (Kolkata, India), pp.29, 2006

Electron Paramagnetic Resonance Spectral Studies on Sapphite Mineral, S. Lakshmi Reddy*, Tamio Endo: International Conference on Recent Trends in Nanoscience and Technology (Kolkata, India), pp.260, (2006).

Growth control of carbon nanotubes by plasma- enhanced chemical vapor deposition and reactive ion etching, Hideki Sato, Takamichi Sakai , Mai Matsubayashi, Koichi Hata, Hideto Miyake, Kazumasa Hiramatsu, Akinori Oshita, Yahachi Saito*: Vacuum 80, No.7, pp.798-801, 2006

A novel process for growth of carbon nanotubes using plasma processes is reported. This process consists of formation of nanotips on substrate and growth of carbon nanotubes on it. The formation of the nanotips, which were formed under an intention to control formation of catalyst nanoparticles, was carried out on substrates by reactive ion etching. After the nanotips formation, the carbon nanotubes were grown on the substrate by plasma-enhanced chemical vapor deposition. Our results showed that the introduction of the nanotips on surface gave lower density and smaller diameter growth of carbon nanotubes than those without the structure.

Development of microfocused x-ray source by using carbon nanotube field emitter, Kunihiko Kawakita, Koichi Hata, Hideki Sato, Yahachi Saito*: Journal of Vacuum Science & Technology B 24, No.2, pp.950-952, 2006

To develop a microfocused x-ray source, field emission properties of a bundle of multiwalled carbon nanotubes were investigated under an ordinary vacuum pressure of 5 x 10^{-7} Torr for a practical use. Total emission current reached up to 1.3 mA at an applied voltage of -7 kV. An emitted electron beam was focused on a Cu anode by using a simple electrostatic lens and excited an x ray with the source size of less than 30 m. X-ray transmission images were taken as a preliminary demonstration for a microfocused x-ray source and clear images whose resolutions were nearly equal to the source size of x ray were easily obtained.

Growth of Carbon Nanotubes by Plasma-Enhanced Chemical Vapor Deposition, Hideki Sato, Koichi Hata: New Diamond and Frontier Carbon Technology, 16, No.3, pp.163-176, 2006

The growth of carbon nanotubes (CNTs) by plasma-enhanced chemical vapor deposition (PECVD) has attracted much attention because PECVD enables vertically aligned CNT growth and is applicable for CNT growth at low temperature. Large area growth of CNTs is also possible by PECVD. These are desirable features for the growth process of CNTs in nanoelectronics applications. Because of these features, it is expected that CNT growth has a variety of applications such as in field emission displays, interconnections in large-scale integrated circuits (LSIs) and optical devices. In this paper, we review studies of CNT growth by PECVD. Some examples of CNT growth by PECVD and selective CNT growth on substrates using semiconductor processes are described in this review.

Effect of catalyst oxidation on the growth of carbon nanotubes by thermal chemical vapor deposition, Hideki Sato,

Yasunori Hori, Koichi Hata, Kazuyuki Seko*, Hitoshi Nakahara*, Yahachi Saito*: Journal of Applied Physisc, 100, No.10, pp.104321_1-6, 2006

We report a heat treatment of catalyst in air that drastically enhances a growth of carbon nanotubes (CNTs) by means of thermal chemical vapor deposition (CVD). An Fe catalyst film deposited on a Si substrate was heat treated at 700 degrees C in air before the acetylene CVD. The growth rate of the CNTs grown with the heat treatment was more than seven times higher than that of growth without the heat treatment. A scanning electron microscopy observation showed that the heat treatment in air promotes a granulation of the Fe catalyst. X-ray photoelectron spectroscopy and reflection high energy electron diffraction analyses showed that the heat treatment in air promotes an oxidation of the catalyst film and formation of Fe_2O_3 nanoparticles, suggesting that the heat treatment of Fe catalyst in air prevented the formation of Fe silicide that would deactivate the catalyst effect of Fe. The Fe_2O_3 nanoparticles do not agglomerate and can keep their original particles size. Thus the catalyst can maintain a catalyst activity during CNTs growth and, as a result, gives a growth enhancement of CNTs.

Desorption of Adsorbed Gas Molecule on a Pentagon at a Tip of Carbon Nanotube by Pulse Laser Irradiation, Shunsaku Waki, Koichi Hata, Hideki Sato, Yahachi Saito*: Technical Digest of 19th International Vacuum Nanoelectronics Conference & 50th International Field Emission Symposium, pp.263-264, 2006

Low Temperature Growth of Carbon Nanotubes by Alcohol Catalytic CVD for Field Emitter Applications, Hideki Sato, Koichi Hata, Ken Hiasa, Yahachi Saito*: Technical Digest of 19th International Vacuum Nanoelectronics Conference & 50th International Field Emission Symposium, pp.335-336, 2006

Development of Compact SEM Equipped with Carbon Nanotube Field Emission Cathode, Technical Ryosuke Yabushita, Koichi Hata, Hideki Sato, Yahachi Saito*: Technical Digest of 19th International Vacuum Nanoelectronics Conference & 50th International Field Emission Symposium, pp.427-428, 2006

Electron Optical System for Micro-Focused X-ray Source with Carbon Nanotubes Field Emitter,
Technical Digest, Koichi Hata, Kunihiko Kawakita, Hideki Sato, Yahachi Saito*: Technical Digest of International Vacuum Nanoelectronics Conference & 50th International Field Emission Symposium, pp.429-430, 2006

Percolation Phenomena of Composites Made with Two Kinds of Filler and A New Potential Grading Materials, Tetsushi Okamoto*, Makoto Kawahara*, Toshimitsu Yamada*, Yoshiyuki Inoue* and Shuhei Nakamura: Trans. IEE of Japan, Vol. 126-A, pp. 1004-1012, 2006

During the last three decades, extensive and worldwide research has resulted in progress being made with respect to many aspects of percolation phenomena of composites with one kind of filler. However, composites made with two kinds of filler have not yet been investigated in depth. The percolation phenomena of the potential grading materials made up of silicon carbide, tri-iron oxide and high density polyethylene have been discussed in this study. As a result, a potential grading layer, which has a stable and excellent partial discharge suppression capability, has been developed.

Mechanical properties of composite materials made with PDMS-ethyl silicate hybrid and silica powder, S. Magara, F.

Imasato, A. Ohno, Y. Aoki, S. Nakamura, T. Shindo, T. Kawakita, T. Okamoto: Organic Materials for Electronics and Photonics, KOREA-JAPAN JOINT FORUM 2006, p. 167, 2006.

Application of a Hybrid Material Made with Ethoxy-Altered PDMS and TEOS to Thermostable Adhesives, A. Ohno, F. Imasato, S. Magara, Y. Aoki, S. Nakamura, T. Shindo, T. Kawakita, T. Okamoto: Organic Materials for Electronics and Photonics, KOREA-JAPAN JOINT FORUM 2006, p.168, 2006

Thermally Stable Proton Conductive Organic-Inorganic Hybrid Materials, Y. Aoki, T. Shindou: Organic Materials for Electronics and Photonics, KOREA-JAPAN JOINT FORUM 2006, p.169, 2006

Development of Thermally Conducting Sheet Made with PDMS-Based Organic-Inorganic Hybrid Material, Y. Aoki, S. Nakamura, T. Shindou: Organic Materials for Electronics and Photonics, KOREA-JAPAN JOINT FORUM 2006, p.170, 2006

CHANGE IN HEAT RESISTIVE, ELECTRICAL INSULATING AND MECHANICAL PROPERTIES OF HYBRID MADE WITH PDMS AND TEOS FOR THE MOLE RATIO OF THEM, Tetsushi OKAMOTO*, Takuya SHINDOU*, Makoto SUGIURA, Shuhei NAKAMURA: Conf. on Elect. Insul. Dielec. Phenom., pp.55-60, 2006

Electrical Insulating and Heat Resistive Properties of TEOS-PDMS Hybrid Materials [in Japanese], Tetsushi Okamoto, Fumitoshi Imasato, Takuya Shindou, Shuhei Nakamura: ,Proceedings of the 37th Symposium on Electrical and Electronic Insulating Materials and Applications in systems, pp.117-120, 2006

Preparation of Organic-inorganic Hybrid Materials by Sol-gel Method at Low Temperature and Their Application to Thermally Conducting Sheets [in Japanese], Yusuke Aoki, Shuhei Nakamura, Takuya Shindou: The papers of Technical Meetings on Dielectrics and Electrical Insulation, IEE Japan, pp.43-47, 2006.

Organic-Inorganic Hybrid Material and Its Application to Adhesive [in Japanese], Shuhei NAKAMURA, Atsushi OHNO, Yusuke AOKI, Takuya SHINDOU, Tadashi KAWAKITA: IEICE Technical Report OME2006-93 (2006-11), pp. 13-18, 2006