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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.

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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

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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

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Selective growth of carbon nanotubes (CNTs) to required positions is a matter of importance for an application to electron sources for field emitter arrays. Although some techniques have been proposed concerning the selective growth of carbon nanotubes, they have complex processes and difficulties in reliability and controllability. We have developed the selective CNT growth technique, which consists of fabrication of pyramid-shaped protrusion arrays on silicon (Si) substrate by a liftoff process, selective deposition of metal catalyst film on the vertexes of the protrusions, and growth of the CNTs on the metal catalyst by chemical vapor deposition (CVD). Here we report the detailed growth characteristics of CNTs selectively grown by thermal CVD (TCVD) on vertexes of pyramid-shaped protrusions fabricated on Si substrate. The growth of CNTs by TCVD gave long, randomly oriented and dispersed CNT growth, which was completely different from growth regimes given by plasma enhanced CVD (PECVD), i.e., vertically

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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