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A Study about the Posture and Joint Stiffness at Stationary Force Control of Human Arm, Syugo UCHIDA, Satoshi KOMADA, and Junji HIRAI: Proceedings of the 8th International Workshop on Advanced Motion Control, pp.359-362, 2004.

The purpose of our research is to realize a simple and high performance control of robots using strategy of human arm operation. This time, we measure joint angle and joint stiffness of human arm during force control. When tip force is large, human being selects the posture using joint torque minimum index. When tip force is small, human being selects the posture so that manipulability becomes large. Moreover, the wrist stiffness becomes large so as to keep the posture. In order to adapt for perturbation, a regulator to avoid joint torque saturation is introduced. The effectiveness of this strategy is confirmed by a simulation result of human arm.

Joint Design Method Based on Coprime Factorization of 2DOF Control System, Tsuyoshi HIOKI, Kazuhiro YUBAI, and Junji HIRAI: Proceedings of the 8th International Workshop on Advanced Motion Control, pp.523-527, 2004.

In many cases, control system synthesis is formulated as minimization of prescribed closed loop performance reflecting control requirements. Since the closed loop performance is a function of a controlled plant and a controller, a model identification and a controller design must interact with each other. This motivates us to consider the model identification and the 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. On the other hand, we have analyzed the internal structure of 2DOF control system using a coprime factorization on RH and shown that two free parameters, K and Q RH , specify the tracking performance and the feedback performance, respectively. Also Tay et.al have proposed a parameterization of the plant dynamics by switching the role of the controlled plant and the 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 a wider class than the conventional joint design method.

Fault-Tolerant Control System of Flexible Arm for Sensor Fault by Using Reaction Force Observer, Yu IZUMIKAWA, Kazuhiro YUBAI, Junji HIRAI: Proceedings of the 8th International Workshop on Advanced Motion Control, pp.583-588, 2004.

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 stability and 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 has a strain gauge sensor signal observer 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.

Tracking of Moving Object by Manipulator Using Estimated Image Feature and Its Error Correction on Image Planes, Dai NISHIO, Masaru NAKAMURA, Satoshi KOMADA, and Junji HIRAI: Proceedings of the 8th International Workshop on Advanced Motion Control, pp.653-657, 2004.

This paper proposes a new visual servo system compensating delay time of image processing. To obtain an image feature without delay time, variation of image feature of manipulators during delay time is estimated by a Jacobian matrix from joint velocity to image feature. An image feature of moving object during delay time is estimated from a simple model by using the average velocity/acceleration that are calculated from the past image data. Moreover, its estimation error is reduced by a method based on past estimation error. The effectiveness of the proposed strategy is confirmed by a tracking of a moving object by a manipulator.

A Preliminary Study for Reconfigurable Robot System, Akihiko MATSUURA, Yuji ISHIKURA, and Junji HIRAI: Proceedings of the 30th Annual Conference of the IEEE Industrial Electronics Society (IECON 2004), vol. 2, pp.1052-1057, 2004.

In order to expand the scope of robot application, the robot should cope with the divergence of the assigned tasks and surrounding environments. With the conventional type of robot, however, the scope of the application is limited due to the lack of its reconfigurability. The authors, therefore, propose to realize a novel robot called reconfigurable robot, which is capable of changing its structure adaptively to the situation and the given tasks. The fundamental features of the robot are introduced and problems to be solved for its realization are described in this paper.

Preliminary Study on Robotic Exercise Therapy, Takashi HISADA, Noboru OKUYAMA, Satoshi KOMADA, and Junji HIRAI: Proceedings of the 30th Annual Conference of the IEEE Industrial Electronics Society (IECON 2004), vol. 3, pp.2780-2785, 2004.

This paper proposes a new concept of robotic exercise that displays human muscle force during rehabilitation procedures. The estimation is made by combination of an isokinetic dynamometer improved from its original usage for rehabilitation and a conventional muscle force estimation method based on a musculo-skeletal model which has been applied for human gait analysis. The novel isokinetic dynamometer the authors developed has a force sensor for the musculo-skeletal model analysis, and provides an arbitrary training trajectory control function. The musculo-skeletal model analysis is constructed limitedly to the under limb movement, and the muscle force estimation is made in the thigh area by employing the two optimization methods. As a result of experiments, we confirmed that there is really not much difference between the results of two methods.

Harmonic Current Suppression Using Repetitive Control for Improvement of PMSM Control Performance, Jeong-seong KIM, Shinji DOKI, Muneaki ISHIDA : IEEJ Trans. IA, Vol. 124, No. 12, pp. 1189-1196, 2004

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Resistance Heating Control with A Few Flashing Using PWM Inverter –Flash Welding Control by Use of PWM Inverter Power Supply (3rd Report)-, Yukihiko SATO, Muneaki ISHIDA : Quar. J. JWS, Vol. 22, No. 3, pp. 430-434, 2004

Basic Study on Conductive Characteristics of SiC Power Device for Its Application to AC/DC Converter, Tatsuya MATSUKAWA, Hirotaka CHIKARAISHI*, Yoshihisa SATO*, Ryuichi SHIMADA* : IEEE Trans. on Applied Superconductivity, Vol. 14, No. 2, pp. 690-692, 2004

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Construction of Solar Module Simulator Using Linear Amplifier, Hiroto HAYASHI, Naoki YAMAMURA and Muneaki ISHIDA: Proceedings of international conference on Electrical Engineering 2004 (ICEE 2004), p.p.542-547, 2004-7

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Direct visualization of electromagnetic micro-field by superposition of three types of electron holograms, Masaaki OKUHARA*, Akinori OHSHITA, Yohei YAMAKAWA, Koichi HATA and Kazuo IIDA : Proceedings of 8th Asia-pacific Conference on Electron Microscopy, 2004

A new electron holographic method is presented for direct visualization of electromagnetic micro-fields. In this method, three types of electron holograms obtained under the same operating condition of an electron biprism are superposed. The phase information which cannot be extracted from the modified double-exposure electron hologram can be obtained. This implies that we can get the more information by using three types of electron holograms.

Direct visualization of magnetic micro-field around a barium ferrite particle by modified double-exposure electron holography, Akinori OHSHITA, Masaaki OKUHARA*, Yohei YAMAKAWA, Koichi HATA and Kazuo IIDA : Proceedings of 13th European Microscopy Congress, 2004

        Double-exposure electron holography, three-electron-wave interference method and four-electron-wave interference method were developed for direct visualization of pure phase objects such as electromagnetic micro-fields. Although the three-electron-wave and four-electron-wave interference methods are very useful, two electron biprisms are indispensable. Therefore we proposed the modified double-exposure electron holographic method using an electron biprism. In this paper, we present an experimental result of magnetic-field observation with this method.

Low molecular weight of fluid in an alloy of EPDM/SIR, Kazuo IIDA and Reuben HACKAM*, 2004 Annual Report Conference on Electrical Insulation and Dielectric Phenomena, pp.607-610, 2004

        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 and polluted conditions as a result of the presence of silicone fluid on the surface. This is sustained by the 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. A study of the amount, loss and generation of the LMW fluid in an alloy of EPDM/SIR used for outdoor insulators has been performed as a function of temperature in order to simulate the effects of the heat generated by the dry band arcings on the surface. From an infrared (IR) spectroscopy study, the LMW fluid extracted from the virgin specimen is found to be composed of two kinds of fluids; one comes from the EPDM and the other comes from the SIR components of the alloy. The component of the fluid from the SIR initially decreases with sequential heating at 200 ^{o}C for 32 h in air and extraction by immersion in hexane at 44 ^{o}C for 96 h, but then the component of the fluid from EPDM finally becomes predominant.

Two Dimensional Motion Tracking of Left Ventricular Myocardium Using Ultrasonic Doppler Signal, Wataru OHYAMA, Toshikazu MURAMATSU, Tetsushi WAKABAYASHI, Fumitaka KIMURA, Shinji TSURUOKA, and Kiyotsugu SEKIOKA*: Proc. of the Sixth IASTED International Conference on Signal and Image Processing, pp.436-440 (#444-187), 2004

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Regional Tissue Estimation for Myocardium Using Phase Frequency Spectrum of Ultrasonic RF Signal, Yoshikadu YASUMOTO, Hirotake ISHII, Shinji TSURUOKA, Fumitaka KIMURA, Tetsushi WAKABAYASHI, Wataru OHYAMA, and Kiyotsugu SEKIOKA*: The tenth International Conference on Virtual Systems and Multimedia (VSMM2004) , pp.82-88, 2004

Hybrid Automatic Tracking of Regional Myocardium from Ultrasonic RF Echo Signal Using Cardiac Cycle Estimation, Akihiko KAWABATA, Shinji TSURUOKA, Wataru OHYAMA, Hiroharu KAWANAKA* and Kiyotsugu SEKIOKA*, The tenth International Conference on Virtual Systems and Multimedia (VSMM2004) , pp.307-310, 2004

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Electrical and Magnetic Properties of La(Ba)MnO3 Thin Films, Tamio ENDO, Shin-ichi IWASAKI, Kouji YOSHII, Takahisa SAKURADA, Michi OGATA, Ajay SARKAR, Josep NOGUES*, Juan MUNOZ*, Jose COLINO*: Trans. Mat. Res. Soc. Jpn. 29(4), pp.1431-1436, 2004

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Brightness of electron beam emitted from a single pentagon on a multiwall carbon nanotube tip, Koichi HATA, Akihiro TAKAKURA, Akinori OHSHITA, and Yahachi SAITO*: Surface and Interface Ana2004lysis 36, pp.506-509, 2004

A capped multiwall carbon nanotube (MWNT) with clean surface gives field emission patterns consisting of six pentagonal rings corresponding to pentagons located at the tip.   To evaluate optical properties of a single pentagon as an electron source, I-V characteristics and angular current densities for a single clean pentagon have been measured by probe-hole type field emission microscopy (FEM).   A reduced brightness estimated from the angular current density and the geometrical size of pentagon, reached about 5.6 × 10^9 A/(m^{2}srV) at an emission current of 53 nA. This value of reduced brightness is one order of magnitude or more higher than that of individual MWNT field emitter reported by Jonge *et al.*

Interference fringes observed in electron emission patterns of a multiwall carbon nanotube, Koichi HATA, Akihiro TAKAKURA, Kenji MIURA, Akinori OHSHITA, and Yahachi SAITO*: Journal of Vacuum Science & Technology B, 22, 3, pp.1312-1314, June ,2004

A capped multiwall carbon nanotube (MWNT) with clean surface gives field emission patterns consisting of six pentagonal rings which correspond to pentagons located at the tip end.   One or a few bright streaks are also observed at the boundaries of neighboring pentagons.   The spacing of streaks is inversely proportional to the square root of the accelerating voltage.   Namely, the spacing changes with the wave length of emitted

electrons according to Young's interference equation.   The visibility of streaks increased with the accelerating voltage, which can be explained successfully in terms of a concept of a virtual source size.   These experimental results suggest that the streaks are no more than Young's interference fringes for which the adjacent pentagons behave as double slits.

Fabrication of carbon nanotube array and its field emission property, H. SATO, H. TAKEGAWA, H. YAMAJI, H. MIYAKE, K. HIRAMATSU and Y. SAITO*: Journal of Vacuum Science & Technology B 22 (3) pp.1335-1337, 2004

A novel fabrication process for carbon nanotubes (CNTs) field emitter array is reported.   This process consists of formation of a protrusion on a silicon substrate, selective deposition of catalyst film on tips of the protrusions and direct growth of carbon nanotubes on the tips of the protrusions by plasma-enhanced chemical vapor deposition (PECVD).   In this process, number of the CNTs grown on each tip of the protrusion can be controlled by size of the protrusion.   The CNTs field emitter arrays gave better field emission property than a continuous CNTs film.   A threshold voltage required to obtain $1\mu A/cm^2$ of field emission current from the CNTs field emitter array was about 300V lower than that from the continuous CNTs film.   This improvement is presumably due to reduction of screening effect, which prevents the field from concentrating on the tip of the CNT emitters.

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