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FOREWORD FROM EDITOR-IN-CHIEF

Journal of Mechatronics, Electrical Power, and Vehicular Technology (MEV) has been accreditated by the Indonesian Institute of Sciences (LIPI) in April 2012. It started using Open Journal System (OJS) since the online publishing of the third volume released in July 2012. This journal has been indexed by Google Scholar, Directory of Open Access Journal (DOAJ), Indonesian Scientific Journal Database (ISJD), Indonesian Publication Index (IPI)/Portal Garuda, Crossref, Mendeley, CiteULike, Academic Journal Database, ResearchBib, and Cite Factor. In addition, it has been granted Digital Object Identifier with the DOI Prefix 10.14203.

This issue publishes eight papers, all are written in English, with the total number of paper pages of 70 pages. The selected papers in this issue have passed some levels of reviews and revisions based on the standard operating procedure of the journal. Four topics are related to mechatronics, three topics to electrical power and one topic to vehicular technology. Most of the papers reflect one of the characteristics of this journal i.e. interdisciplinary. In the paper concerning nano-fiber fabrication, for example, the authors who have different backgrounds of expertise tackle a focused issue in a multidisciplinary approach.

The policy up to this current issue is that both authors and readers are not charged at all. On the other hand, the editorial board is planning to improve the quality by registering the journal to other international academic citation index. Moreover, the editorial board is also considering to gradually increase the number of papers and journal's pages. All of this plan will give consequence on financial burden. Therefore, from the next issue, financial policy will probably change based on that condition.

We wish to offer our thanks to all the editorial members and the Research Center for Electrical Power and Mechatronics (RC-EPM) – Indonesian Institute of Sciences (LIPI) for their continuing unwavering support. Also, we would like to acknowledge our gratitude to this issue's International Editorial Board members, reviewers and authors.

We hope this publication would contribute to the enhancement of science and technology.

Bandung, December 2013

Editor-in-Chief

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ABSTRACTS SHEET

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Design and Development of A Control System forNanofiber Electrospinning

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2,p. 65-74, 16 ill, 4tab, 15 ref.

This paper describes the development of a control hardware and software for a nano-fiber electro-spinning system. Thehardware consists of motor driver boards, a high DC voltage board, and a main control board. The user interface software on PCis developed using Visual Studio C # 2010 express edition. The motor driver boards are controlled by an ATmega8microcontroller IC, while the main board is controlled by an ATmega 128 microcontroller IC. Communication between the mainboard and the motor driver boards uses the inter integrated circuit (I2C), while communication between PC and the main boarduses a serial communication at a baud rate of 9600 bps. The high DC voltage generator is designed to have an output of 0-25 kV.High DC voltage output is configurable by giving a combination of low logic and high impedance into a six bit input. The resultshow that maximum output of high DC voltage is 25.025 kV with formula of curve is y = 1x-0.0244 with R2=0.9998 and pcsoftware interface can work very well. Polymer flow rate can be configured from PC interface software via I2C connected to themain board. The flow rate y follows the RPM setting x, according to the formula y = 0.954x – 0.0099 with R2 = 1. The results ofscanning electron microscope (SEM) for morphology analysis of PVDF copolymer composite nano-fiber shows that the averagediameter of the resulted fiber is 136.43 nm, when output high DC voltage is set to 15 kV and speed of syringe pump is set to 5RPM..

(Author)

Keywords: electrospinning, high DC voltage, I2C, motor driver, microcontroller, PC interfacesoftware.

Moh. Zaenal Efendi [a], Novie Ayub Windarko [a], M. Faisal Amir [a]([a]Department of Electrical Engineering, Politeknik Elektronika Negeri Surabaya, Surabaya)

Design and Implementation of Battery Charger with Power Factor Correction using Sepic Converter and Full-Bridge DC-DC Converter

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2, p. 75-80, 11 ill, 3tab, 12 ref.

This paper presents a design and implementation of a converter which has a high power factor for battery charger application. The converter is a combination of a SEPIC converter and a full-bridge dc-dc converter connected in two stages of series circuit. The SEPIC converter works in discontinuous conduction mode and it serves as a power factor corrector so that the shape of input current waveform follows the shape of input voltage waveform. The full-bridge dc-dc converter serves as a regulator of output voltage and operates at continuous conduction mode. The experimental results show that the power factor of this converter system can be achieved up to 0.96.

(Author)

Key words: SEPIC converter,full-bridgedc-dc converter, discontinuous conduction mode, power factor correction, battery charger.

Demi Soetraprawata, Arjon Turnip(Technical Implementation Unit for Instrumentation Development Division – LIPI, Bandung)

The Performance of EEG-P300 Classification using Backpropagation Neural Networks

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2, p. 81-88, 4 ill, 4tab, 22 ref.

Electroencephalogram (EEG) recordings signal provide an important function of brain-computer communication, but the accuracy of their classification is very limited in unforeseeable signal variations relating to artifacts. In this paper, we propose aclassification method entailing time-series EEG-P300 signals using backpropagation neural networks to predict the qualitative properties of a subject's mental tasks by extracting useful information from the highly multivariate non-invasive recordings ofbrain activity. To test the improvement in the EEG-P300 classification performance (i.e., classification accuracy and transferrate) with the proposed method, comparative experiments were conducted using Bayesian Linear Discriminant Analysis (BLDA).Finally, the result of the experiment showed that the average of the classification accuracy was 97% and the maximum improvement of the average transfer rate is 42.4%, indicating the considerable potential of the using of EEG-P300 for the continuous classification of mental tasks.

(Author)

Keywords: EEG-P300 classification, backpropagation neural networks, BLDA, accuracy, transfer rate.

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Economic Analysis of Cikaso Mini Hydro Power Plant as A Cdm Project for Increasing IRR

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2, p. 89-98, 4ill, 13tab, 17 ref.

Renewable energy fueled power generations are few developed by private sector in Indonesia. High-cost investment and low electricity selling price to PT PLN as a single buyer is main barriers for private sector to involve in the development of renewable energy fueled power generations. In this project, the economic feasibility of Mini Hydro Power Plant of Cikaso with capacity of 5.3 MW, located at Sukabumi Regency, Jawa Barat province was assessed. This project utilized revenue generated from carbon market to increase the economic feasibility. Procedure to register the project to United Nation for Climate Change Convention (UNFCCC) as a Clean Development Mechanism project was explained in detail. Approved Consolidation Methodology (ACM) 0002 Version 12.3.0 was used to calculate grid emission factor in Jawa-Bali – Madura the grid electricity system. It was calculated that the grid emission factor is 0.833 (t-CO2/MWh), and the carbon emission reduction generated for this project is 21,982 ton/year. From the analysis result, it can be proven that the additional revenue from carbon credit could increase the project IRR from 10.28% to 13.52%.

(Author)

Keywords: mini hydro power plant, Clean Development Mechanism, emission factor, IRR.

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Object Recognition System in Remote Controlled Weapon Station Using Sift and Surf Methods

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2, p. 99-108, 17 ill, 4tab, 14 ref.

Object recognition system using computer vision that is implemented on Remote Controlled Weapon Station (RCWS) is discussed. This system will make it easier to identify and shoot targeted object automatically. Algorithm was created to recognizereal time multiple objects using two methods i.e. Scale Invariant Feature Transform (SIFT) and Speeded Up Robust Features (SURF) combined with K-Nearest Neighbors (KNN) and Random Sample Consensus (RANSAC) for verification. The algorithm is designed to improve object detection to be more robust and to minimize the processing time required. Objects are registered on the system consisting of the armoured personnel carrier, tanks, bus, sedan, big foot, and police jeep. In addition, object selection can use mouse to shoot another object that has not been registered on the system. Kinect(™) isused to capture RGB images and to find the coordinates x, y, and z of the object. The programming language used is C with visual studio IDE 2010 and opencv libraries. Object recognition program is divided into three parts: 1) reading image from kinect(™) and simulation results, 2) object recognition process, and 3) transfer of the object data to the ballistic computer. Communication between programs is performed using shared memory. The detected object data is sent to the ballistic computer via Local Area Network (LAN) using winsock for ballistic calculation, then the motor control system moves the direction of the weapon model to the desired object. The experimental results show that the SIFT method is more suitable because more accurate and faster than SURF with the average processing time to detect one object is 430.2 ms, two object is 618.4 ms, three objects is 682.4 ms, and four objects is 756.2 ms. Object recognition program is able to recognize multi-objects and the data of the identified object can be processed by the ballistic computer in realtime.

(Author)

Keywords: RCWS, object recognition, shared memory, SIFT, SURF, opencv, C language, kinect(™).

Hendri Maja Saputra [a], Arif Santoso[a], Midriem Mirdanies[a],Vikita Windarwati[b], Riastus Nayanti[b], Lukni Maulana[b]([a]Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Bandung; [b]Mechatronics Department, Faculty of Engineering - Yogyakarta State University, Yogyakarta)

Control of Pan-Tilt Mechanism Angle using Position Matrix Method

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2, p. 109-116, 7 ill, 0tab, 10 ref.

Control of a Pan-Tilt Mechanism (PTM) angle for the bomb disposal robot Morolipi-V2 using inertial sensor measurement unit, x-IMU, has been done. The PTM has to be able to be actively controlled both manually and automatically in order to correct the orientation of the moving Morolipi-V2 platform. The x-IMU detects the platform orientation and sends the result in order to automatically control the PTM. The orientation is calculated using the quaternion combined with Madwick and Mahony filtermethods. The orientation data that consists of angles of roll (α), pitch (β), and yaw (γ) from the x-IMU are then being sent to the camera for controlling the PTM motion (pan & tilt angles) after calculating the reverse angle using position matrix method.Experiment results using Madwick and Mahony methods show that the x-IMU can be used to find the robot platform orientation. Acceleration data from accelerometer andflux from magnetometer produce noise with standard deviation of 0.015g and 0.006G, respectively. Maximum absolute errors caused by Madgwick and Mahony method with respect to X-axis are 48.45º and 33.91º, respectively. The x-IMU implementation as inertia sensor to control the Pan-Tilt Mechanism shows a good result, which the probability of pan angle tends to be the same with yaw and tilt angle equal to the pitch angle, except a very small angle shift due to the influence of roll angle.

(Author)

Keywords: Pan-Tilt control, x-IMU sensor, quaternion, position matrix, Morolipi-V2.

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Combustion Property Analysis and Control System for The Dynamics of A Single Cylinder Diesel Engine

Mechatronics, Electrical Power, and Vehicular Technology, December 2013, vol. 4, no. 2, p. 117-126, 10 ill, 3tab, 19 ref.

Corresponding to global environment problems in recent year, the technology for reducing fuel consumption and exhaust gas emission of engine was needed. Simulation of transient engine response is needed to predict engine performance that frequently experience rapid changes of speed. The aim of this research is to develop a non-linear dynamic control model for direct injection single cylinder diesel engine which can simulate engine performance under transient conditions. In this paper, the combustion model with multistage injection and conducted experiments in the transient conditions to clarify the combustion characteristics was proposed. In order to perform the analysis of acceleration operation characteristics, it was built a Model Predictive Control (MPC) to reproduce the characteristic values of the exhaust gas and fuel consumption from the control parameters in particular. Finally, MPC is an effective method to perform the analysis of characteristic in diesel engine under transient conditions.

(Author)

Keywords: model predictive control (MPC), transient, diesel engine, disturbance, modeling.

Seno Aji [a], Dwi Ajiatmo [b], Imam Robandi [a], Heri Suryoatmojo [a]([a] Department of Electrical Engineering, Institut Teknologi Sepuluh Nopember (ITS), Surabaya; [b] Department of Electrical Engineering, Universitas Darul Ulum Jombang, Jombang)

MPPT Based on Fuzzy Logic Controller (FLC) for Photovoltaic (PV) System in Solar Car

Mechatronics, Electrical Power, and Vehicular Technology,

December 2013, vol. 4, no. 2, p. 127-134, 13 ill, 5tab, 11 ref.

This paper presents a control called Maximum Power Point Tracking (MPPT) for photovoltaic (PV) system in a solar car. The main purpose of this system is to extracts PV power maximally while keeping small losses using a simple design of converter. Working principle of MPPT based fuzzy logic controller (MPPT-FLC) is to get desirable values of reference current and voltage. MPPT-FLC compares them with the values of the PV's actual current and voltage to control duty cycle value. Then the duty cycle value is used to adjust the angle of ignition switch (MOSFET gate) on the Boost converter. The proposed method was shown through simulation performed using PSIM and MATLAB software. Simulation results show that the system is able to improve the PV power extraction efficiency significantly by approximately 98% of PV's power.

(Author)

Keywords: maximum power point tracking (MPPT), photovoltaic (PV), boost converter, fuzzy logic controller, solar car.

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