Journal of

Mechatronics, Electrical Power, and Vehicular Technology

Volume 04, Issue 1, July 2013

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Mechatronics, Electrical Power, and Vehicular Technology (MEV) is a journal aims to be a leading international peer-reviewed platform and an authoritative source of information. We publish original research papers, review articles and case studies focused on:

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Indexed in Google Scholar, Directory of Open Access Journal (DOAJ), Indonesian Scientific Journal Database (ISJD), and Indonesian Publication Index (IPI).

Journal of

Mechatronics, Electrical Power, and Vehicular Technology

Volume 04, Issue 1, July 2013

IMPRINT

Journal of Mechatronics, Electrical Power, and Vehicular Technology (MEV) is published and imprinted by Research Center for Electrical Power and Mechatronics - Indonesian Institute of Sciences (RCEPM-LIPI).

MEV Journal is managed to be issued twice in every volume. For every edition, the online edition is published earlier than the print edition.

ISSN print edition: 2087-3379
ISSN electronics edition: 2088-6985

Electronics edition is available at www.mevjournal.com

ACCREDITATION

MEV Journal has been certificated as National Scientific Journal by Indonesian Institute of Sciences (LIPI) by 24 April 2012.

Accreditation Number:
432/Akred-LIPI/P2MI-LIPI/04/2012

Valid thru: 24 April 2015

POSTAL ADDRESS

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Journal of

Mechatronics, Electrical Power, and Vehicular Technology

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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 Directory of Open Access Journal (DOAJ), Google Scholar, Indonesian Scientific Journal Database (ISJD), and Indonesian Publication Index (IPI). Recently 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 are 64 pages. The selected papers in this issue have passed some levels of reviews and revisions based on the standard operating procedure of the journal. Two topics are related to mechatronics, four topics to electrical power and two topics to vehicular technology.

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 elevate 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 administration division of the Research Center for Electrical Power and Mechatronics (RCEPM) – 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 and peer reviewers: Prof. Dr. Taufik, Prof. Dr. Rosli bin Abu Bakar, Prof. Dr. Muhammad Nizam, Arko Djajadi, Ph.D., Edi Leksono, Ph.D., Dr. Yuliadi Erdani, Dr. Riza Muhida, Dr. Ahmad Agus Setiawan, Dr. Rizqon Fajar, Dr. Yoyon Ahmudiarto, and Dr.-Ing. Mochamad Ichwan.

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

Bandung, July 2013

Editor-in-Chief

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Mechatronics, Electrical Power, and Vehicular Technology

Volume 04, Issue 1, July 2013

ABSTRACTS SHEET

e-ISSN: 2088-6985
p-ISSN: 2087-3379

Date of issues: 30 July 2013

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

Autoregressive Integrated Adaptive Neural Networks Classifier for EEG-P300 Classification

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 1-8, 6 ill, 0 tab, 19 ref.

Brain Computer Interface has a potency to be applied in mechatronics apparatus and vehicles in the future. Compared to the other techniques, EEG is the most preferred for BCI designs. In this paper, a new adaptive neural network classifier of different mental activities from EEG-based P300 signals is proposed. To overcome the over-training that is caused by noisy and non-stationary data, the EEG signals are filtered and extracted using autoregressive models before passed to the adaptive neural networks classifier. To test the improvement in the EEG classification performance with the proposed method, comparative experiments were conducted using Bayesian Linear Discriminant Analysis. The experiment results show that the all subjects achieve a classification accuracy of 100%.

(Author)

Keywords: brain computer interface, feature extraction, classification accuracy, autoregressive, adaptive neural networks, EEG-based P300, transfer rate.

Dodiek Ika Candra [a,b], Camilo Andreas Wilches Tamayo [b] ([a]Research Centre for Electrical Power & Mechatronics, Indonesian Institute of Sciences, Bandung; [b]bwe biogas-weser-ems GmbH & Co. KG, Friesoy-Germany)

Optimization for Biogas Power Plants using Automatic Control of Gas Pressures

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 9-16, 13 ill, 2 tab, 13 ref.

In many cases, gas storages on biogas power plants are not used optimally to store gas as much as their capacity. The digester is sometimes overload to store gas and the controller cannot deliver gas to other storage. Consequently, gas is often released from digester to avoid over pressure. At the end, biogas power plant has less efficiency. Hence, a mechanism to control gas pressure to make different pressure between its storages is required. Fans were used to manipulate the most majority system pressures on a biogas power plant using frequency converters. Measurements, simulations, and experiments were conducted to create a new system on a biogas power plant. A controller, Programmable Logic Controller was used to control the entire system pressure using Proportional-Integral-Derivative algorithm. When the gas pressures are not in the allowable range of pressure, then the controller changes the fans' frequency to the desired conditions. As a result, gas moves to another storage and system pressures are in the allowable range.

(Author)

Keywords: control biogas pressures, biogas storages optimization, biogas system pressure.

Yanuandri Putrasari, Arifin Nur, Aam Muharam (Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Bandung)

The Influence of Two Cylinder Diesel Engine Modification (IDI to DI) on the Performance and Its Emission

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 17-24, 10 ill, 3 tab, 19 ref.

Modification of combustion system from indirect injection (IDI) to direct injection (DI) was carried out on the two cylinder diesel engine, followed with tests for performance and emission. The modification from IDI to DI was conducted on a two cylinder diesel engine by removing the pre-chamber from the inside of the cylinder head, replacing the injector and its position to the top of the combustion chamber directly and also replacing the original piston with a piston that has a bowl on the crown. Performance and emission tests were conducted on 1,500 rpm with loads that vary from 0, 10, 20, 30, 40, 50, to 60 Nm. The investigation results of the diesel engine modification from IDI to DI showed several interesting phenomena. Further research is needed in order to increase the engine performance and reduce its emission.

(Author)

Keywords: diesel, IDI, DI, performance, emission.

Ghalya Pikra, Andri Joko Purwanto, Adi Santoso (Research Centre for Electrical Power & Mechatronics, Indonesian Institute of Sciences, Bandung)

Effect of Regenerative Organic Rankine Cycle (RORC) on the Performance of Solar Thermal Power in Yogyakarta, Indonesia

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 25-32, 12 ill, 3 tab, 28 ref.

This paper presents effect of Regenerative Organic Rankine Cycle (RORC) on the performance of solar thermal power in Yogyakarta, Indonesia. Solar thermal power is a plant that uses solar energy as heat source. Indonesia has high humidity level, so that parabolic trough is the most suitable type of solar thermal power technology to be developed, where the design is made with small focal distance. Organic Rankine Cycle (ORC) is a Rankine cycle that use organic fluid as working fluid to utilize low temperature heat sources.

RORC is used to increase ORC performance. The analysis was done by comparing ORC system with and without regenerator addition. Refrigerant that be used in the analysis is R123. Preliminary data was taken from the solar collector system that has been installed in Yogyakarta. The analysis shows that with 36 m total parabolic length, the resulting solar collector capacity is 63 kW, heat input/evaporator capacity is determined 26.78 kW and turbine power is 3.11 kW for ORC, and 3.38 kW for RORC. ORC thermal efficiency is 11.28% and RORC is 12.26%. Overall electricity efficiency is 4.93% for ORC, and 5.36% for RORC. With 40°C condensing temperature and evaporation at 10 bar saturated condition, efficiency of RORC is higher than ORC. Greater evaporation temperature at the same pressure (10 bar) provide greater turbine power and efficiency.

(Author)

Keywords: solar thermal power, parabolic trough, regenerative organic Rankine cycle, regenerator, R123.

Noviadi Arief Rachman [a], Agus Risdiyanto [a], Ade Ramdan [b] ([a]Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Bandung; [b]Research Centre for Informatics, Indonesian Institute of Sciences, Bandung)

Modeling of Electric Field around 100 MVA 150/20 kV Power Transformator using Charge Simulation Method

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 33-40, 15 ill, 1 tab, 13 ref.

Charge Simulation Method is one of the field theory that can be used as an approach to calculate the electromagnetic distribution on the electrical conductor. This paper discussed electric field modeling around power transformator by using Mat lab to find the safety distance. The safe distance threshold of the electric field to human health refers to WHO and SNI was 5kV/m. The specification of the power transformator was three phases, 150/20kV, and 100MVA. The basic concept is to change the distribution charge on the conductor or dielectric polarization charge with a set of discrete fictitious charge. The value of discrete fictitious charge was equivalent to the potential value of the conductor, and became a reference to calculate the electric field around the surface contour of the selected power transformator. The measurement distance was 5 meter on each side of the transformator surface. The results showed that the magnitude of the electric field at the front side was5541 V/m, exceeding the safety limits.

(Author)

Keywords: electric field, charge simulation method, discrete charge, power transformator.

Hendri Maja Saputra [a], Zainal Abidin [b], Estiko Rijanto [a] ([a]Research Center for Electrical Power & Mechatronics, Indonesian Institute of Sciences, Bandung; [b]Faculty of Mechanical and Aerospace Engineering, Institut Teknologi Bandung)

IMU Application in Measurement of Vehicle Position and Orientation for Controlling a Pan-Tilt Mechanism

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 41-50, 18 ill, 8 tab, 14 ref.

This paper describes a modeling and designing of inertial sensor using Inertial Measurement Unit (IMU) to measure the position and orientation of a vehicle motion. Sensor modeling is used to derive the vehicle attitude models where the sensor is attached while the sensor design is used to obtain the data as the input to control the angles of a pan-tilt mechanism with 2 degrees of freedom. Inertial sensor Phidget Spatial 3/3/3, which is a combination of 3-axis gyroscope, 3-axis accelerometer and 3-axis magnetometer, is used as the research object. Software for reading the sensor was made by using Matlab™. The result shows that the software can be applied to the sensor in the real-time reading process. The sensor readings should consider several things i.e. (a) sampling time should not be less than 32 ms and (b) deviation ratio between measurement noise (r) and process noise (q) for the parameters of Kalman filter is 1:5 (i.e. r = 0.08 and q = 0.4).

(Author)

Keywords: IMU, pan-tilt, gyroscope, accelerometer, magnetometer, Kalman filter.

Taufik Hidayat, Hilman Syaeful Alam (Technical Implementation Unit for Instrumentation Development - LIPI, Bandung)

Quality Improvement Evaluation of the Modified Diesel-Electric Train (KRDE)

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 51-56, 14 ill, 2 tab, 10 ref.

Quality of the diesel-electric train (KRDE) modified from the electric train (A and B types) which were used in three operating regions in the Indonesian Railway Company has been evaluated by analyzing the cause of the KRDE damages in terms of some aspects including: design, components quality, maintenance (method, finance, human resources), environment and way of operation. Based on the evaluation it was found that the modification of the both types of KRDE provided a very low reliability and availability due to design and technical problems, as well as unoptimal maintenance. In KRDE type A, damage occurs in the cabling system, compressor, radiator fan system, and the braking system. While in type B, damage occurs in the traction motors, static inverter, and radiator fan. It is predicted that their life span can not reach the design life of 25 years, and even they are expected to be grounded. Many improvement is required to lengten their service life including: repair, modification, human resource competence, facilities, spare parts, maintenance and management.

(Author)

Key words: quality improvement, diesel-electric train, damage, maintenance, operation.

Riza Muhida [a], Nor Hilmi Mohamad [b], Ari Legowo [c], Rudi Irawan [a], Winda Astuti [b] ([a]Surya University, Tangerang, [b]Department of Mechatronics Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia, [c]Department of Mechanical Engineering, International Islamic University Malaysia, Kuala Lumpur, Malaysia)

Maximum Power Point Tracking of Photovoltaic System for Traffic Light Application

Mechatronics, Electrical Power, and Vehicular Technology, July 2013, vol. 4, no. 1, p. 57-64, 18 ill, 2 tab, 13 ref.

Photovoltaic traffic light system is a significant application of renewable energy source. The development of the system is an alternative effort of local authority to reduce expenditure for paying fees to power supplier which the power comes from conventional energy source. Since photovoltaic (PV) modules still have relatively low conversion efficiency, an alternative control of maximum power point tracking (MPPT) method is applied to the traffic light system. MPPT is intended to catch up the maximum power at daytime in order to charge the battery at the maximum rate in which the power from the battery is intended to be used at night time or cloudy day. MPPT is actually a DC-DC converter that can step up or down voltage in order to achieve the maximum power using Pulse Width Modulation (PWM) control. From experiment, we obtained the voltage of operation using MPPT is at 16.454 V, this value has error of 2.6%, if we compared with maximum power point voltage of PV module that is 16.9V. Based on this result it can be said that this MPPT control works successfully to deliver the power from PV module to battery maximally.

(Author)

Keywords: photovoltaic, maximum power point tracking, traffic light, voltage converter, battery charging.