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FOREWORD FROM EDITOR-IN-CHIEF

Journal of Mechatronics, Electrical Power, and Vehicular Technology (JMEV) is an international journal 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, Cite Factor, and others. Its Digital Object Identifier (DOI) Prefix is 10.14203.

In this issue, six papers are published with the total number of paper pages of 56 pages. Two papers are written by a principal author from Japan dan South Korea. Other authors come from Indonesia, Egypt, and Lybia.

One paper is related to mechatronics which describes aiming direction accuracy analysis of geometrical and numerical inverse kinematic approaches for two degrees of freedom robot manipulator. The manipulator degrees of freedom are azimuth and elevation angles. The analysis was carried out based on experiment results using circular error probable (CEP) and other statistical parameters.

Three papers address topics on electrical power. The first paper deals with a problem of designing load frequency control (LFC) in a multi area power system. It proposes a new design method through a selection of optimal LQR parameter values using artificial immune system (AIS) algorithm. The second paper describes a method to determine optimum sizing and placement of shunt capacitor in order to reduce line losses. The IEEE-14 bus test system is used for the case study. Derivative load bus voltage is simulated to determine the most sensitive load bus, while Particle Swarm Optimization (PSO) algorithm is carried out to determine the optimum size of shunt capacitor at the most sensitive bus. The third paper presents the design, implementation, and economic evaluation of a hybrid PV-Battery/Diesel electricity supply in Pulau Peucang, an isolated small island at the west of Java island Indonesia. Two different battery options were taken into account, lead-acid batteries and lithium-ion batteries. Levelized cost of energy (LCOE) of the system is explained. The results may also give a rough orientation for other locations which have similar characteristics.

In the scope of vehicular technology, there are two papers presented. The first paper builds a prototype of small-scale Electric Vehicle Simulator (EVS) and a simple charging scheme of the supercapacitor. A supercapacitor is one of electrical energy sources that have faster charging-discharging times when compared to other power sources, such as battery and fuel cell. The supercapacitor charging scheme is employed by controlling the relays. This scheme is simple, and it is useful for education purpose. The second paper reports results of performance comparison between diesel engine based range extender and gasoline engine based range extender. Fuel consumption and CO_2 emission are investigated through simulation. Single cylinder 499 cc gasoline engine and single cylinder 667 cc diesel engine are chosen. The simulation is performed using Japan 08 driving cycle.

Since the first volume, our journal provides discretion in the financial term by waiving the article processing charge. We are planning to improve the quality by registering the journal to other international academic citation index. We wish to offer our thanks to the Indonesian Institute of Sciences (LIPI) for their continuing unwavering support. Also, we would like to acknowledge our immense gratitude to our International Editorial Board members, reviewers, and authors.

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

Bandung, December 2016

Editor-in-Chief

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ABSTRACTS SHEET

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Derivative Load Voltage and Particle Swarm Optimization to Determine Optimum Sizing and Placement of Shunt Capacitor in Improving Line Losses

Journal of Mechatronics, Electrical Power, and Vehicular Technology, December 2016, vol. 7, no. 2, p. 67-76, 11 ill, 7 tab, 13 ref.

The purpose of this research is to study optimal size and placement of shunt capacitor in order to minimize line loss. Derivative load bus voltage was calculated to determine the sensitive load buses which further being optimum with the placement of shunt capacitor. Particle swarm optimization (PSO) was demonstrated on the IEEE 14 bus power system to find optimum size of shunt capacitor in reducing line loss. The objective function was applied to determine the proper placement of capacitor and get satisfied solutions towards constraints. The simulation was run over Matlab under two scenarios namely base case and increasing 100% load. Derivative load bus voltage was simulated to determine the most sensitive load bus. PSO was carried out to determine the optimum sizing of shunt capacitor at the most sensitive bus. The results have been determined that the most sensitive bus was bus number 14 for the base case and increasing 100% load. The optimum sizing was 8.17 Mvar for the base case and 23.98 Mvar for increasing load about 100%. Line losses were able to reduce approximately 0.98% for the base case and increasing 100% load reduced about 3.16%. The proposed method was also proven as a better result compared with harmony search algorithm (HSA) method. HSA method recorded loss reduction ratio about 0.44% for the base case and 2.67% when the load was increased by 100% while PSO calculated loss reduction ratio about 1.12% and 4.02% for the base case and increasing 100% load respectively. The result of this study will support the previous study and it is concluded that PSO was successfully able to solve some engineering problems as well as to find a solution in determining shunt capacitor sizing on the power system simply and accurately compared with other evolutionary optimization methods.

(Author)

Keywords: particle swarm optimization; shunt capacitor; line losses.

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Simple Supercapacitor Charging Scheme of an Electric Vehicle on Small-Scale Hardware Simulator: A Prototype Development for Education Purpose

Journal of Mechatronics, Electrical Power, and Vehicular Technology, December 2016, vol.7, no. 2, p. 77-86, 11 ill, 2 tab, 18 ref.

Supercapacitor is one of electrical energy sources that have faster charging-discharging times when compared to other power sources, such as battery and fuel cell. Therefore, it is often used as an additional power source in an electric vehicle. In this paper, a prototype of small-scale electric vehicle simulator (EVS) is built and a simple charging scheme of supercapacitor is used for education purpose. EVS is an electric vehicle prototype which can show the vehicle's powertrain on small-scale configuration. Main components of this device are two direct current motors (DCMs) with a linked axis of rotation. Therefore one of them will be able to act as a generator. The supercapacitor charging scheme is employed by controlling the relays. The hardware experimental result shows that the averages of charging current are proportional to the maximum slope angle of the road profiles. This scheme is simple due to the EVS utility and it is useful for education purpose.

(Author)

Keywords: supercapacitor; charging; electric vehicle simulator (EVS); direct current motor (DCM).

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Fuel Consumption and CO_2 Emission Investigation of Range Extender With Diesel and Gasoline Engine

Journal of Mechatronics, Electrical Power, and Vehicular Technology, December 2016, vol. 7, no. 2, p. 87-92, 7 ill, 5 tab, 17 ref.

Range extender engine is one of the main components of the range-extended electric vehicle (REEV) and together with a generator to extend the mileage of the electric vehicle. The main component of REEV is an electric motor, battery, and generator set that consist of generator and engine. In this study, we compared two models of REEV performance with two different types of the engine by simulation. Single cylinder 499 cc gasoline engine and single cylinder 667 cc diesel engine are chosen as the object of this

research especially relating to the utilization of the fuel consumption and CO2 emissions when fitted to an electric vehicle. The simulation was conducted by using AVL Cruise software and performed by entering the data, both experiment and simulation data, on all the main components of REEV. This simulation was performed in Japan 08 driving cycle. Based on the simulation, fuel consumption is reduced up to 35.59% for REEV with single cylinder diesel engine 667 cc compared to REEV with single cylinder gasoline engine 499 cc. The reduction of CO2 emissions from REEV with single cylinder 499 cc gasoline engine compared to REEV with single cylinder 667 cc diesel engine up to 30.47%.

(Author)

Keywords: range extender engine; performance; diesel; gasoline; AVL Cruise.

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Optimal Selection of LQR Parameter Using AIS for LFC in a Multi-Area Power System

Journal of Mechatronics, Electrical Power, and Vehicular Technology, December 2016, vol. 7, no. 2, p. 93-104, 12 ill, 7 tab, 17 ref

This paper proposes a method to optimize the parameter of the linear quadratic regulator (LQR) using artificial immune system (AIS) via clonal selection. The parameters of LQR utilized in this paper are the weighting matrices Q and R. The optimal LQR control for load frequency control (LFC) is installed on each area as a decentralized control scheme. The aim of this control design is to improve the dynamic performance of LFC automatically when unexpected load change occurred on power system network. The change of load demands 0.01 p.u used as a disturbance is applied to LFC in Area 1. The proposed method guarantees the stability of the overall closed-loop system. The simulation result shows that the proposed method can reduce the overshoot of the system and compress the time response to steady-state which is better compared to trial error method (TEM) and without optimal LQR control.

(Author)

Keywords: linear quadratic regulator (LQR); artificial immune system; clonal selection; load frequency control (LFC).

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Accuracy Analysis of Geometrical and Numerical Approaches for Two Degrees of Freedom Robot Manipulator

Journal of Mechatronics, Electrical Power, and Vehicular Technology, December 2016, vol. 7, no. 2, p. 105-112, 10 ill, 3 tab, 15 ref.

Analysis of algorithms to determine the accuracy of aiming direction using two inverse kinematic approaches i.e. geometric and numeric has been done. The best method needs to be specified to precisely and accurately control the aiming direction of a two degrees of freedom (TDOF) manipulator. The manipulator degrees of freedom are azimuth (Az) and elevation (El) angles. A program has been made using C language to implement the algorithm. Analysis of the two algorithms was done using statistical approach and circular error probable (CEP). The research proves that accuracy percentage of numerical method is better than geometrical method, those are 98.63% and 98.55%, respectively. Based on the experiment results, the numerical approach is the right algorithm to be applied in the TDOF robot manipulator.

(Author)

Keywords: azimuth; elevation; geometrical; numerical; C language.

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A Hybrid PV-Battery/Diesel Electricity Supply on Peucang Island: an Economic Evaluation

Journal of Mechatronics, Electrical Power, and Vehicular Technology, December 2016, vol. 7, no. 2, p. 113-122, 9 ill, 3 tab, 18 ref.

Renewable energy technologies are currently under a dynamic cost development. This case holds especially for solar technology that has reached price levels that were unimaginable until a short time ago. It also holds for battery technologies the application of which is related to the increasing usage of photovoltaic energy converters and the growing interest in electric vehicles. With the decreasing prices more and more possible application cases of renewable energy technologies become economically viable. A case study was done for a location on a small island located on the west tip of Java. The levelized electricity cost of a hybrid electricity supply system composed of a solar generator and battery in combination with the existing diesel generators was compared to the electricity generation cost of the existing system. Two different battery options were taken into account, lead-acid batteries and lithium-ion batteries. The results of this study can give a rough orientation also for other locations with similar characteristics.

(Author)

Keywords: hybrid electricity supply; photovoltaics; lead-acid battery; lithium-ion battery; Peucang island.