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Journal of Mechatronics, Electrical Power, and Vehicular Technology (MEV) is an internationally peer-reviewed journal aims to provide authoritative global source of scientific information for researchers and engineers in academia, research institutions, government agencies, and industries. The Journal publishes original research papers, review articles and case studies focused on:

Mechatronics: including control system, robotic, CNC Machine, sensor, signal processing, electronics, actuator, and mechanical dynamics.

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FOREWORD FROM EDITOR-IN-CHIEF

Journal of Mechatronics, Electrical Power, and Vehicular Technology (MEV) has become an increasingly recognized journal in the past years and is an international journal indexed by many internationally recognized indexers greatly due to the dedicated efforts of the outstanding guest editors, the managing editors, and the advisory editors.

In this issue, seven papers are published with the authors diversity came from Indonesia, Malaysia, Russian Federation, Republic of Maldives, Saudi Arabia, Iraq, United Arab Emirates, Taiwan, and Australia. The papers come from multidisciplinary topics including mechatronics, electrical power, and vehicular technology. They may be classified as follows.

One paper discusses a comparison of the characteristics of interior and inset types of PMMs for electric vehicle applications to find out the effect of the rotor construction on the magnetic characteristics, torque-speed characteristics, and cogging torque. Two papers talk about photovoltaic, one aims to validate the PV and outlet temperature for various mass flow rates and solar radiation by development a predictive model to perform a steady-state energy analysis of a PVT air collector, while the other evaluates the electrical characteristics of flexible solar panel for PV and PV with bi-fluid (air and water) cooling system by testing the integration of monocrystalline flexible solar panel into both systems under a fixed solar radiation. One paper presents a novel method of small local outdoor positioning system for localizing the area of dropping and landing of an autonomous VTOL by utilizing the low-cost precision Ultra-Wide Band (UWB) ranging system. The next paper discusses a simulation to determine the power factor of an electrical network can be done with Proteus ISIS software by creating a phase detection circuit. The other two papers talk about microchannels and sensor fabrication. One of them aims to make a comprehensive study of fluid flow characteristics through a microchannel with several possible bends. While the other one describes the development of chemical sensors to detect polypyrrole (PPy) based phosphate sensors in doped di-ammonium hydrogen phosphate (DAP) with thick film technology (TFT).

Since the first volume, our journal provides discretion in financial term by waiving the article processing charge. 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, July 2021

Editor-in-Chief

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ABSTRACTS SHEET

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Characteristics analysis of interior and inset type permanent magnet motors for electric vehicle applications

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no. 1, p. 1-9, 9 ill, 2 tab, 25 ref.

Permanent magnet motors (PMMs) are widely used in electric vehicles because of their benefits. Based on the permanent magnet topologies on the rotor, PMMs are classified into three types: surface mounted PMM, inset PMM, and interior PMM. This paper discusses a comparison of the characteristics of interior and inset types of PMMs for electric vehicle applications. The study aims to find out the effect of the rotor construction on the magnetic characteristics, torque-speed characteristics, and cogging torque. Simulations were carried out analytically and numerically using the FEMM 4.2 software. The simulation results at the base speed show that the interior PMM generates a higher torque but with a lower rotation, namely 56.47 Nm and 3162 rpm, respectively, while the inset PMM produces higher rotation 4200 rpm but lower output torque of 46.01 Nm. However, with a higher saliency ratio, the interior PMM produces higher maximum torque and speed at both constant torque and field weakening regions than the PMM inset, which is 92.87 Nm and 6310 rpm, consecutively. In terms of cogging torque, the interior PMM raises it slightly higher (2.90 Nm) than the inset PMM (1.93 Nm). The results conclude that, in general, the interior PMM shows better performance in all studied regions and is preferable for electric vehicle applications.

(Author)

Keywords: permanent magnet motor; interior PMM; inset PMM; torque-speed characteristic; cogging torque.

Ahmad Fudholi [a, b], Mariyam Fazleena Musthafa [c], Goh Li Jin [a], Rudi Darussalam [b], Ahmad Rajani [b], Andri Setiawan [b], Anwar [b], Mohammad Hossein Yazdi [d], Hazim Moria [e], Mohd Yusof Othman [a], Mohd Hafidz Ruslan [a], Kamaruzzaman Sopian [a] ([a] Solar Energy Research Institute, Universiti Kebangsaan Malaysia, Malaysia; [b] Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences (LIPI), Indonesia; [c] Department of Energy, Ministry of Environment, Republic of Maldives; [d] Dept. of Electric Power Generation Stations, Network and Supply Systems, Institute of Engineering and Technology, South Ural State University, Russian Federation; [e] Department of Mechanical Engineering Technology, Yanbu Industrial College, Kingdom of Saudi Arabia)

Experimental and model validation of photovoltaic-thermal (PVT) air collector: exergy analysis

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no. 1, p. 10-17, 9 ill, 4 tab, 22 ref.

Solar energy is a renewable energy that can produce heat via a thermal system and generate electricity via a photovoltaic (PV) module. A photovoltaic-thermal (PVT) collector is a system that has a PV module combined with a thermal collector system. The PVT collector is a popular technology for harvesting solar energy. A PVT collector can generate both electrical and thermal energies simultaneously. The study aims to validate the PV and outlet temperature for various mass flow rates and solar radiation. To develop a predictive model, a steady-state energy analysis of a PVT air collector was performed. An energy balance equation was solved using the matrix inversion method. The theoretical model was developed and validated against the experimental results, which have a similar trend and are consistent with the experimental results. On the other hand, the validated model was used to study the performances of PVT air collectors using exergy analysis for the mass flow rate ranging from 0.007 kg/s to 0.07 kg/s and solar radiation ranging from 385 W/m2 to 820 W/m2. The result from the mathematical model was found to be consistent with the experimental data with an accuracy of about 95 %. The average PVT exergy efficiency was found to be 12.7 % and 12.0 % for the theoretical and experimental studies, respectively.

(Author)

Keywords: mathematical model; thermal efficiency; electrical efficiency; second law efficiency.

Niam Tamami, Bambang Sumantri, Prima Kristalina (Electrical Engineering Department, Politeknik Elektronika Negeri Surabaya, Indonesia)

Local positioning system for autonomous vertical take-off and landing using ultra-wide band measurement ranging system

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no.1, p. 18-27, 18 ill, 0 tab, 25 ref.

An autonomous vertical take-off and landing (VTOL) must be supported with an accurate positioning system, especially for autonomous take-off, landing, and other tasks in small area. This paper presents a novel method of small local outdoor positioning system for localizing the area of dropping and landing of autonomous VTOL by utilizing the low-cost precision ultra-wide band (UWB) ranging system. We compared symmetrical single sided-two way ranging (SSS-TWR), symmetrical double sided-two way ranging (SDS-TWR), and asymmetrical double sided-two way ranging (ADS-TWR) methods to get precision ranging measurement on UWB radio module. ADS-TWR was superior to others by resulting in minimum distance error. The ADS-TWR average error was 1.38 % (35.88 cm), SDS-TWR average error was 1.83 % (47.58 cm), and SSS-TWR average error was 2.73 % (70.98 cm). Furthermore, the trilateration method was utilized to obtain the local position of the autonomous VTOL. The trilateration method successfully implemented autonomous VTOL quadcopter positioning in a small local outdoor area (20 m x 30 m). Autonomous VTOL has been able to drop seven payloads in seven areas (2 m x 2 m) and landed in the home position (3 m x 3 m) successfully.

(Author)

Keywords: autonomous VTOL; UWB local positioning system; trilateration.

Jumrianto [a], Royan [b] ([a] System and Information Technology Department, IVET University, Indonesia; [b] Electromedical Engineering Department, Muhammadiyah University Purwokerto, Indonesia)

Proteus ISIS simulation for power factor calculation using zero crossing detector

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no. 1, p. 28-37, 34 ill, 1 tab, 21 ref.

One of the important parameters for electrical systems is the power factor (cos phi), which is the ratio of the real power (watt) to the apparent power (volt ampere). The best cos phi value is between 0.85 to 1. A resistive load causes the voltage and current in equal phase angle, while the inductive load causes the current to lag behind the voltage. On the other hand, the capacitive load causes the current to precede the voltage (leading). A simulation to determine the power factor of an electrical network can be done with Proteus ISIS software by creating a phase detection circuit. Automatic control can be done by a microcontroller. This simulation circuit can be used as power factor correction, a trigger angle on SCR trigger for DC motor speed control, for rocket launch angle adjuster, to measure the angle of inclination, and other uses relating to angle adjustments.

(Author)

Keywords: power factor; cos phi; zero-crossing.

Endro Junianto, Jooned Hendrarsakti ([a] Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Indonesia; [b] Faculty of Mechanical and Aerospace Engineering, Institut Teknologi Bandung, Indonesia)

A review of single-phase pressure drop characteristics microchannels with bends

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no. 1, p. 38-44, 1 ill, 1 tab, 62 ref.

Microfluidic use in various innovative research, many fields aimed at developing an application device related to handling fluid flows in miniature scale systems. On the other hand, on the use of micro-devices for fluid flow the existence of bends cannot be avoided. This research aims to make a comprehensive study of fluid flow characteristics through a microchannel with several possible bends. This study was conducted by comparing Reynolds number versus pressure drop in a serpentine microchannel to gain bends loss coefficient. The result showed that the fluid flow with Re < 100 did not affect the pressure drop, but on the Reynolds number above that, the pressure drop was increased along with the appears of vortices in the outer and inner walls around the channel bends which causes an increase in an additional pressure drop. The other finding shows that the reduction in diameter bend tube can increase the pressure drop.

(Author)

Keywords: pressure drop; bend loss coefficient; single-phase; microchannel bends.

Nofriyani [a], Robeth Viktoria Manurung [b], Aminuddin Debataraja [c], Indra Dwisaputra [a] ([a] Electrical Engineering Department, Politeknik Manufaktur Negeri Bangka Belitung, Indonesia; [b] Research Center for Electronics and Telecommunications, Indonesian Institute of Sciences, Indonesia; [c] Electrical Engineering Department, Politeknik Negeri Jakarta, Indonesia)

Phosphate ion sensor fabrication based on conductive polymer polypyrrole film coatings in doped phosphate using thick film technology

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no. 1, p. 45-50, 7 ill, 2 tab, 15 ref.

This study describes the development of chemical sensors to detect polypyrrole (PPy) based phosphate sensors in doped di-ammonium hydrogen phosphate (DAP) with thick film technology (TFT). Manufacturing screen-printed carbon electrode (SPCE) with thick film uses alumina substrate provided a more portable, miniature, inexpensive, and reduced use of samples and reagents. Polymer polypyrrole and di-ammonium hydrogen phosphate as sensitive membranes are electrodeposition on carbon electrodes. Characterization has been conducted to see the electrode morphology in scanning electron microscopy (SEM) test, which showed that sensitive material particles were distributed evenly on the surface of the sample and spherical. The energy dispersive spectroscopy (EDS) experiment results showed the atomic composition respectively carbon 86.95 %, nitrogen 6.94 %, oxygen 5.9 %, and phosphate 0.21 %, which were exposed to the electrode. The performance test of electrodes with a phosphate standard solution has proceeded at a concentration between 5 to 100 mg/l, which is measured using the galvanostatic method. The voltage range was from 0.252 to 0.957 V with R2 at approximately 90.265 %. The results of sensor performance were concluded that the electrode was able to detect phosphate ions.

(Author)

Keywords: carbon electrode; electropolimerization; phosphate; polymer polypyrrole; thick film.

Nurul Shahirah Rukman [a], Ahmad Fudholi [a, b], Putri Adia Utari [c], Cheku Nurul Aisyah [a], Andri Joko Purwanto [b], Rakhmad Indra Pramana [b], Erie Martides [b], Ant. Ardath Kristi [b], Nilofar Asim [a], M. H. Yazdi [d], Hazim Moria [e], Husam Abdulrasool Hasan [f], Zeki Ahmed Darwish [g] ([a] Solar Energy Research Institute, Universiti Kebangsaan Malaysia, Malaysia; [b] Research Centre for Electrical Power and

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Bi-fluid cooling effect on electrical characteristics of flexible photovoltaic panel

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2021, vol. 12, no. 1, p. 51-56, 4 ill, 4 tab, 21 ref.

A photovoltaic (PV) system integrated with a bi-fluid cooling mechanism, which is known as photovoltaic thermal (PVT) system, was investigated. The electrical characteristics of flexible solar panel were evaluated for PV and PV with bi-fluid (air and water) cooling system. The integration of monocrystalline flexible solar panel into both systems was tested under a fixed solar radiation of 800 W/m2. A total of 0.04–0.10 kg/s of air flow was utilized in PV with cooling system with a fixed water mass flow rate of 0.025 kg/s. The efficiencies of flexible panel for PV and PV with cooling system were explored. For PV with bi-fluid flow, the highest obtained efficiency of module was 15.95 % when 0.08 kg/s of air and 0.025 kg/s of water were allowed to flow through the cooling system. Compared with PV without cooling mechanism, the highest efficiency of module was 13.35 % under same solar radiation. Current–voltage and power graphs were also plotted to present the electrical characteristics (current, voltage, and power) generated by both systems.

(Author)

Keywords: PV efficiency; PV current; PV voltage; PV power; I–V–P curves.