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Aim and Scope

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:

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Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences (RCEPM - LIPI)

Komp LIPI Jl. Sangkuriang, Building 20, 2nd Floor, R209
Bandung, West Java, 40135
Indonesia

Tel: +62-022-2503055 (ext. 215)
Tel: +62-022-2504770 (ext. 203)
Fax: +62-22-2504773

Business hour: Monday to Friday 08:00 to 16:00 GMT+7

e-mail:
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FOREWORD FROM EDITOR-IN-CHIEF

Journal of Mechatronics, Electrical Power, and Vehicular Technology (MEV) is an international journal indexed by many internationally recognized indexers. Its Digital Object Identifier (DOI) Prefix is 10.14203. In this issue, five papers are published with the authors diversity came from Indonesia, Australia, and United Kingdom.

The papers come from multidisciplinary topics including mechatronics, electrical power, and mechanics. They may be classified as follows. Three papers fall in electrical power topic. The first paper presents simulation study for the effect of lightning strikes on the performance of arresters at 150 kV overhead lines. The second paper proposes a comprehensive guide and comparison surrounding the technologies supporting Smart Grid implementation especially on communication application. The third paper has the aim to identify the impact of synthetic textiles on earthing system performance through numerical analysis with the state-of-the-art software package. One paper is related to mechatronics which address the different exoskeleton designs and presents a working prototype of a surface electromyography (EMG) controlled exoskeleton to enhance the strength of the lower leg.

One paper deals with mechanical topic i.e. Three axis deviation analysis of CNC milling machine. 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, December 2019

Editor-in-Chief

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ABSTRACTS SHEET

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Fri Murdiya, Febrizal, Cecilia Stevany, Havel Alindo Sano, Firdaus (Department of Electrical Engineering, Faculty of Engineering, Universitas Riau, Indonesia)

The effect of lightning impulse characteristics and line arrester to the lightning protection performance on 150 kV overhead lines: ATP-EMTP computational approach

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2019, vol. 10, no. 2, p. 49-59, 21 ill, 3 tab, 29 ref.

This simulation study presents the effect of lightning strikes on the performance of arresters at 150 kV overhead lines. Lightning strikes have several parameters that affect the performance of line arresters (LA), namely lightning charge, and impulse energy. The simulation was attempted by injection of a direct strike to the ground wire with the peak voltage of 10 MV. The peak voltage was varied in terms of wavefront time (Tf) and the duration of lightning impulses (tau). In order to calculate current, charge and impulse energy of LA from various variations of Tf and tau, the trapezoidal numerical integration method is used. The current and impulse energy arising due to direct strikes and various variations of Tf and tau will be compared for each phase so that the influence of Tf and tau can be obtained from the performance of the LA and the current charge and impulse energy values are still within the limits of the IEEE C62.11 standard. The installation of LA and the position of arresters affected the peak voltage of lightning on the phase line when lightning struck it. The line arresters provide a drop in the peak voltage of lightning in phase lines. By installing line arresters in each tower, it will reduce the peak voltage of lightning on the phase line more significantly than the standalone line arrester. It is shown that the line arresters have to install at least six towers to reduce the peak voltage in the phase lines.

(Author)

Keywords: lightning impulse; line arrester; peak voltage; impulse energy; placement of arrester.

Mikecon Cenit, Vaibhav Gandhi (Department of Design Engineering and Mathematics, Middlesex University London, United Kingdom)

Design and development of the sEMG-based exoskeleton strength enhancer for the legs

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2019, vol. 10, no. 2, p.61-71, 12 ill, 0 tab, 73 ref.

This paper reviews the different exoskeleton designs and presents a working prototype of a surface electromyography (EMG) controlled exoskeleton to enhance the strength of the lower leg. The Computer Aided Design (CAD) model of the exoskeleton is designed, 3D printed with respect to the golden ratio of human anthropometry, and tested structurally. The exoskeleton control system is designed on the LabVIEW National Instrument platform and embedded in myRIO. Surface EMG sensors (sEMG) and flex sensors are used coherently to create different state filters for the EMG, human body posture and control for the mechanical exoskeleton actuation. The myRIO is used to process sEMG signals and send control signals to the exoskeleton. Thus, the complete exoskeleton system consists of sEMG as primary sensor and flex sensor as secondary sensor while the whole control system is designed in LabVIEW. FEA simulation and tests show that the exoskeleton is suitable for an average human weight of 62 kg plus excess force with different reactive spring forces. However, due to the mechanical properties of the exoskeleton actuator, it will require additional lift to provide the rapid reactive impulse force needed to increase biomechanical movement such as squatting up. Finally, with the increasing availability of such assistive devices on the market, the important aspect of ethical, social and legal issues have also emerged and discussed in this paper.

(Author)

Keywords: leg-exoskeleton; electromyography based exoskeleton; LabVIEW myRIO; ethical, societal, and legal concerns.

Tinton Dwi Atmaja [a], Dian Andriani [b], Rudi Darussalam [a] ([a] Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Indonesia; [b] Research Unit for Clean Technology, Indonesian Institute of Science, Indonesia)

Smart Grid communication applications: measurement equipment and networks architecture for data and energy flow

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2019, vol. 10, no. 2, p. 73-84, 10 ill, 5 tab, 63 ref.

Smart Grid is an advanced two way data and energy flow capable of self-healing, adaptive, resilient, and sustainable

with prediction capability of possible fault. This article aimed to disclose Smart Grid communication in a logical way to facilitate the understanding of each component function. The study was focused on the improvement, advantages, common used design, and possible feature of Smart Grid communication components. The results of the study divide the Smart Grid communication application into two main category i.e. measurement equipment and network architecture. Measurement equipment consists of Advance Metering Infrastructure, Phasor Measurement Unit, Intelligent Electronic Devices, and Wide Area Measurement System. The network architecture is divided based on three hierarchies; local area network for 1 to 100 m with 100 kbps data rate, neighbour area network for 100 m to 10 km with 100 Mbps data rate, and wide area network for up to 100 km with 1 Gbps data rate. More information is provided regarding the routing protocol for each network from various available protocols. The final section presents the energy and data flow architecture for Smart Grid implementation based on the measurement equipment and the network suitability. This article is expected to provide a comprehensive guide and comparison surrounding the technologies supporting Smart Grid implementation especially on communication applications.

(Author)

Keywords: Smart Grid application; phasor measurement unit; communication network; communication protocol; energy and data flow.

Mostafa Nazih (Building, Infrastructure and Advanced Facilities, Jacobs, Australia)

Safety assessment of high voltage substation earthing systems with synthetic geotextile membrane

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2019, vol. 10, no. 2, p. 85-91, 7 ill, 4 tab, 17 ref.

High voltage substations built within areas prone to vegetation or with unfavourable subgrade conditions are paved with the addition of punched geotextiles and non-conductive synthetic fabrics underneath switchyard surfacing. The aim of this research is to identify the impact of synthetic textiles on earthing system performance through numerical analysis with the state-of-the-art software package. The new layer interferes with the earthing grids performance with a different behaviour depending on the installation above or underneath the layer with considerable impact taking place when the earthing grid is installed above the geotextile layer. Rods penetrating the geotextile can alleviate the potential voltage distribution issues and improve the earthing system performance regardless of the native soil stratification.

(Author)

Keywords: substation earthing; synthetic geotextile; tolerable voltages; high voltage.

Dalmasius Ganjar Subagio, Ridwan Arief Subekti, Hendri Maja Saputra, Ahmad Rajani, Kadek Heri Sanjaya (Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences, Indonesia)

Three axis deviation analysis of CNC milling machine

Journal of Mechatronics, Electrical Power, and Vehicular Technology, 2019, vol. 10, no. 2, p. 93-101, 12 ill, 4 tab, 31 ref.

The manufacturing technology has developed rapidly, especially those intended to improve the precision. Consequently, increasing precision requires greater technical capabilities in the field of measurement. A prototype of a 3-axis CNC milling machine has been designed and developed in the Research Centre for Electrical Power and Mechatronics, Indonesian Institute of Sciences (RCEPM-LIPI). The CNC milling machine is driven by a 0.4 kW servo motor with a spindle rotation of 12,000 rpm. This study aims to measure the precision of the CNC milling machine by carrying out the measurement process. It is expected that the CNC milling machine will be able toperform in an optimum precision during the manufacturing process. Accuracy level testing is done by measuring the deviations on the three axes namely X-axis, Y-axis, and Z-axis, as well as the flatness using a dial indicator and parallel plates. The measurement results show the deviation on the X-axis by 0.033 mm, the Y-axis by 0.102 mm, the Z-axis by 0.063 mm, and the flatness of the table by 0.096 mm, respectively. It is confirmed that the deviation value is within the tolerance standard limits set by ISO 2768 standard. However, the calibration is required for this CNC milling machine to achieve more accurate precision. Furthermore, the design improvement of CNC milling machine and the application of information technology in accordance with Industry 4.0 concept will enhance the precision and realibility.

(Author)

Keywords: precision measurement; orthogonal axes; manufacturing machine; automation industry.