



© 2019

Proceedings of the 10th National Technical Seminar on Underwater System Technology 2018

NUSYS'18

Editors: Md Zain, Z., Ahmad, H., Pebrianti, d., Mustafa, M., Abdullah, N.R.H., Samad, R., Mat Noh, M. (Eds.)

ISSN 2194-5357 ISSN 2194-5365 (electronic)
Advances in Intelligent Systems and Computing
ISBN 978-3-030-00978-6 ISBN 978-3-030-00979-3 (eBook)
<https://doi.org/10.1007/978-3-030-00979-3>

Library of Congress Control Number: 2018955576

© Springer Nature Switzerland AG 2019

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Contents

| | |
|--|------------|
| Restoration of Kids Leg Function Using Exoskeleton Robotic Leg (<i>ExRoLEG</i>) Device | 335 |
| Mohd Azrul Hisham Mohd Adib, Szeto Yang Han, Prashant Raj Ramani, Low Jian You, Law Ming Yan, Idris Mat Sahat and Nur Hazreen Mohd Hasni | |
| Simulated Kalman Filter Algorithm with Improved Accuracy | 343 |
| Mohd Falfazli Mat Jusof, Ahmad Azwan Abd Razak, Shuhairie Mohammad, Ahmad Nor Kasruddin Nasir, Mohd Helmi Suid, Mohd Ashraf Ahmad and Zuwairie Ibrahim | |
| Initial Study of Multiple Excitation Source for Electrical Resistance Tomography in Steel Pipe Application | 353 |
| Yasmin Abdul Wahab, Syazwani Amanina Syakyeen, Zainah Md. Zain, Normaniha Abd Ghani and Maziyah Mat Noh | |
| Simultaneous Perturbation Stochastic Approximation Optimization for Energy Management Strategy of HEV | 361 |
| Muhammad Fadhlan Afif Nazri and Muhammad Ikram Mohd Rashid | |
| Part III Applied Electronics and Computer Engineering | |
| Image Processing-Based Flood Detection | 371 |
| Angga Ariawan, Dwi Pebrianti, Ronny, Yudha Maulana Akbar, Lestari Margatama and Luhur Bayuaji | |
| Enhancement on Stain Detection for Automatic Handwashing Audit Vision System | 381 |
| Faradila Naim, Muhammad Aizat Romaino and Rosyati Hamid | |
| Classification of Transient Facial Wrinkle | 391 |
| Rosdiyana Samad, Mohammad Zarif Rosli, Nor Rul Hasma Abdullah, Mahfuzah Mustafa, Dwi Pebrianti and Nurul Hazlina Noordin | |

SIMULTANEOUS PERTURBATION STOCHASTIC APPROXIMATION OPTIMIZATION FOR ENERGY MANAGEMENT STRATEGY OF HEV

Muhammad Fadhlán Afif Bin Nazri¹ [0000-1111-2222-3333] and Muhammad Ikram bin Mohd Rashid² [1111-2222-3333-4444]

^{1,2} Faculty of Electrical & Electronic Engineering
University Malaysia Pahang

¹ mfadhlanafif@gmail.com

² mikram@ump.edu.my

Abstract. – *This paper addresses optimization for hybrid electric vehicle (HEV). This project is using a single agent method to optimize the power losses under a specific driving cycle which is simultaneous perturbation stochastic approximation (SPSA) based method. For optimization process, four gain are added in four main parts of the HEV system. Those main parts are engine, motor, generator and battery. These four gain is controlled the output for each components to give the minimum power losses. The design method is applied to free model of HEV by using Simulink/MATLAB software while M-File/MATLAB is used to apply the SPSA method. The result from design method achieved a minimum reduction of power losses compared to original system. Thus, the comparison of result has been done to show the different before and after optimization.*

Keywords: HEV, Simultaneous Perturbation Stochastic Approximation (SPSA), optimization

1. INTRODUCTION

Hybrid electric vehicles (HEV) is introduce to help user reduce their daily cost when using vehicle as fuel consumption can be minimize with help of electric system. This is because HEV is using hybrid of two sources which are Internal Combustion Engine (ICE) and an electric generator as alternate energy source. ICE consume fuel (petrol/diesel) to generate energy to move the vehicle while electric motor use electricity that generate by generator. HEV give a minimum fuel consumption as the electric motor used to move the vehicle from the rest and ICE support the vehicle when it start to accelerate. This fuel economic give an advantage to HEV compare to ICE vehicle. Energy Management Strategy (EMS) is a method to optimize the split usage between electric motor and fuel in order to give the best optimization of the fuel consumption. The main function of the EMS is power management. Automotive and communication control make a joint research that