

MECHATRONICS BOOK SERIES

**SYSTEM DESIGN AND SIGNAL PROCESSING
VOLUME 2**

Editors

Md. Raisuddin Khan

Md. Mozasser Rahman

Muhammad Mahbubur Rashid

Shahrul Na'im Sidek



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

MECHATRONICS BOOK SERIES: SYSTEM DESIGN AND SIGNAL PROCESSING - VOLUME 2

Editors

Md. Raisuddin Khan
Md. Mozasser Rahman
Muhammad Mahbubur Rashid
Shahrul Na'im Sidek

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011
©IIUM Press, IIUM

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without any prior written permission of the publisher.

Perpustakaan Negara Malaysia

Cataloguing-in-Publication Data

ISBN: 978-967-418-132-1

Member of Majlis Penerbitan Ilmiah Malaysia – MAPIM
(Malaysian Scholarly Publishing Council)

Printed by :
IIUM PRINTING SDN.BHD.
No. 1, Jalan Industri Batu Caves 1/3
Taman Perindustrian Batu Caves
Batu Caves Centre Point
68100 Batu Caves
Selangor Darul Ehsan
Tel: **+603-6188 1542 / 44 / 45** Fax: **+603-6188 1543**
EMAIL: iiumprinting@yahoo.com

CONTENTS

Editorial Notes.....	v
About the Editors.....	vi
Contents.....	vii
1. A Brief Overview of Biomechatronics and Its Applications.....	1
<i>Nur Izatulnisha A.Rashid, Jamaliah Kassim and Asan G. A. Muthalif</i>	
2. Self-Powered Solar Tracking System Part 1: System Modeling and Hardware Selections.....	7
<i>Asan G. A. Muthalif, Dzairul Hafiz and Haris Shafiq</i>	
3. Self-Powered Solar Tracking System Part 2: System Design.....	14
<i>Asan G.A. Muthalif, Dzairul Hafiz and Haris Shafiq</i>	
4. Self-Powered Solar Tracking System Part 3: System Integration and Testing.....	19
<i>Asan G.A. Muthalif, Dzairul Hafiz and Haris Shafiq</i>	
5. Smart System For Monitoring Electrical Power Usage at Homes.....	25
<i>Kawthar A. Rahman, Asan G. A. Muthalif and Nurul F. Shua'ib</i>	
6. Vibration Based Predictive Maintenance: Common Rotating Machinery Faults and Their Signatures.....	30
<i>Siti F. Mansor, Asan G. A. Muthalif and Nurul 'I. Zaman</i>	
7. Modeling of Disc Rotor Induction Motor	38

M. M. Rashid, S. Abubakar and R. Tamjis

8. Computer Communication for a Smart Card Based Ordering System Via Visual Basic	52
<i>Siti Fauziah Toha and Rosdiazli Ibrahim</i>	
9. Electronic Smart Ordering System: Graphical User Interface	59
<i>Siti Fauziah Toha and Rosdiazli Ibrahim</i>	
10. Intruder Avoidance System Via Short Message Service (SMS)	65
<i>Siti Fauziah Toha and Mohammad Zafran Haja Mohideen</i>	
11. Anti Skid Control System, A Tutorial	71
<i>M. J. E. Salami, R. Khan, A.M. Aibinu, Syahrul Syazanizam Bin Md Said and Mohd Sofian Bin Basrah</i>	
12. Intelligent Anti Skid Control System	75
<i>M. J. E. Salami, R. Khan, A.M. Aibinu, Syahrul Syazanizam Bin Md Said and Mohd Sofian Bin Basrah</i>	
13. Principles of FMCW Radar Signal Processing	91
<i>Wahju Sediono and Andrian Andaya Lestari</i>	
14. Design and Implementation of a Simple Queueing System for Vehicle Traffic Simulator	99
<i>Wahju Sediono</i>	
15. Determination of Target Speed from the FMCW Radar Data	107
<i>Wahju Sediono and Andrian Andaya Lestari</i>	
16. Intelligent Egg Incubator: Introduction	116
<i>Shahrul Na'im Sidek, Yasir Mohd Mustafah, Urwah Ismail, Nur Hasnaa Che Awang</i>	
17. Intelligent Egg Incubator: Mechanical Design	125

Shahrul Na'im Sidek, Yasir Mohd Mustafah, Urwah Ismail, Nur Hasnaa Che Awang

18. Intelligent Egg Incubator: System Integration And Results.....	137
<i>Shahrul Na'im Sidek, Yasir Mohd Mustafah, Urwah Ismail, Nur Hasnaa Che Awang</i>	
19. Human Posture Recognition Classification And Recognition.....	157
<i>Kyaw Kyaw Htike, Othman O. Khalifa and and Lai Weng Kin</i>	
20. Human Posture Recognition Preprocessing Techniques.....	162
<i>Othman O. Khalifa, Kyaw Kyaw Htike, Lai Weng Kin and A. Albagoul</i>	
21. Path Detection Implementation Using Fuzzy Classifier	171
<i>Imran Moez Khan, Yusof Zaw Zaw, Othman O. Khalifa and Lai Weng Kin</i>	
22. Mechanical Design Of Unmanned Underwater Vehicle	180
<i>Md. Raisuddin Khan, M. Zuhdi and Masum Billah</i>	
23. Design And Development Of An Automated Café System.....	187
<i>Md. Raisuddin Khan, MAS Kamal and Masum Billah</i>	
24. Speech Coding Using Compressive Sensing On A Multicore System	194
<i>T.S. Gunawan, Othman O. Khalifa, A. A. Shafie and E. Ambikairajah</i>	
25. A Case For Cooperative Vision System.....	202
<i>A. A. Shafie and N. Samudin</i>	
26. Path Following Autonomous Vehicle Based On Vision System.....	208
<i>A. A. Shafie, E. A. Syukur and N. I. Sidek</i>	
27. Trajectory Planning Using Gps For Unmanned Aerial Vehicle With Microcontroller Based System	215
<i>A. A. Shafie, Md. Raisuddin Khan and M Shehzad Islam</i>	

28. Digital Hearing Aids Analysis And Implementation.....	224
<i>Othman O. Khalifa, Aisha H. Abdalla and Sheroz Khan</i>	
29. Automatic Intelligent Ordering System: Design And Tools Selection	233
<i>Siti Fauziah Toha and Rosdiazli Ibrahim</i>	
30. Automatic Smart Card Purchasing System for Express Kiosk.....	240
<i>Siti Fauziah Toha and Rosdiazli Ibrahim</i>	
31. Finite Element Formulation of Piezoelectric Laminated Composite Plate	247
<i>Iskandar Al-Thani Mahmood and Md. Raisuddin Khan</i>	
32. A Review on Modeling And Shape Control Of Piezoelectric Laminated Composite Plate Using Finite Element Method.....	257
<i>Iskandar Al-Thani Mahmood and Md. Raisuddin Khan</i>	
33. Development of Auto Parking System & Auto Billing System Using Image Processing Technique (Part 1).....	267
<i>M. M. Rashid</i>	
34. Development of Auto Parking System and Auto Billing System Using Image Processing Technique (Part 2)	274
<i>M. M. Rashid</i>	
35. Development of Auto Parking System& Auto Billing System Using Image Processing Technique (Part 3).....	281
<i>M. M. Rashid</i>	
36. Automatic Car Parking Management System for Large Parking Lot.....	289
<i>M. M. Rashid</i>	
37. Development of Wireless Home Power Monitoring System	296
<i>M. M. Rashid</i>	

CHAPTER 5

SMART SYSTEM FOR MONITORING ELECTRICAL POWER USAGE AT HOMES

Kawthar A. Rahman^a, Asan G. A. Muthalif^b and Nurul F. Shua'ib^c

Department Of Mechatronics Engineering, International Islamic University Malaysia,
Jalan Gombak, 53100, Kuala Lumpur, Malaysia

^akutaranma@yahoo.com, ^basan@iium.edu.my, ^cmnfs_0407@yahoo.com

5.1 Introduction

Global warming and its disasters environmental and economic effects are considered as one of the major challenges that mankind will face during this century. Therefore, green technologies are very needed nowadays to reduce global warming. The smart device proposed in this chapter can help environment in reducing carbon footprint and save energy consumption at homes. Malaysia is now in mission towards “Green Earth” so any smart green technologies which may corresponds to this mission will get much of the attention worldwide. Smart home system functionality is dividing into the following five components which are sensor system, signal transmission systems, power transmission system, action system and central control system. Sensory system work having the responsibility to collect data. Whereas, power transmission is responsible for the various parts of the power supply, refers primarily to electric doors and windows, curtains, electrical switches and other actions to complete the module terminal and lastly the most central part of the central control system.

5.2 Smart Home Power Monitoring Systems and its Development

Today, low power design is a mature research area and power consumption is considered at all levels of system generalization. As smart home becomes increasingly popular, People are in need of more home automation devices to upgrade their living spaces and enjoy a high-tech and tranquil yet cost-saving life [1]. They went to equip their houses with more sensors and actuators for optimum convenience, security and entertainment.

5.2.1 Concept of Smart Home Power Monitoring System. An external plug-in device is used as one way in smart home management in terms of power consumption. Power outlets or power socket are the most commonly-used electrical devices in modern home environment. External plug is used as a monitoring device that can show specifically power consumed on each appliance attached to power socket. User can also remotely control the power on/off of particular appliance using a controller through this external plug.

5.2.2 Development of Smart Home. This project is aimed for getting data (current) of home appliances that have been used by homeowner where we can monitor via software interface. The study aspects are the electrical/electronic devices, software development using LabVIEW, wireless connectivity and mechanical part which aimed to get the best design for the whole system. Hardware development is more concern in designing the circuit connection inside the plug and also the design of plug itself. As this plug has the capability to measure the power consumption, the basic idea inside this plug is a controller that