MECHATRONICS BOOK SERIES SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 1

Editors
Asan G. A. Muthalif
Amir Akramin Shafie
Siti Fauziah Toha
Iskandar Al-Thani Mahmood

IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

MECHATRONICS BOOK SERIES: SYSTEM DESIGN AND SIGNAL PROCESSING - VOLUME 1

Editors

Asan G. A. Muthalif
Amir Akramin Shafie
Siti Fauziah Toha
Iskandar Al-Thani Mahmood

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

ISBN: 978-967-418-173-4

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 Energy Harvesting For Wide Area Sensor Networks 1
Nahrul Khair Alang Md Rashid and Mohamad Ghazali Ameer Amsa

2 Design And Development Of Automatic Paper Box Folding Machine 8
Md Mozasser Rahman, Anwar Hussain bin Mohamed Rasied and Ahmad Zulkamal Ismail

3 Intelligent Shoe Guard System 20
M. J. E. Salami,, A. M. Aibinu, Siti Sarah binti Mohd Sufian

4 Applications of Mechatronics Engineering In Modern Agriculture 29
Nahrul Khair Alang Md Rashid

5 Mathematical Modeling of Counter Flow Scrubber Using Eulerian-Lagrangian Approach 34
Bashir Ahmed Danzomo and Momoh Jimoh E. Salami

6 Auto Landmarks Generation For SLAM Algorithm 42
Nahrul Khair Alang Md Rashid and Imama Karim Manba Usama

7 Automatic Intelligent Ordering System Design and Tools Selection 46
Siti Fauziah Toha and Rosdiazli Ibrahim

8 Design And Development of a Sorting Machine Using Multiple Sensory System 52
Md Mozasser Rahman1, Siti Fatimah binti Abdul Rahim

9 Design And Development Of Intelligent Wiper For Vehicle Windshield: Mechanical Design 58
Shahrul Na'im Sidek, Abd Rahman Ibrahim

10 Design and Development of Intelligent Wiper for Vehicle Windshield: Electrical Design 63
Shahrul Na'im Sidek, Mohammad Afhamuddin Ab Aziz

11 Design and Development of Intelligent Wiper for Vehicle Windshield: Final Assembly And Results 68
Shahrul Na'im Sidek, Mohammad Afhamuddin Ab Aziz

12 Design and Prototyping of Inertia Wheel 73
W. Astuti, A. R. Kasim, M. I. Solihin, A.M. Aibinu, Momoh Jimoh E.Salami and Wahyudi

13 Design and Implementation of Instant Noodles Vending Machine 80
M.M.Rashid

14 Mathematical Model for Three Tank System 88
W. Astuti, R. Alimuddin, A.M. Aibinu, Momoh Jimoh E.Salami and Wahyudi Martono

15 Design of Software Tool to Detect QRS Complex from ECG Signal 98
Wahju Sediono

16 Development of a Jet Powered Floating Platform (In Air) 104
M. Zharif, Raisuddin Khan and Masum Billah

17 Development of Experimental Station for Earthquake Prediction 109
A. M. Aibinu, M. J. E. Salami, Asan Gani Muthalif, Sumaiyah Mior Badri, Sarah Khalidah and Nuruleeman Saat

18 Development of Robotic Manipulator to Assist Human by Using Brain Signal 117
Rodhiah, Raisuddin Khan and Masum Billah

19 Development of Unmanned Aerial Vehicle – Part 1 123
Shahrul Na'im Sidek, M. Ismail Mohtar, A Mushawwir M Khalil

20 Development of Unmanned Aerial Vehicle – Part 2..... 129
Shahrul Na'im Sidek, A Mushawwir M Khalil, M. Ismail Mohtar

21 Earthquake Prediction And Monitoring Using Unusual Animal Behavior..... 134
A. M. Aibinu, W. Astuti, M. J. E. Salami, R. Akmelawati and Asan Gani Muthalif

22 Development of Automatic Rocking Baby Cradle..... 141
W. Astuti, N. F. Azlan, A.M. Aibinu, Momoh Jimoh E.Salami and Wahyudi Martono

23 Electrooculograghy (EOG)-Controlled Wheelchair..... 149
Shahrul Na'im Sidek, M. Iqbal Zakaria and A. Ridwan A.Aziz

24 Conceptual Design of an Intelligent Coconut Dehusking..... 155
M. J. E. Salami,, A. M. Aibinu

25 An Electrooculogram (EOG) Signal for Wheelchair Motion Control..... 163
Salmiah Ahmad, Nurul Muthmainnah Mohd Noor

26 A conceptual Paper on Intelligent Car Battery Monitoring System..... 171
Abdul Hafiz Bin Sahar, Khairul Azhar Bin Muhamat, M. J. E. Salami, and A. M. Aibinu

27 GIS-Based Vehicle Traffic Simulation..... 177
Wahju Sediono

28 Intelligent Postal Mails Sorter..... 183
Mohd Arif Faiz Bin Omar, Mohd Zain Bin Ismail, M. J. E. Salami, A. M. Aibinu

29 Intelligent Wet Scrubber System for Industrial Air Pollution Control..... 188
Bashir Ahmed Danzomo and Momoh Jimoh E. Salami

30 Leveraging on Nature for Systems Design..... 194
Nahrul Khair Alang Md Rashid and Safinaz Kader Mohideen

31 Natural Ventilation of Yam Storage System..... 199
Murtala Abdulazeez, M.J.E. Salami, Md. Raisuddin Khan

32 Self-Repair Capability in Engineering Systems..... 208
Nahrul Khair Alang Md Rashid and Aous Naji Rasheed

33 Simulation of Airflow and Temperature Distribution in Yam Storage System 213
Murtala Abdulazeez, M.J.E. Salami, Md. Raisuddin Khan, Nabeel Adeyemi

34 Sound Identification in Noisy Environment..... 218
Nahrul Khair Alang Md Rashid, Nor Hidayati Diana Nordin and Alim Sabur Ajibola

35 Intelligent CCTV-Based Monitoring System for Kulliyyah of Engineering, IIUM..... 225
M. J. E. Saslami,, A. M. Aibinu and Nur Syahrain binti Mohd Jahini

36 Virtual Modeling of Two-Wheeled Wheelchair using Msc Visual Nastran 4D..... 231
Salmiah Ahmad, M. O. Tokhi

CHAPTER 21

Earthquake Prediction and Monitoring Using Unusual Animal Behavior

A. M. Aibinu, W. Astuti, M. J. E. Salami, R. Akmelawati and Asan Gani Muthalif

Intelligent Mechatronics System Research Group

Department of Mechatronics Engineering, International Islamic University Malaysia.

P.O. Box 10. 50728, Kuala Lumpur, Malaysia.

maibinu@iium.edu.my

21.1 Introduction

Earthquake is one of the most destructive natural disasters that killed many people and destroy lots of properties. The ability to predict the earthquake can lead to great reduction in catastrophic effect caused by this unwanted phenomenon. Earthquake predictions involve the study of the phenomenon prior to the earthquake. As many observation of the earthquake prior phenomenon, unusual animal behavior is one of the precursor phenomena prior to the earthquake.

Among the geophysical stimuli which lead as precursor signals for earthquake, the changes of electric field and electromagnetic can be detected by animals and has been attributed to the reason for unusual animals behavior. On the other hand, changes in magnetic field reported before earthquakes are less than one ten thousandth of the earth magnetic field, thus it is highly impossible for this to be the cause of unusual animal behavior. Unusual animal behavior prior to the earthquake would be cause by pulsed electric field rather than magnetic fields.

The observation to the experiment result shown that the aquatic animal are more sensitive to the changing of electric field compare to the land animals, since it has high sensitivity in receiving changing of electric fields.

Earthquake is a movement or displacement of the earth's surface, resulting in release of energy through a sudden dislocation in the segment of the earth crush [6]. The necessity associated with this earthquake needs not be over emphasized. As earthquake is one of the most destructive natural disasters that killed many people and destroy many things. The very big tsunami triggered by a magnitude 9 in Richter scale of northern Sumatra Island on December 26, 2005 rolled through the Indian Ocean, and killed more than 150,000 people (Wikipedia,2011). Similarly, The recent giant earthquake magnitude 9 R that followed by the tsunami on March 11, 2011, happened in Tohoku, Japan [5] and killed 18.000 people. Moreover the ability to know the occurrence of earthquake ahead of time can lead to reduction in causality and damage caused by this unwanted phenomenon.

21.2 Unusual Animal Behavior Prior to the Earthquake Experiment

Reducing the impact of the earthquake is an important issue. In order to reduce the number of damages caused by earthquake, the prediction of the incoming earthquake can be one of the solutions. There have been lots of concerted efforts in reducing the catastrophic effects of earthquake among which are the ability to accurately predict the incoming earthquake far ahead of time. Earthquake predictions involve forecasting the occurrence of this unwanted natural disaster of specific magnitude, time and likely region of occurrence. Earthquake prediction can be divided into three different types, namely long term, intermediate and short-term prediction [6]. Long term prediction, which is not so accurate, is rarely used for public evacuation while intermediate prediction, which consists of prediction over years to weeks. Similar to the long term prediction, this is also of less usage. Short term predictions involve forecasting the likely occurrence of