

MECHATRONICS

BOOK SERIES

SYSTEM DESIGN AND SIGNAL PROCESSING

VOLUME 2

Editors

Md. Raisuddin Khan

Md. Mozasser Rahman

Muhammad Mahbubur Rashid

Shahrul Na'im Sidek



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

19. Human Posture Recognition Classification And Recognition..... 157
Kyaw Kyaw Htike, Othman O. Khalifa and and Lai Weng Kin

20. Human Posture Recognition Preprocessing Techniques..... 162
Othman O. Khalifa, Kyaw Kyaw Htike, Lai Weng Kin and A. Albagoul

21. Path Detection Implementation Using Fuzzy Classifier 171
Imran Moez Khan, Yusof Zaw Zaw, Othman O. Khalifa and Lai Weng Kin

22. Mechanical Design Of Unmanned Underwater Vehicle 180
Md. Raisuddin Khan, M. Zuhdi and Masum Billah

23. Design And Development Of An Automated Café System..... 187
Md. Raisuddin Khan, MAS Kamal and Masum Billah

24. Speech Coding Using Compressive Sensing On A Multicore System 194
T.S. Gunawan, Othman O. Khalifa, A. A. Shafie and E. Ambikairajah

25. A Case For Cooperative Vision System..... 202
A. A. Shafie and N. Samudin

26. Path Following Autonomous Vehicle Based On Vision System..... 208
A. A. Shafie, E. A. Syukur and N. I. Sidek

27. Trajectory Planning Using Gps For Unmanned Aerial Vehicle With Microcontroller Based System 215
A. A. Shafie, Md. Raisuddin Khan and M Shehzad Islam

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 2

SELF-POWERED SOLAR TRACKING SYSTEM PART 1 : SYSTEM MODELING AND HARDWARE SELECTIONS

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2.1 Introduction

Solar power is an alternative technology that will hopefully leads us away from petroleum dependant energy sources. The main issue regarding conventional solar panel is about its efficiencies of power absorption. Researches had been conducted and found out that the maximum power absorption happen when the panel is normal to the solar rays [1]. To orient the solar panel according to the sun's position can be achieved by implementing motors and actuators in the system. The implementation of motors and actuators will create a mechanism to control the orientation of the panel. There are quite numbers of solar tracker system nowadays that are being used widely. There are two types of solar tracker that is single axis and dual axis tracker.

Basically, in order to orient the panel according to the sun position, the study of the elevation angle of the sun is necessary. This angle differs with its location. For accommodating this matter, dual axis solar tracking system should be more appropriate [2]. This chapter discusses the system modeling and hardware selection for the two axis solar tracker.

2.2 Methodology

For this project, we decided to fabricate a solar tracking system that is suitable for all places at any elevation angles. For self-powered function, the power absorbed from the solar will be stored in battery. Therefore, dual axis solar tracking system is required and to design it, a thorough research and a sufficient knowledge about control system, theory of machines and design, and electronics are required.

A normal solar panel or fixed photovoltaic panel consists of the photovoltaic panel and its charger [4]. Due to the system features, fixed photovoltaic panel do not aim directly to the sun due to the constant motion of earth. As a result, the power produced by the system is less than its maximum capability. The amount of power produced by a photovoltaic panel depends upon the amount of sunlight it is exposed to. In other word, more light means more power. To overcome this problem, the tracking system can be installed in order that the panel will constantly orient itself to the normal of the solar rays as it will produce maximum power [5]. The design of the tracking system consists of both mechanical and electrical parts.

For mechanical part, we need to control the tilt angle of the panel according to the elevation angle of the sun. The movement of the panel controlled by the actuators must be accurate according to the sun position. There are several types of actuators and motors used commonly for tracking system.

For electrical part, we need to affix the functions of autonomous using electronics components such as microcontroller, motor driver and many more.