

MECHATRONICS BOOK SERIES

ROBOTICS AND AUTOMATION

Rini Akmeliawati
Wahju Sediono
Nahrul Khair Alang Md. Rashid



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Editors

Rini Akmeliawati
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TABLE OF CONTENTS

Preface	i
Acknowledgement	ii
Editor	iii
Table of Content	v
1. Visual Tracking for Human Face A.A. Shafie, Iqbal and M.R. Khan	1
2. Robot Design : A Case Study of Team Learning Experience and Outcome A.A. Shafie	7
3. Development Neck Support for Humanoid Robot Head A. A. Shafie, M.N. Kasyfi and N. I. Taufik Y	14
4. Development of Cooperative Mini Robot Amir A. Shafie , Siti E.M.Z and Shazeela A	21
5. Humanoid Robot Arm Amir A. Shafie and Mohd N. Y.	26
6. Designing Human Robot Interaction for Emotionally Expressive Robotic Hear AMIR-III A. Iqbal, A. A. Shafie, and M. R. Khan	32
7. An Overview of Fuzzy Based Person Following Robot T. Alamgir, I. J. Alfar and M. M. Rashid	38
8. Mechanical Design of a Person Following Robot Tarik Bin Alamgir, Ibrahim Jawad Alfar and Muhammad Mahbubur Rashid	43

9. Development of Fuzzy Based Person Following Robot part 2	49
Tarik Bin Alamgir, Ibrahim Jawad Alfar and Muhammad Mahbubur Rashid	
10. Mobile Robot for Fined Tube Inspection	56
Muhammad Mahbubur Rashid	
11. Robot Aided Upper Limb Rehabilitation System: Mechanical Design	64
Shahrul Na'im Sidek, Hidayatullah Mohamed Nawi	
12. Robot Aided Upper Limb Rehabilitation System: Electronics for Sensors and Actuators	69
Shahrul Na'im Sidek, Khairul Anwar Khalid	
13. Robot Aided Upper Limb Rehabilitation System: Results and Analysis	73
Shahrul Na'im Sidek	
14. Snake Robot Locomation in Narrow Space: A Review	79
Raisuddin Khan, Mitsuru Watanabe and Masum Billah	
15. Multiple Hexapod Robot and Collaborative communication	86
Raisuddin Khan, Masum Billah and Mohiuddin Ahmed	
16. Autonomous Unicycle Robot Using Reaction Wheel Pendulum: Mechanical Design	94
Atika Adrina Teepol, Nur Fadhilah Mohd Fauzey, Shahrul Na'im Sidek, Yasir Mohd Mustafah	
17. Autonomous Unicycle Robot Using Reaction Wheel Pendulum: Controller Design	103
Nur Fadhilah Mohd Fauzey, Atika Adrina Teepol, Shahrul Na'im Sidek, Yasir Mohd Mustafah	

HISTORICAL BACKGROUND AND EDUCATION

19. Develop an Algorithm for Goal Finding Robot using Reinforcement Learning	118
M. Kamal, R. Khan, S. Bazuhair and M. Billah	
20. Design and Development of 2 Fingers Robotic Hand Actuated by Active Grasping Data	126
MdMozasser Rahman ¹ ,MohdZoolfadli B MdSalleh	
21. Design and Development of Interactive Fish Robot	144
MdMozasser Rahman ¹ ,RizaMuhida and Mohammad Zukhair b MohdNazmi	
22. Design and Development of A Digger Robot	154
MdMozasser Rahman,MohdRuzaini Bin AbdRalim and Others	
23. Glass Wall Cleaning Robot: A Review	170
Md Mozasser Rahman, Ahmed Murgab Mohammed Mahil, Norsofiana Bt Umar and Nurul Izzati Bt Samsuddin	
24. Glass Wall Cleaning Robot: -Electrical design and control	177
Md Mozasser Rahman, Ahmed Murgab Mohammed Mahil, Norsofiana Bt Umar and Nurul Izzati Bt Samsuddin	
25. Glass Wall Cleaning Robot: -Electrical design and control	187
M. M. Rahman, M. R. b A. Ralim	
26. Development of Robotic Manipulator to assist human using brain Signal	198
Mahbuba Hossain, Raisuddin Khan, and Masum Billah	
27. Glass Wall Cleaning Robot: Mechanical Design	204
Mahbuba Hossain Raisuddin Khan, and Masum Billah	

28. Intelligent SCADA Based Monitoring Scheme for Low Voltage Distribution System	210
M. J. E. Salami, A. M. Aibinua, Mohd Shafie Bin Sani and Nurfaizal Bin Wah	
29. Intelligent SCADA Based Monitoring Scheme for Low Voltage Distribution System	218
Abdullateef Ayodele Isqeel and Momoh Jimoh Eyiomika Salami.	
30. Autonomous Goal Finding Robot	227
M. Kamal, Md. R. Khan, Faisal and M. Billah	
31. Intelligent SCADA Based Pipe Monitoring System	236
M. J. E. Salami, A. M. Aibinua, Mohd Shafie Bin Sani and Nurfaizal Bin Wah	
32. Path Tracking of Car Like Mobile Robot	250
A. A. Isqeela and M. J. E. Salami	
33. A New Energy Efficient Building System	255
M. J. E. Salami, Md. R. Khan, O. A. Abdulquadric	
34. Automatic Car Parking System	262
M. J. E. Salami, Md. R. Khan and O. A. Abdulquadria	
35. Anthropomorphic biped robot	267
A. A. Shafie, M. F. Baharudin	

Development of Cooperative Mini Robots

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4.1 Introduction

Many teams of intelligent robots have been developed at different labs for mainly for research issues in specific areas of collaborative and cooperative work. The teams of intelligent robots can also be classified according to the robotic system either homogeneous or non-homogeneous.

Cooperative actions can be defined as to associate with another for mutual, often economic benefit. It also can be defined as joint collaborative behaviour that is directed toward some goal in which there is a common interest or reward, the form of interaction usually based on communication.

Cooperative behaviors enable a team of mobile robots to accomplish missions that cannot be achieved with individual mobile robot. Since each of robots is only responsible for partial fulfillment of the task, the robots can be less complex. Multiple robots can be used for numerous tasks such as foraging and coverage, box pushing and object transportation, exploration and flocking, multi-target observation as well as entertainment purposes such robotic soccer or coordinated dancing robot.

In this paper, a description of the design and structure of a pair of mini robot to be used in cooperative work is presented. The immediate aim of the development is to design and develop a pair of mini robot which has the ability of moving and balancing the long beam at the same time. Each of the robots can be programmed to be a leader or follower, whereby the leader will be instruction to other robots whilst the follower will receive instructions from the leader robot. The robots as presented here are homogeneous multi-robot system as both of the robots are similar with each other (sensor, microcontroller and mechanical components). Implicit communication where the robots communicate through physical interaction is implemented.

4.2 Literature Review

Farinelli et al. [1] classified the works on multi-robot system (MRS) as two group of dimensions; Coordination dimensions and System dimension. Coordination dimension is divided into four level; Cooperation, Knowledge, Coordination and Organization.

The first level, Cooperation level is focused on the ability of the system to cooperate in order to accomplish a specific task. The second level, Knowledge level is concerned with the knowledge the teach robot in the team has about its team mates. In this level, there is aware and unaware robot which the former robot has knowledge of their team mates while the latter robot is in the other way round. The Coordination level is concerned with the mechanism used for cooperation. The final level, Organization level introduces the distinction in the form of coordination, distinguishing centralized approach from distributed ones.