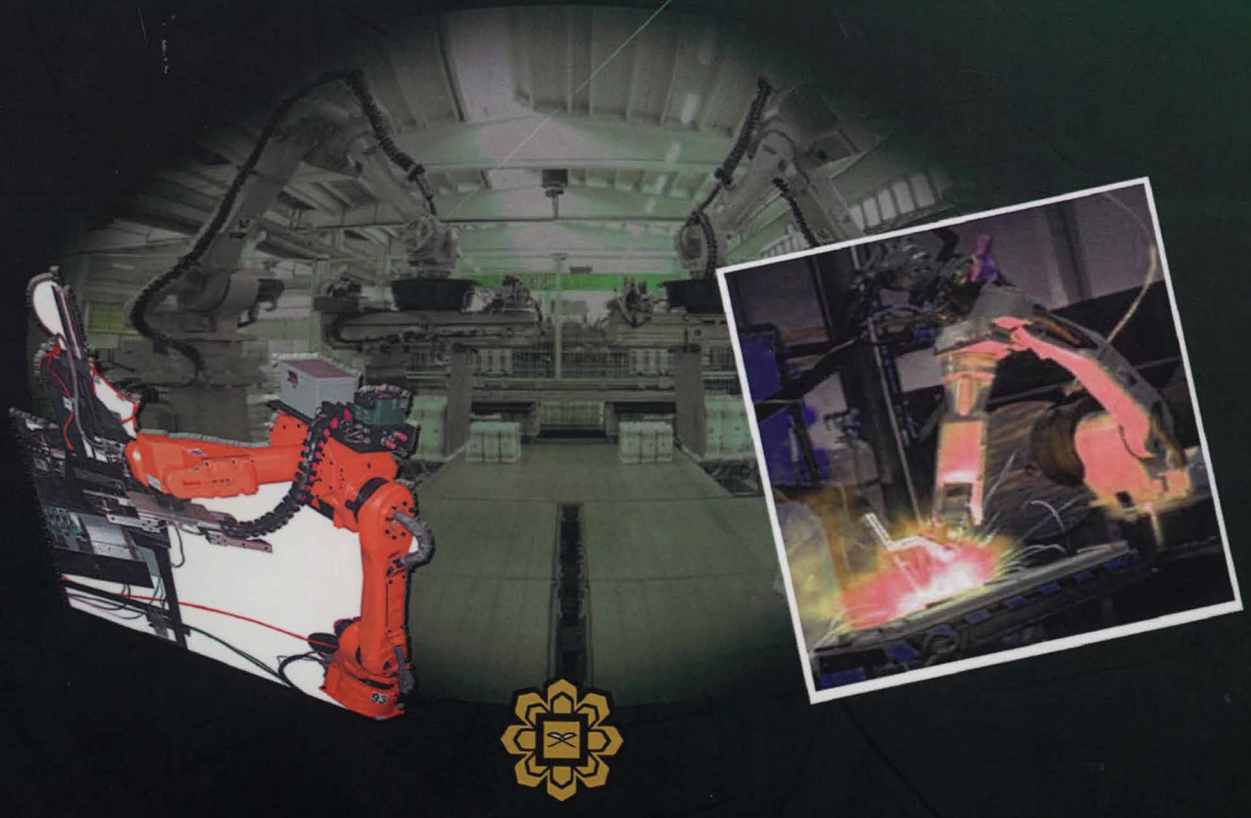
MECHATRONICS BOOK SERIES

ROBOTICS AND AUTOMATION

Rini Akmeliawati
Wahju Sediono
Nahrul Khair Alang Md. Rashid



IIUM PRESS

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

MECHATRONICS BOOK SERIES: ROBOTICS AND AUTOMATION

Editors

Rini Akmeliawati
Wahju Sediono
Nahrul Khair Alang Md. Rashid

IIUM Press

Published by:
IIUM Press
International Islamic University Malaysia

First Edition, 2011

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

Rini Akmeliawati, Wahju Sediono & Nahrul Khair Alang Md. Rashid: Mechatronics Book Series Robotics and Automation

ISBN: 978-967-418-152-9

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

TABLE OF CONTENTS

CHAPTER 35

Anthropomorphic Biped Robot

A. A. SHAFIE[1*], M. F. BAHARUDIN [1]

[1]Department of Mechatronics Engineering, Faculty of Engineering, International Islamic University Malaysia, Jalan Gombak, 53100 Kuala Lumpur, Malaysia.
aashafie@iiu.edu.my

35.1. Introduction

This chapter discusses the basic considerations of an anthropomorphic biped robot based on the experimental hardware developed for mimicking a simple gait. The experimental hardware developed primarily used to investigate the control for balancing act of bipedal robot. The method of controlling the sequence for gaiting in the experiment reported here to mimic the human walking locomotion.

35.1.1 Motivation

An active relationship between hardware and software is required in designing an anthropomorphic gait. Software design is required to provide the balance control to the gaits. This involves maintaining a stable equilibrium while progressing along a surface. To achieve such a balance, static balance can be used to define points of tending to balance during a gait. This refers as the walking state methodology. Many methods can be applied to choose the point where biped robot can achieve maximum balance. Biologically, the control strategy of getting this point for a biped human is its natural gait as limited by individual body structure.

Legged machines that utilize bipedal gait capability are highly sought because they can pass obstacles or move on uneven terrains in a low-invasive way which is in general better than that of wheeled robots. This is particularly true in situations, such as climbing stairs and walking through corridors. The biped locomotion achieves this feat with small convex hull of contact points and high capacities of mobility.

However, compared to a hexapod robot the mechanical design and actuation of bipedal legsis more difficult. This is due to the contradictory issues, such as lightness, high jointtorques, large joint range, low backlash and friction that have to be considered in the design of bipedal legs. Besides, bipedal legsare naturally unstable, thus, requires very efficient control methods. Because of this unstability, safetyaspects are very important in design. As a consequence, the quality of achievement of biped robot dependsheavily on a tight cooperation between fields of mechanics and automatic control.

35.1.2 Project objectives

In this study, there are two main original features that are considered in robot design. First,the design should equip the robot with the abilityto manoeuvre on partially uneven