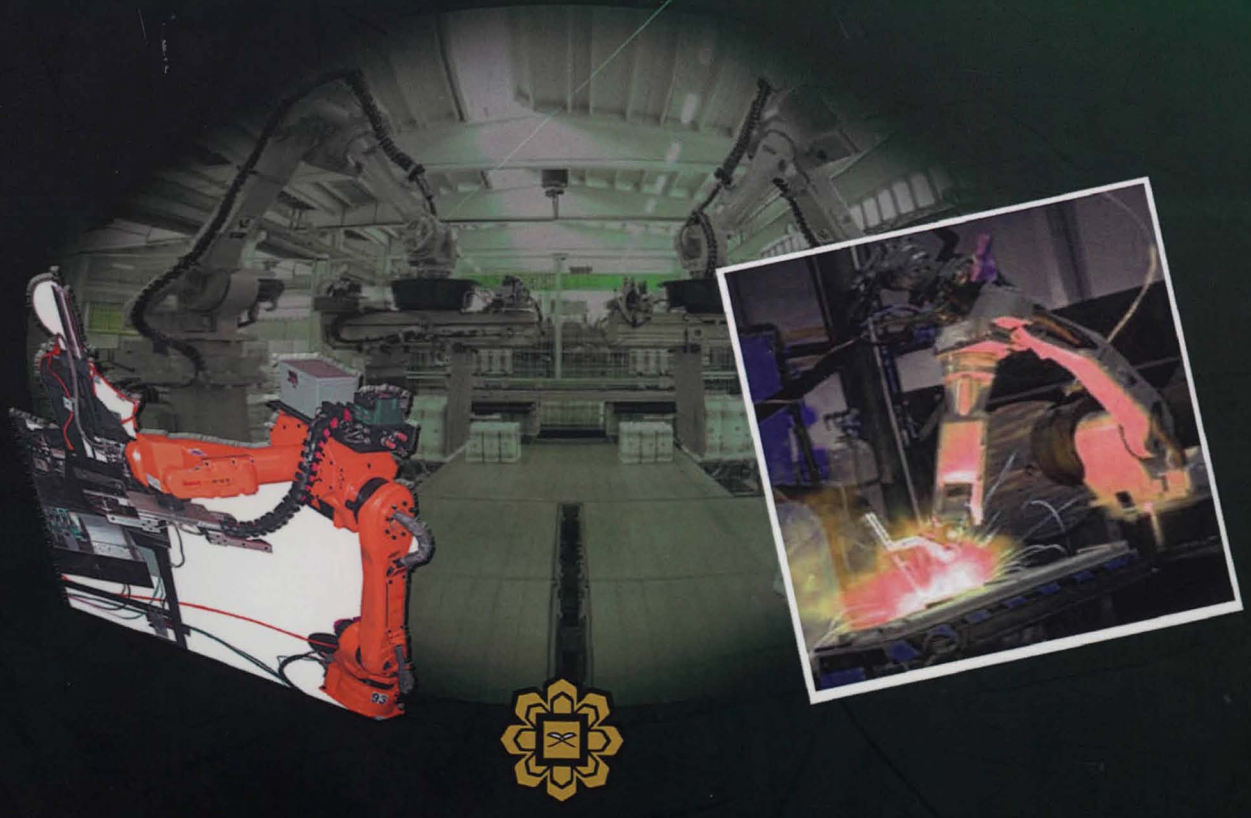
MECHATRONICS BOOK SERIES

ROBOTICS AND AUTOMATION

Rini Akmeliawati
Wahju Sediono
Nahrul Khair Alang Md. Rashid



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Editors

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CHAPTER 6

Designing human robot interaction for emotionally expressive robotic head AMIR-iii

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6.1 Introduction

When people think about a robotic control interface they usually envisage a screen with different flashing lights and numerical indications from the sensors or robot devices that are meant to represent the condition of the robot. This kind of interface can mean that the use of the robot, the interaction and the diagnosis are limited to specialist users. However, in some situations and certain fields it could be advantageous to have a simple interface, on which, people without any knowledge of computer science and robots, could interact effectively.

As robots have been predicted to become part of our everyday life, there have been a significant number of active researches in the area of Human-Robot Interaction (HRI) for socially interactive humanoid robots. Among the innovative methods proposed includes Michalowski [1] that shows a rhythmic movement technique to engage a robot with human for an effective interaction. Cynthia [2] and Rosalind [3] suggests that HRI for applications like socially interactive machines can be very effective if it can exchange emotional expressions with the human counterpart. To date, robots have been studied in a variety of therapeutic application domains, ranging from using robots as exercise partners, using robots in pediatrics, robots as pets for children and elderly people, and robots in autism therapy. Researchers have developed robots engaged in social interaction with human using various modes of communication. Robots such as Paro [4], Robota [5], Keepon [6], Infanoid [7], Kismet [8] have been used successfully to emotionally engage with human very effectively via speech, vision, touch etc. as the channel for interaction.

The human face is one of the most compelling components of a human-like interface. The most common way of expressing emotional state of a human is via facial expression augmented with verbal cues and physical gestures. Emotional expressions over time may make peoples' faces descriptive of their personalities and their state of mind. Emotions are very natural and integrated attributes of human behavior. Peoples try to understand and interpret human emotions and respond to it in an appropriate way to maintain a natural interaction with each other. It is only then that an effective and natural Human-Human interaction takes place. While emotions are reflected in the voice, in hand and body gestures, to express the feelings, face is undeniably the most important part of the body that displays major information regarding the emotional state of human.

6.2 Evolution of the humanoid head: AMIR

The first prototype of the robotic head, named AMIR-I [9, 10], had Basic Stamp 2 microcontroller at its heart. The controller was linked to 17 parallax servo motors connected with different parts of the mechanical structure. The aim of AMIR-I was to head-start into this emerging field of research and create a test bed for development and iterative improvement towards developing an interactive