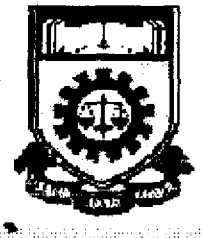
FUZZY LOGIC CONTROLLER
OF AN
INVERTED PENDULUM

Thesis presented in partial fulfillment for the award of the
Bachelor in Electrical Engineering (Hons) of
INSTITUT TEKNOLOGI MARA



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NOVEMBER 1998

ACKNOWLEDGMENT

In the name of ALLAH, I would like to take this opportunity to express my special gratitude to my project supervisor, Dr. Mohd Nasir Bin Taib for his guidance, support and advise during the progress of this project.

Apart from that, I would like to thank Dr. K. Parvatism, Encik Azhar and Puan Halimaton for their assistance.

ABSTRACT

This report is concerned with the development of a fuzzy controller for an inverted pendulum system. The pendulum is mounted on a mobile cart. The aim of the controller is to stabilise the pendulum at 90° to the direction of the cart. The controller was designed based on the FuzzyTECH software and then integrated into a computer based main program written using the C-language. The controller performs very well when compared to a generic predictive control technique.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

For several decades, control theorists have successfully dealt with a large class of control problems by using an approximate mathematical model to describe a physical process; the model is solved analytically to obtain a certain control law. However, in many cases the design of conventional controller is difficult because of the process is too complex or poorly understood to be modelled accurately. For such systems, human experts can provide acceptable performance under conditions of uncertainty and imprecision using mainly logical reasoning. Control actions by human experts can be expressed as linguistic rules that can be programmed into a rule-based system [1].

Since the introduction of fuzzy logic by Zadeh, rule-based controllers have been extensively developed using fuzzy logic to mechanise linguistic reasoning of human experts. The benefits of fuzzy logic control theory have made this technique very attractive and useful for solving a large class of non-linear control problems. Several applications have been reported on torpedo control, non-linear thermal process control, and aircraft flight control with impressive results [1].

1.2 Project Overview

The project mainly dealt with a control system implemented using the fuzzy logic controller to enable a free moving inverted pendulum to be stabilised at 90° to the cart movement direction.