AUTOMATIC ADJUSTABLE SPEED CONTROL

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This report is submitted in partial fulfilment of the requirement for the award of Bachelor of Electronic Engineering (Industrial Electronic) with honours

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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : ADJUSTABLE AUTOMATIC SPEED CONTROL

Sesi Pengajian : 0 9 / 1 0

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"I hereby declare that this report is result of my own effort except for works that have been cited clearly in the references."

Signature : .....

Name : MOHD ROEE BIN MOHD TASRIP

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DEDICATION

To my beloved father and mother

ABSTRAK

Projek ini bertujuan untuk membina sebuah alat yang boleh mengawal kelajuannya dengan sendiri walaupun terdapat ganguan. Motor ini mempunyai beberapa kelajuan untuk dipilih. Antaranya kelajuan redah, sederhana dan tinggi. Sistem ini dikawal dengan menggunakan sistem PIC (Programmable Interface Controller). Kelajuan motor arus terus akan diukur dengan menggunakan pengesan cahaya. Sistem ini juga dibina dengan bertujuan untuk mengesan kelajuan motor arus terus sekiranya diberi gangguan pada motor arus terus. Sistem ini akan beroperasi tanpa sebarang masalah ketika tiada gangguan yang dikenakan. Manakala, ketika gangguan yang rendah dikenakan pada sistem ini, kelajuan motor akan berkurang sedikit. Pada ketika gangguan yang tinggi dikenakan, kelajuan motor akan berkurang terlalu rendah daripada keadaan asalnya. Objektif utama projek ini adalah untuk membina sebuah sistem yang dikawal oleh PLC untuk mengawal kelajuan motor arus terus secara automatik walaupun terdapat sebarang gangguan dalam sistem tersebut. PLC memainkan peranan yang penting dalam sistem kawalan ini. Sistem PLC akan tetap mengawal kelajuan motor arus terus pada kelajuan yang ditetapkan walaupun terdapat sebarang gangguan pada sistem ini. Kelajuan motor arus terus yang diukur dengan menggunakan pengesan cahaya dan akan dipaparkan pada ruas tujuh dalam bentuk integer.

ABSTRACT

This project is aimed to create a device that can automatically control the speed of the motor at the certain speed even thought there is any disturbance. The motor's speed also can be selected in certain speed. There is low, medium and high speed. The PIC (Programmable Interface Controller) is used as a controller to control the speed of DC motor. Optoelectronic sensor will be used to measure the speed of DC motor. In this system, the photo detector sensor was used for measure the rotation speed of DC motor. This system is also can measure the speed of rotation even there is any disturbance occurred in systems. The disturbances could be such as wind, oil or water. When there is any disturbance occurred in system, the PLC will be triggered and control the rotation of motor to the setting speed. The main objective of this project is to design a system with PLC to measure the speed of rotation of DC motor even there is any disturbance occurs in systems. The speed of rotation can be detected by using the optoelectronic sensor. This LED will emit a beam of light to rotated disk. The interrupted beam light will be captured by the photo detector and the speed will be measured. The PLC acts as a main part in this project as it triggers and controls the whole circuit. The PLC controller is controls the speed of rotation. The measured speed will be display in a seven segment display.

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UTeM -	Universiti Teknikal Malaysia Melaka
rpm -	Rotation per minute
DC -	Direct current
Amp -	Ampere
V -	Voltage
LED -	Light Emitting Diode
PIC -	Programmable Integrated Circuit

LIST OF APPENDIX

CHAPTER I

INTRODUCTION

Projek Sarjana Muda (PSM) or Bachelor's project is one of the compulsory subjects that each of UTeM's students should taken in order to fulfill the requirement for the award of Bachelor of Electronic Engineering with Honours. Each of students will spend around one year or two semesters to design and complete their Bachelor's project. In this chapter, the background of the project has been discussed briefly.

1.1 INTRODUCTION

This project requires designing a control system that can automatically control the motor's speed even there is any disturbance. photodetector sensor will be used to measure the speed of DC motor. The LED will produce a beam of light to rotated disk and the speed will be measured. Then, the measured value will be display in the Seven Segment Display. The system will use PIC as controller to control the speed even if

there are disturbances occur at system. PIC act as a main part in this project as it triggers and controls the whole circuit. The PIC controller is controls the speed of rotation. There are three types of speed that can be selected. There are low speed, medium speed and high speed. The measure speed will be display in a Seven Segment Display.

1.2 OBJECTIVE OF PROJECT

The objectives that will be fulfilled in order to complete this project:-

a) To create a device that can automatically control the speed of the motor if the is any disturbance.
b) The motor's speed also can be selected in certain speed which is low speed, medium speed and high speed.

1.3 PROBLEM STATEMENT

This project is design based from idea to overcome some of the problem that can be occurring in manual control system. Firstly, uncontrolled or unstable speed control can bring problems to the process that required constant motors speed even when disturbance occur. Disturbance can reduce the speed of the motor. Manual controlling needs system or process to activate and deactivate the motor's speed.

1.4 *SCOPE OF WORK*

The system designed to control the motor's speed. photodetector sensor used to count the revolution of the motor(rpm) and give feedback signal if there any problem. The PLC controller act as brain of this device to trigger the circuit to control the speed of the motor if there is any disturbance. There are three types of disturbance that can adapt to the system which is zero disturbances, low disturbance and high disturbance. The zero disturbances will not give any effect to the system. However, the low disturbances will slower the speed of rotation a little and the high disturbance will slower the speed quite big. Next, the automatic adjustable speed control can be selected in three various speed. There is low speed, medium speed and high speed. The speed of rotation can be count by using optoelectronic sensor and the speed of rotation will be display in Seven Segment Display. Flash MX h is used to make animation of this project.

1.5 FLOWCHART

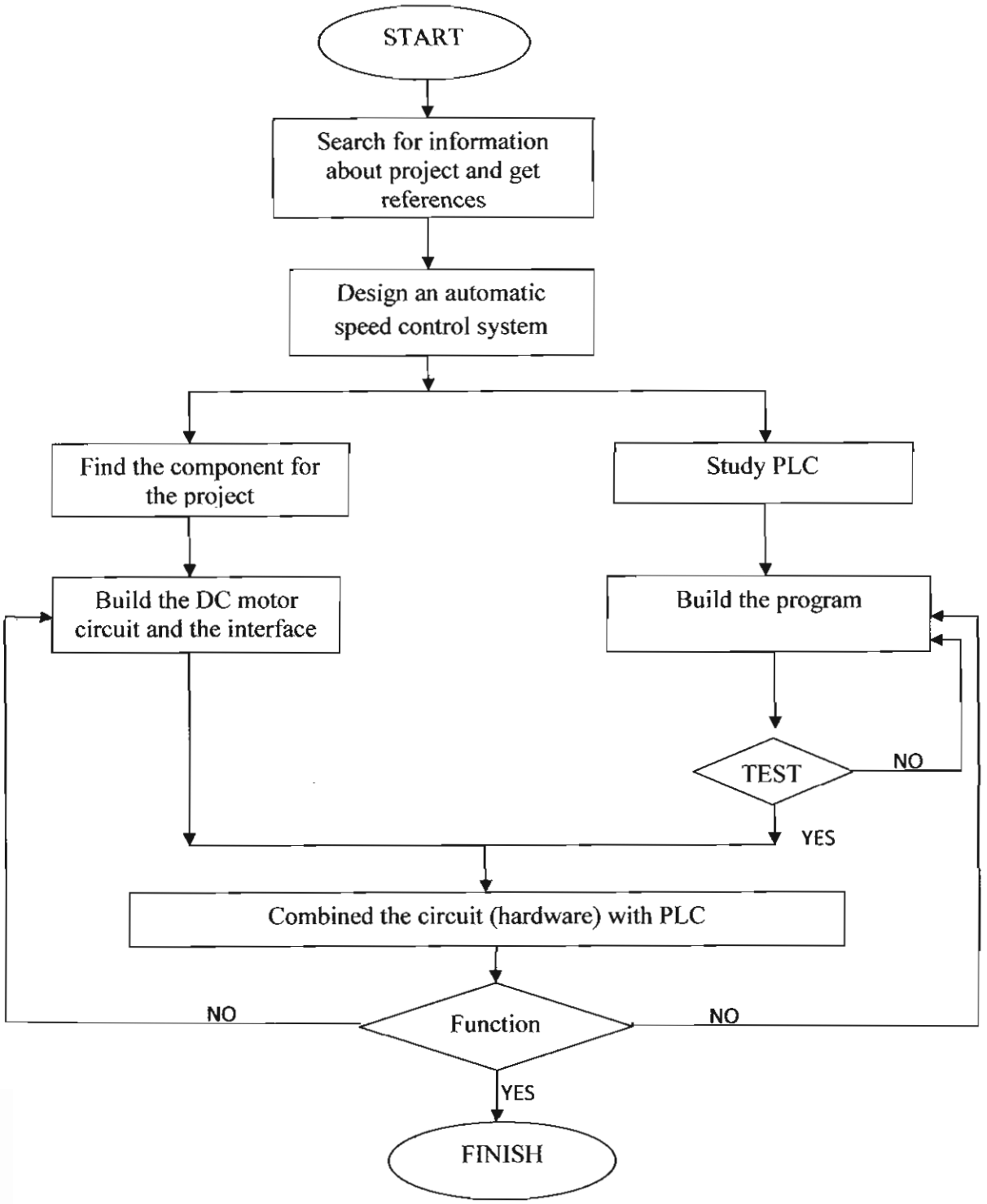

Figure 1.1: Flow Chart of the Project

a) *Research about DC motor circuit.*

Study the characteristic of DC motor and design the circuit. Choose the suitable DC motor to use in the project.

b) Research about controlling circuit.

Study and develop the Programmable Logic Circuit (PLC) to act as a brain to control the motor's speed.

c) Research about measuring circuit.

Study and design the optoelectronic sensor such as photodetector for measuring the rotation of the DC motor's disk.

d) Research about display circuit.

Study and design the display circuit such as Seven Segment Display. The rotation will be measured in revolution per minute (rpm).

e) Testing and Commissioning.

Combine all the hardware part and perform the test run.

f) Analysis the result.

Observe all the result, find the trend and make comparison to theory.

g) Submit complete report.

Write the project report.

1.6 THESIS OUTLINE

Each chapter begins with identifiable objectives and brief overview. This report is divided into several chapters which are Introduction, Literature Review, Theory, Project Methodology, Result and Analysis and Conclusion.

The first chapter is an introduction to the project. It consists of objectives, scope of works, problem statements and research methodologies that clearly describe what is the project is all about.

The second chapter contains about theory and concept of the entire project. Literature review based on technologies and information has been done in order to create a specific research about this project. Several research are been highlighted such as temperature sensors, Programmable Logic Controller and the used of FLASH as an animation of the project.

Chapter three explained the methodology of implemented used in this project in detail. In this chapter, the methods and the project flow has been explained clearly. In chapter four, it describes the results and analysis obtained on this project. This is the main chapter that shows the development of the project and thus, provides a full analysis on the project, starting from theoretical findings to a conceptual design and lastly simulation results.

For the last chapter of the thesis, some suggestions and conclusion have been made to make this project much better.

CHAPTER II

LITERITURE REVIEW

A literature review is a body of text that aims to review the critical points of current knowledge on a particular topic. In this chapter, each part of the project has been focused so that the more details about the project can be understood clearly. Besides that, the process and systems that involved in project are also discussed so that the process of the project can be understood.

2.1 CONTROL SYSTEM

Control is a system that deals with the behavior of dynamical systems. The desired output of a system is called the reference. A controller manipulates the inputs to a system to obtain the desired effect on the output of the system when one or more output variables of a system need to follow a certain reference over time.

2.1.1 *Open-Loop Control*

An open-loop controller, also called a non-feedback controller, is a type of controller which computes its input into a system using only the current state and its model of the system. A characteristic of the open-loop controller is that it does not use feedback to determine if its input has achieved the desired goal. This means that the system does not observe the output of the processes that it is controlling. Consequently, a true open-loop system can not engage in machine learning and also cannot correct any errors that it could make. It also may not compensate for disturbances in the system [1].

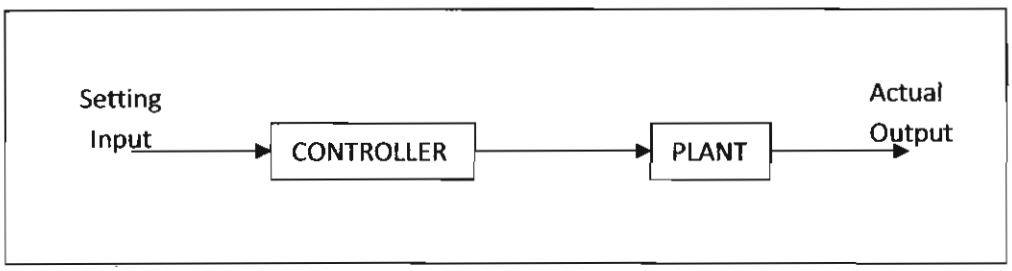

Figure 2.1: Open-Loop Control System

Open-loop control system as show in figure 2.1 is useful for well-defined systems where the relationship between input and the resultant state can be modeled by a mathematical formula. For example determining the voltage to be fed to an electric motor that drives a constant load, in order to achieve a desired speed would be a good application of open-loop control. If the load were not predictable, on the other hand, the motor's speed might vary as a function of the load as well as of the voltage, and an open-loop controller would therefore not be sufficient to ensure repeatable control of the velocity.

An open-loop controller is often used in simple processes because of its simplicity and low-cost, especially in systems where feedback is not critical. A typical example would be a conventional washing machine, for which the length of machine wash time is entirely dependent on the judgment and estimation of the human operator. Generally, to obtain a more accurate or more adaptive control, it is necessary to feed the output of the system back to the inputs of the controller. This type of system is called a closed-loop system.