

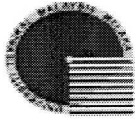
DEVELOP A MOTOR SPEED SYSTEM USING AN INFRARED SENSOR

AZIM FAUZA BIN MD KHAIR

This report is submitted in partial fulfillment of requirements for the award of
Bachelor of Electronic Engineering (Industrial Electronics) with Honours

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek: Develop a motor speed system using an infrared sensor

Sesi Pengajian: 2007/08

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FARID ARAFAT B AZIDIN

Pensyarah


Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200,
Ayer Keroh, 75450 Melaka

Tarikh: 09 MAY 2008

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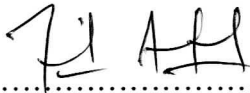
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To my beloved family

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ABSTRACT

The purpose of this project is to design or develop the motor speed sensor using infrared sensor. The concept of this project is quite similar with digital RPM meter for motor. The different between digital RPM meter with this project is the way to sense the rotation of motor. Normally, the digital RPM using mechanical sensor as their sensing element but this project that I want to develop is using infrared sensor as their sensing element. This special infrared sensor is not function as mechanical or other sensor but it is uses to detect the changing of black and white colors. Those black and white colors are creating on a motor shaft or motor pulley. That pulley is connected to the motor shaft and the infrared sensor will placed near the pulley. The rotation of motor will cause the changes of black and white colors. These changing of both colors produce the different signal or voltage and that voltage will compared using the comparator and other electronic devices to works with digital output. Then, that output signal will displays at seven segment display to shows the speed of motor in rotation per minute (RPM).

ABSTRAK

Kegunaan projek ini adalah untuk merekabentuk sebuah sistem kawalan kelajuan motor dengan menggunakan alat pengesan infra merah. Konsep yang digunakan atau diaplikasikan dalam sistem ini adalah lebih kurang sama seperti meter digital RPM. Perbezaan antara kedua-dua sistem adalah cara ia mengesan kelajuan motor tersebut. Kebiasaannya, meter digital RPM menggunakan alat pengesan mekanikal sebagai elemen pengesan dalam sistem tersebut tetapi sistem yang hendak saya bangunkan ini ialah dengan menggantikan alat pengesan mekanikal tersebut kepada alat pengesan infra merah. Alat pengesan infra merah ini tidak beroperasi seperti alat pengesan mekanikal tersebut tetapi ia digunakan untuk mengesan perubahan warna hitam dan putih. Warna hitam dan putih tersebut dibuat atau diletakkan pada batang atau gandar motor ataupun pada takal motor. Takal motor tersebut disambungkan kepada gandar motor dan alat pengesan infra merah akan diletakkan bersebelahan takal tersebut. Putaran motor tersebut akan menyebabkan perubahan warna hitam dan putih. Perubahan warna tersebut akan menghasilkan voltan dan memberi perbezaan voltan untuk setiap perubahan warna dan voltan tersebut akan dibandingkan dengan menggunakan litar perbandingan (*comparator*) dan lain-lain komponen elektronik untuk berinteraksi dengan keluaran digital. Kemudian, keluaran digital tersebut akan dipamerkan pada papan tujuh paparan (*seven segment display*) untuk menunjukkan kelajuan motor tersebut.

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LIST OF ABBREVIATIONS

BCD	-	Binary Coded Decimal
CDI	-	Capacitor Discharge Ignition
CMOS	-	Complementary Metal-Oxide Semiconductor
DC	-	Direct Current
ESD	-	Electrostatic Discharge
IR	-	Infrared
LSB	-	Least Significant Bit
MSB	-	Most Significant Bit
PSM	-	<i>Projek Sarjana Muda</i>
RPM	-	Revolutions per Minute

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CHAPTER I

INTRODUCTION

In this chapter, the background or overview of the project will be present which includes introduction of the project, objectives and scopes of the project. The problem statement will discuss about the problem occurs from the same product that already exist and how to overcome it compared with this new project. The scope and the methodology of the project also will be discussed in this chapter

1.1 Introduction

This project is quite similar with digital Revolutions per Minute (RPM) meter that exist in the market. For the display output, it consists of a unit of dual up counter, bipolar timer, dual monostable multivibrator, Binary Coded Decimal (BCD) to seven segment decoder and others electronics components. For this digital rpm meter, normally it has two wires for connect to supply and one wire for input signal. The different between this digital RPM meter compare with my final year project is focus on their types of detector to produce the input signal to connect to digital rpm meter. In this project, the new design needs to build an infrared sensor to be connected with that digital rpm meter and the input is produces by detecting black and white colors.

1.2 Objectives

Each project that we want to develop has their objectives to make sure the project is relevant and realistic. These objectives are used as a guide for me to ensure my project is success and follows all the requirements needed. So, the main objective of developing motor speed system using infrared sensor is to produce a new and creative design in the engineering field in addition to the variety of technologies today and can detects the changing of black and white colors and produce different voltage between both colors. The type of detector that will be uses in this project is infrared sensor or reflective photointerrupters and the reflective photointerrupters that had proposed is LTH-209-01 which manufactured by LITEON.

The additional objectives are to investigate and do some comparisons study with other motor speed systems that already exist. From this investigation, the weaknesses or the problems that occur in that system will be overcome by designing this new alternative project. The relevant of using this type of reflective photointerrupters are this sensor has fast switching speed, non-contact switching and suitable for detecting black and white colors.

Besides that, this project is design to study and investigate the characteristics of infrared sensor, the whole circuit and each components and parts involved in this project. In designing this project, the first assumption that can be made for the operation of infrared sensor is it can produce the different voltage between both colors. Its meaning that the output of infrared sensor will produced pulse signal to supply with the RPM digital meter.

1.3 Problem Statement

This project was created to make new and creative technology in engineering field and make some improvement to the digital RPM meter that already exist. That digital RPM meter normally applies to the vehicles such as cars and motorcycles by supply it with pulse signal that produces by electric Capacitor Discharge Ignition (CDI) motorcycles. Because by this project want that digital RPM meter to read the speed of the changing between black and white colors, the additional circuit needed to be connected with that digital RPM meter which is infrared sensor circuit. So, the main problem of develop this system is to design infrared sensor circuit that can produces pulse signal to supply to the digital RPM meter. All the criteria must be taken into consideration to ensure that the output signal that produces by infrared sensor is sufficient to supply as the input signal to the digital RPM meter. The voltage measured from the infrared sensor will be amplified by using amplifier circuit.

1.4 Scope of Work

Scope of work explains about the specifications of project including the tools and material used and the design concept. First of all, the specifications of the project being determine such as the application of the project, either to using any programming software or not and the proposed dimension for this project.

To ensure the progress of this project smooth and success, the first step that important is doing the research and make some simulation to the circuits that had designed. From that, obtain preliminary results and after that develop the circuits. For the hardware, there are two types of models that had decided which is the simple model of motor speed system and the second one is the detector which is infrared sensor with digital RPM meter. The simple model of motor speed system consists of a Direct Current (DC) motor that installs it with a piece of paper or card board that has the stripe of black and white colors.

This project needs to develop the hardware only and it is no need the programming application to function it. So, the concept design of the hardware is based on the simple design and flexible. The important things to make this project successful are it is achieves the objectives of the project and it will be function as the requirement needed which is can detect the changing of black and white colors.

The other scope is to doing troubleshooting process to the circuits if there have any problems that can cause the malfunction of the project. With this troubleshoot process, the real problems will be determined and will find the best solution to overcome all these problems.

1.5 Methodology

The simple methodology that applies to this project is shown below:

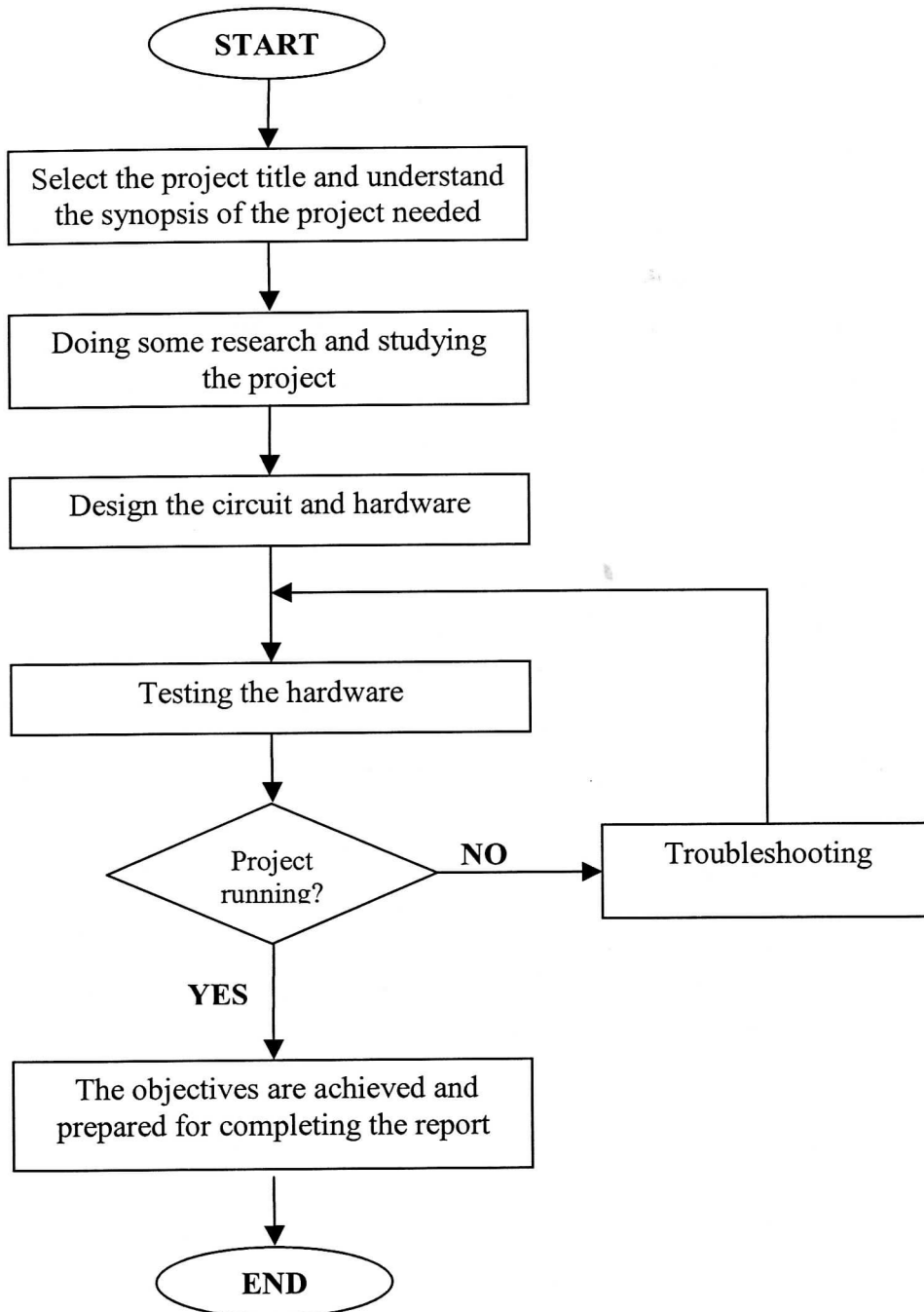


Figure 1.1: Methodology of the Project

1.6 Thesis Synopsis

This thesis contains five chapters that will explain more details about this project. First chapter, Introduction; consists of project background, objectives, problem statement, scope of work, methodology and thesis synopsis. Project background explains the basic introduction of this project while the project objectives explain about the target that need to achieve and the relevant of doing this project. Problem statement discuss about any related issues to find the best and suitable solution to make any improvement to the products that already have. Scope of work explains details about the specification of project including the tools and material used and the design concept. Methodology just explains in the simple way and thesis synopsis describes the overall contents that exist in this thesis.

Second chapter will discuss about the research and literature review that related to this project. All that sources will produce the draft that shows the relation between the project research and the theories via suitable figures. Every fact and information found from any reference books will be observed and debated to choose the best method for the project. Therefore, the research hypothesis that related with the project methodology will describe clearly. In other word, this chapter is all about theoretical part and relates and applies it to this project until the best solution found.

Third chapter discuss about the project methodology consists of techniques and approaches used in solve the project problems such as the method use in collecting and analyzing data, model and flow chart. Otherwise, the factors that being considered in choosing the best method and approach in solve the problems also explain in this chapter.

Fourth chapter shows the results of the project and the discussion that can made before starting the project and after completing the project. This chapter includes the figures and tables to express the results of the project. In discussion part, the problems occurred or faced during completing the project will be discussed and the best solution to overcome those problems will decide.

Last chapter will discuss about the conclusion made and the recommendation. In this chapter, the results and the achievements of the project will summarize and conclude. Otherwise, all the improvements and the changing that apply to the project will be explain clearly including the reasons to make some changing to the project. Then, the methodology and implementation that apply in the project will be discussed. For the recommendation, several suggestions are made to improve the project level and to ensure this project is become well in the future with some unique enhancements.

CHAPTER II

BACKGROUND STUDY

This chapter includes several sub-chapters which are introduction, literature study for motor speed system and literature study for infrared sensor including digital RPM meter. All the research will be explain details in this chapter including the specification tables and figures.

2.1 Introduction

This chapter presents the background study and some research required to develop the motor speed system using infrared sensor. This background study is required to studying all the characteristics and requirement needed to develop this creative project. All the information that collected is very important to ensure my project achieved their objectives and useful to make any comparison between the theoretical and the results that will get.