DEVELOP A ROTATING SPEED SENSOR SYSTEM WITH LINK TO VISUAL BASIC.NET

CHEE JIANN TONG

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

Faculty of Electronic and Computer Engineering
Universiti Teknikal Malaysia Melaka

April 2010

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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : **Develop a Rotating Speed Sensor System with Link to Visual Basic.Net**

Sesi Pengajian : 2009/2010 Semester 2

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FARID ARAFAT BIN AZIDIN
Pensyarah
Fakulti Kejuruteraan Elektronik Dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka (UTeM)
Karung Berkunci No 1752
Pejabat Pos Durian Tunggal
76109 Durian Tunggal, Melaka

Tarikh: April 2010

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Dedicated to my family especially my parents, brothers and to all of my friends.

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ACKNOWLEGEMENT

I wish to express sincere appreciation to Universiti Teknikal Malaysia Melaka (UTeM) for giving me a chance to further my study on Bachelor of Degree in Industrial Electronics in Faculty of Electronics and Computer Engineering (FKEKK).

Despite of that, I would take this opportunity to express my profoundest gratitude and deepest regards to all those who gave me the possibility to successfully complete this PSM. I am deeply indebted to my Project Supervisor Encik Farid Arafat Bin Azidin and I wish to express a million thanks for her exemplary guidance, monitoring and constant encouragement throughout the development of the project.

I would like to express my gratitude and appreciation to the following people for their essential helps, guidance and supports in making my PSM's project more successful. In addition to that, I also would like to thanks my friends: Ang Sei Qi and Tan Wei Kian. They are always help me when I face problem in this project. I am also grateful to my all friends who help me and giving me opinion during implementation of this project.

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ABSTRACT

The purpose of this project is to develop an angular speed detection system using a special Infra-Red sensor (IR) where it can detect black and white color and give a small differences voltage signal when the shaft motor was rotating. The black and white color will put at the shaft motor. When the shaft motor is rotated, the emitter IR sensor will emit infrared continuously and detect the color changes depends on setting or fixed time that will be programmed at microcontroller using PIC (Programmable Interface Controllers) complier software. This colors changing will generate a differences voltage. Usually, the microcontroller only recognizes digital input which is 0V and 5V. If the infrared reflected is less, the receiver would probably produce 2V or 3V and microcontroller is unable to deal with these analog values. So, the comparator (LM324) is used to solve this problem. By using the comparator LM324, the output voltage from IR receiver will compare to an input voltage through a variable resistor. This comparator able to compare for both input voltage and generate either 0V or 5V where it can connect to microcontroller. Lastly, the output voltage from microcontroller will display using LCD (Liquid Crystal Display). The important of my project is to display the measured value on the GUI Display on computer via Visual Basic.NET.

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ABSTRAK

Projek ini bertujuan untuk membina sebuah system pengesan kelajuan dengan menggunakan alat khas pengesan infra-merah (IR) di mana membolehkan alat ini mengesan warna hitam dan putih, dan memberikan perubahan isyarat voltan yang kecil apabila batang atau takal motor berpusing. Warna hitam dan putih tersebut akan diletakkan pada takal motor dan disambungkan pada gandar motor. Apabila motor tersebut beroperasi, pemancar infra-merah akan memancarkan infra-merah secara berterusan dan akan mengesan perubahan warna pada gandar motor tersebut mengikut masa yang ditetapkan atau diprogramkan pada mikrokawalan menggunakan perisian atau pengaturcara komputer PIC (Programmable Interface Controller). Perubahan warna ini akan menghasilkan perbezaan voltan. Kebiasaannya, mikrokawalan hanya mengenalpasti masukan digital 0V dan 5V. Jika pantulan cahaya infra-merah berkurangan, kemungkinan besar penerima infra-merah hanya memperoleh 2V atau 3V, dan ini menyebabkan mikrokawalan tidak berupaya untuk berkomunikasi dengan nilai anolog yang diterima. Sebagai penyelesaiannya, pembanding LM324 digunakan. Dengan menggunakan pembanding ini, voltan keluaran daripada penerima infra-merah akan dibezakan dengan voltan masukan melalui perintang boleh laras. Pembanding ini berkebolehan untuk membanding kedua-dua voltan masukan dan menghasilkan sama ada 0V atau 5V di mana membolehkan alat ini disambung pada mikrokawalan (microcontroller). Akhir sekali, voltan keluaran daripada mikrokawalan akan dipamerkan pada LCD (liquid crystal display). Kepentingan project saya ialah untuk memapah nilai pada computer dengan menggunakan Visual Basic.NET.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT INTRODUCTION

The instrument device will design by using a special infrared sensor (IR) where it can detect black and white color and give a small differences voltage signal when the shaft motor was rotating. Then, a combination of comparator, IR sensor and PIC (Programmable Interface Controllers) will detect this voltage signal. The PIC controller will be programmed by using PIC complier software. A PIC controller is used to measure the signal with the output value in rpm (revolutions per minute). The output signal will be taken at setting time and displayed using LCD 2x8 (Liquid Crystal Display) and also send the signal to PC using Visual Basic.NET.

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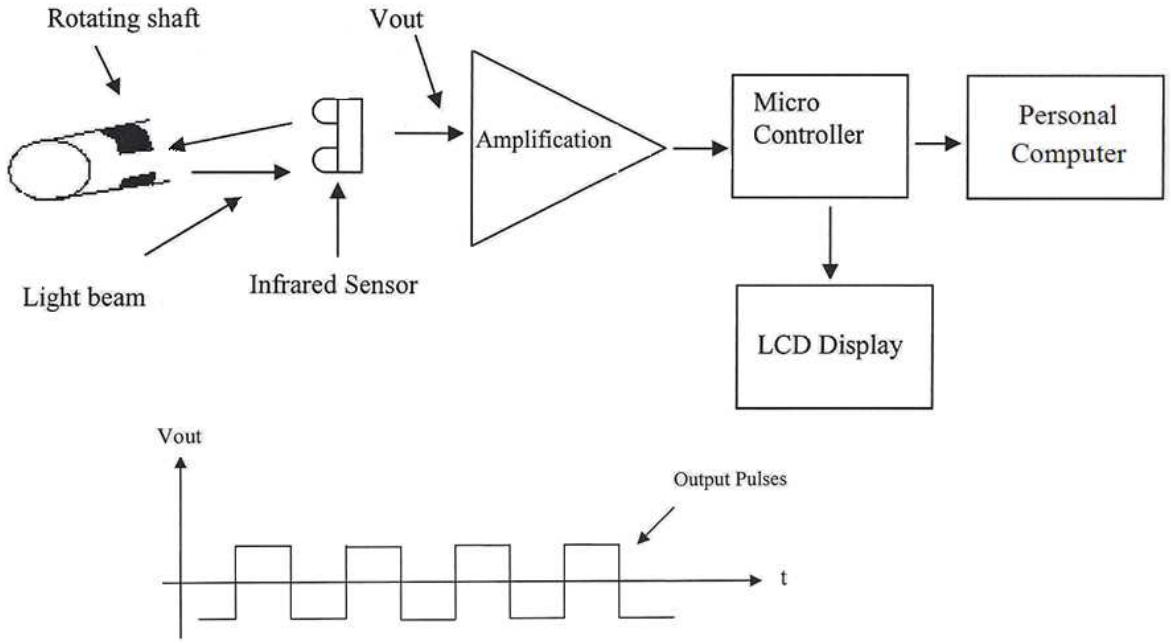

Figure 1.1: Block Diagram of a Rotating Speed Sensor System with Link to Visual Basic.NET

1.2 Project Objectives

The aim of designing and constructing the circuit is to fulfilled several objectives that need to be achieved. Nowadays, sciences and technology is very important to us. Day by day, there a lot of something new and useful has been created. So, this project can be assumed as a contribution to the science and technology if it can be done successfully.

This project is design to get the data from the computer using Visual Basic software. When the rotating speed sensor system measure the speed of the rotor, it will directly show it on the computer so the user can record the data (speed readings) easily.

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There are several objectives that need to be achieved at the end of PSM. The objectives are listed as below:

i. To upgrade the existing project from develop angular speed detection system using infrared sensor to a rotating speed sensor system using infrared sensor with link to Visual Basic.Net.

ii. To develop a graphical user interface (GUI) that can show and record the speed in rev/min of the rotating mechanical device.

iii. To interface the rotating speed sensor system with personal computer by using Visual Basic.Net.

iv. To display the speed value in rev/min on the LCD display and GUI in PC.

1.3 Scope of Project

The scope of this project is to develop a rotating speed sensor system using a special Infra-Red sensor (*IR*) where it can detect black and white color and give a small differences voltage signal This scope project will cover:

a) The input power has used battery 9V-15V.

b) The PIC Controller use in this project is PIC16F628A.

c) The rotation motor speed sensor system will measured around 0 - 4000 revolutions per minute and ± 10% tolerance.

d) The output will display in digital value at 2x8 LCD screen. The screen updates the RPM every 1.5 seconds.

e) The 2x8 LCD screen will display 8 word or digit only. Example: RPM=1000.

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1.4 Problem Statement

1.4.1 Programming Language

The PICBASIC software is used to "cross compile" the BASIC code into assembly and it will make the HEX file for you. It's much easier and is quite powerful.

1.4.2 Interfacing between hardware and software

By using the DB9 connector, the speed value in rev/min can be quickly show on the graphical user interface that i design right after the signal is sent from the hardware. The sampled result can be shown on the Visual Basic.NET front panel in the rapid of time instead.

1.4.3 PIC Programmer

Programming the PIC16F628A is very simple however you need a device called a "PIC Programmer" to do it. It's a small interface that will connect to your computer's serial or parallel port. The PIC chip plugs into the programmer and you load the software (HEX file) into it from the computer.

1.4.4 Reason for select Visual Basic.NET software

The reason of selecting the Visual Basic.NEt software to develop the front panel which is call Graphical User Interface (GUI) to interface with other devices. A graphical user interface (GUI) is a type of user interface which allows people to interact with electronic devices such as computers and hand-held with images rather than text commands.

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1.5 Report Structure

This thesis is a documented report of the ideas generated, the theories and concepts applied, the activities performed and the final product of this project produced. The thesis consists of five chapters and each chapter is described as below:

The first chapter is the introduction of a rotating speed sensor system with link to visual basic.Net. The block diagram gave the general ideas on this project. In addition, objectives, problem statement of the project and the report structure is included as well.

The second chapter is the background study of the project along with the literature review is performed and documented about the theoretical concept applied in completing the project. This includes of similar project but use the different method. The project will be explained briefly in this chapter. So it is very important to understand the concepts involve and how this system works.

The third chapter is the introduction of methodology for the project, design flow and construction of the project. Brief description is given about each procedure in the completion of the project. This chapter will figure out a few tests that have been conducted. This is to make sure the components and other devices involves are in good condition function. The testing procedures, devices and method used to generate the expected results will include in this chapter.

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The fourth chapter is about the components used in this project. This chapter gives information about hardware and software involves in order making this project works. This chapter also gives information about a circuit and the main components used. Hardware protoyping and the develop Visual Basic.Net Graphical User Interface (GUI).

The fifth chapter is shows overall result of rotating speed sensor system and discussion of the result as well as the comparison with the covention method. This chapter consists of an outcome for this project. It shows results, possible problems and solution for the problem occurred.

The last chapter is about project application of the project, discussion and conclusion of the project. This chapter also contain of suggestion to improve this project for the future works. The overall conclusion of this project and the recommendation that can be implemented for future references showed.

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CHAPTER 2

LITERATURE REVIEW

In this chapter the various aspects and the methods on research methodology on the proposed project will be studied and analyzed one by one. Past projects and thesis which were related to the proposed project would be referred. Existing related projects will be referred to make the proposed project fulfill the project objectives and outcomes. Besides, this chapter will show the actual concept of rotating speed sensor system. Moreover, the research and comparison that carried out for some type of tachometer that occur at the market.

2.1 Introduce to rotating speed sensor system with link to visual basic.NET

My project is one type of tachometer. It used for measuring rotational speed. Moreover, it can be used to measure speed of a rotating shaft and also can directly show/display the value in computer using visual basic.NET program software.

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2.2 Introduce to Tachometer

2.2.1 Definition

A tachometer is an instrument designed to measure the speed of an object or substance. The word is formed from Greek roots: *tachos*, meaning speed, and *metron*, meaning measure. The traditional tachometer is laid out as a dial, with a needle indicating the current reading and marking safe and dangerous levels. Recently, digital tachometers giving a direct numeric output have become more common. It can be used to measure speed of a rotating shaft. Moreover, it can also be used to measure flow of liquid by attaching a wheel with inclined vanes.

In its most familiar form, a tachometer measures the speed at which a mechanical device is rotating. A common example is the tachometer found on automobile dashboards. In this application, the tachometer measures the revolutions per minute (RPMs) of the engine drive shaft. It is important to monitor engine RPMs, as running the engine at excessively high rates can drastically shorten engine life.

A tachometer used in this application can be built in multiple ways. It may be a small generator attached to the engine drive shaft, where the RPM measurement is scaled to the electric current generated by the device. Alternately, it may simply measure the rate at which the ignition system sends sparks to the engine.

Tachometers, also known as speedometers, are a fairly common instrument. Tachometers are used in many other machines than just cars. They commonly calculate speed based on how fast an engine shaft is rotating. This information is given in revolutions per minute. Other types of tachometers count output volume of electrical generators, or counting the pulsations of a ignition system.

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