PROPELLER LED DISPLAY

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Sesi Pengajian : 2003-2007

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I dedicated this to both of my parents, my family,
friends and electronic engineering education. Thanks for everything. Your deed
will be remembered till my last breath.

PENGHARGAAN

Syukur ke hadrat Allah, kerana dengan limpah kurnia-Nya, saya telah dapat melaksanakan Projek Sarjana Muda ini dengan dengan baik Saya ingin mengambil kesempatan ini untuk mengucapkan penghargaan kepada semua pihak yang telah banyak membantu saya sepanjang saya melaksanakan PSM ini terutamanya penyelia saya, En. Sani serta pensyarah-pensyarah lain yang banyak membantu. Jutaan terima kasih saya ucapkan dan moga Allah akan membalas jasa baik kalian.

ABSTRACT

Conventional methods of displaying images to public are using LCD display and dot-matrix LED board. Propeller LED display is a device that project an image or time as if the images are floating in the air. The floating image is received because of human eye limitation. Actually the floating images emerge by synchronizing LED's blink to form an image at particular time and rate.

The programming of PIC is using Assembly Language. This project consist two main circuit; motor controller circuit and LED circuit. 9VDC will be used to supply the power for motor controller circuit. Then the motor controller circuit will provides power to LED circuit and DC motor. When DC motor is rotating, the floating image will appear. The synchronization of DC motor speed and LED blink cause the image visible to human eyes. So the desired image such as clock, date or symbol can be programmed and displayed.

ABSTRAK

Antara kaedah konvensional untuk memaparkan imej adalah menggunakan papan LCD dan papan LED dot-matrik. Paparan Berputar LED adalah alat untuk menayangkan imej atau masa seolah-olah imej tersebut terapung di udara. Imej yang terbentuk ini dapat diterima kerana batasan mata manusia. Sebenarnya, imej ini timbul kerana keselarian kerlipan LED untuk membentuk imej pada masa dan kadar yang khusus.

Bahasa pengaturcara Assembly digunakan untuk diprogramkan kedalam PIC. Projek ini terbahagi kepada dua litar utama, iaitu litar pengawal litar motor dan litar LED. 9VDC digunakan untuk membekalkan voltan kepada litar pengawal motor. Apabila motor DC berpusing, imej yang terapung akan terhasil. Keselarian di antara kelajuan motor DC dan kelipan LED akan mengakibatkan imej yang nyata untuk dilihat oleh mata manusia. Oleh itu, imej seperti jam, tarikh dan simbol boleh diprogramkan dan dipaparkan.

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CHAPTER I

INTRODUCTION

1.1 PROJECT SYNOPSIS

Nowadays, there are so many way to displaying a message such as using 7 segment, Frosted Light Bar (RGB 16.7 millions true colours), digital clock and etc. These kind of device are used to advertise or displaying some sort of message in order to attract people. It is different than a conventional method such as poster, banner and etc. These projects are cheaper, easier and even carry out the same purpose as any display apparatus.

1.2 PROBLEM STATEMENTS

From other article and project, there are some problems which are effected the outcome of the image displayed. The main problem is concerning the motor. A VCR motor has to be used as a motor in order to prevent noise. The circuit also have to use photo transistor to generate precise index pulse. In order to display the date and clock, the circuit must have memory capacitor to keep the clock ticking even when the power is not supplied to the circuit. The memory capacitor is expensive plus, it bigger and heavy. To replace the memory capacitor, a small, cheap and light 3V lithium battery is used as a replacement. A voltage regulator also has to be used

in order to allow rotation speed change without effecting the circuit and displayed images.

1.3 OBJECTIVES

The objectives of this project are:

i. To design a display system using LEDs which rotate on a motor.
ii. To design a program using Assembly language.
iii. To display clock, date and symbol using LEDs.
iv. To develop software that can generate LEDs display with accurate synchronization and timing.

1.4 SCOPES OF PROJECT

The scopes of this project are:

i. The circuit is mounted on DC motor.
ii. LED's are used to display clock, date and symbol.
iii. PICF84A is used to control and transmit the signal and utilizing the Assembly language.

1.5 CHAPTER SUMMARY

CHAPTER I will describe the definition of this project will be explained in this chapter. Also in this chapter there will be summary the project progress.

CHAPTER II will discuss about research and information which are related to this project. Every fact and information are gained from different references will be discussed so that the best technique and method can be implemented on this project.

CHAPTER III will be describing how this project is separated to small partition. The elements which are used to build each circuit are described by concept and theory. Plus, figures are provided to ensure the understanding.

CHAPTER IV is describing about the project result and outcome discovery. The project outcome discovery will be presented from the many data analysis results.

The final chapter, CHAPTER V will be explaining about the conclusion of the whole project which includes project finding, achievement analysis and conclusion about the research implementation which have been used. The project suggestion for enhancement also discussed.

CHAPTER II

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter is all about discussing the theory and concept from the past projects. The objective is to explain the perspective and method which has been used in the past projects and to observe how this project can be related with existing research and theory. This shows how the theory and concept have been implemented in order to solve project problem. The theory understanding is crucial as a guidance to start any project. The result of a project cannot be assessed if it's not compared to the theory.

2.2 HENK'S PROPELLER CLOCK ON A MIRROR PROJECT

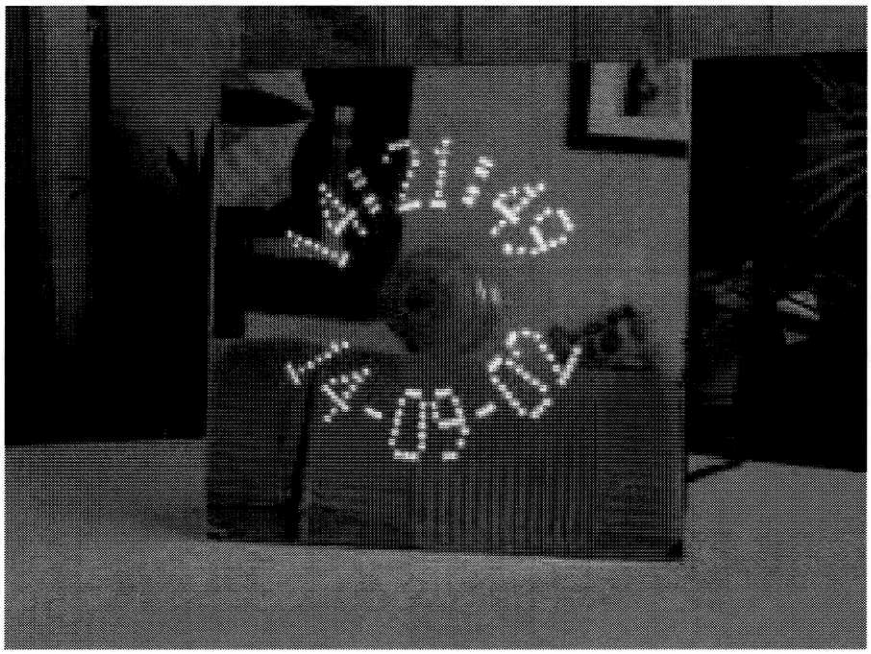

Figure 2.1: Displaying Clock And Date.

The LEDs turn on and turn off, one after another, very rapidly. Due to the slow response of the human eye, the impression that the lights are on all together is obtained and the display can be read. Scanning in this clock is mechanically. A limited number of LEDs are placed in a row and attached to a rotating arm. The arm spins at 1500rpm (or more) and the LEDs are turned on and off at very precise times and places. This gives the impression that there are several hundred LEDs making up a complete display. The fact that the arm is spinning at 1500rpm the LEDs, the electronics and the arm itself are hardly visible. The visible things are the lighted dots from the LEDs making a readable display that seems to float.

Depending on the form of the arm, the display is either a cylinder or a disc. The cylinder shaped display can only show digits. With the disc shaped display it is also possible to simulate analog hands. The electronics is used to drive the LEDs and to keep time are located on the rotating arm. Early versions used buttons on this arm.

Other designs use a reed-switch that can be actuated by holding a magnet near the rotating arm. Chester Lowrey's Propeller Clock using one visible light, one infrared, to create a two-button system. This made settings the time a lot easier.

But Henk wanted to display time and date. To set time and date with just two buttons would not be very efficient. So an infrared sensor is connected to the CPU and programmed it to decode signals from a remote control. This opened up a lot more possibilities. The remote can be used to set time and date. It can also be used to set different display modes. The successful project is shown in Figure 2.1.

2.3 BOB BLICK'S PROPELLER CLOCK PROJECT

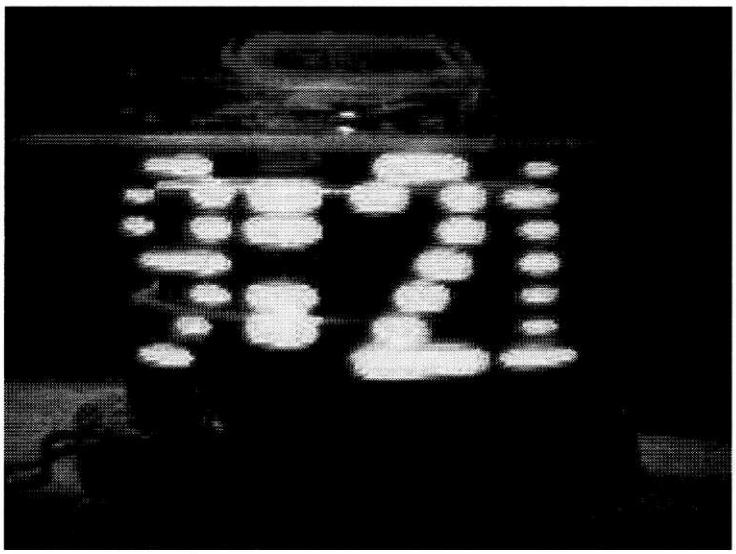

Figure 2.2: Seven Light Emitting Diodes Spin.

Bob Blick made the clock spinning on a piece of perfboard. The power is provided from the spinning armature of a plain DC motor. In order to run the wires out of the motor, the bearing is removed from one end of the motor, leaving a big hole. There are three terminals inside most small DC motors, and it acts a lot like three-phase alternating current, so it must be rectified back to DC. A nice side effect of this is that the position of the motor can be detected by taking one of the phases straight into the microprocessor.

Bob Blick used perfboard (Vectorboard) and handwired the circuit together. Use an 18-pin socket for the 16C84 is used because it needs to be programmed before putting it in the circuit. For the 7 current-limit resistors a DIP resistor array is used, because it made it easy to experiment with LED brightness. He settled on 120 ohms. Seven regular resistors also can be used, because 120 ohms works fine, though it puts the peak current right at the limit for the 16C84. To keep the clock running after turning it off a 47000uf is used, so the time can be set. The LED's gets power separate from this circuit. The result is shown in Figure 2.2.

CHAPTER III

PROJECT METHODOLOGY

3.1 INTRODUCTION

This project consist two different circuits. There are motor controller circuit and LED circuit. At early stage, circuit designs are being done. After that, using a software called 'Proteus-ISIS', both circuit simulation are implemented. After the simulation process is proceeded, both circuit will be designed to be printed in PCB board using 'Proteus-ARES'. Next, circuit construction and testing are using multimeter. If the circuit malfunction, designing and modifying circuit process has to be done to ensure both circuits working properly. The programming language design process is using MPLAB-IDE. Finally after the programming is finished, the program is burned into PICF84A using WinPic800.

3.2 BLOCK DIAGRAM

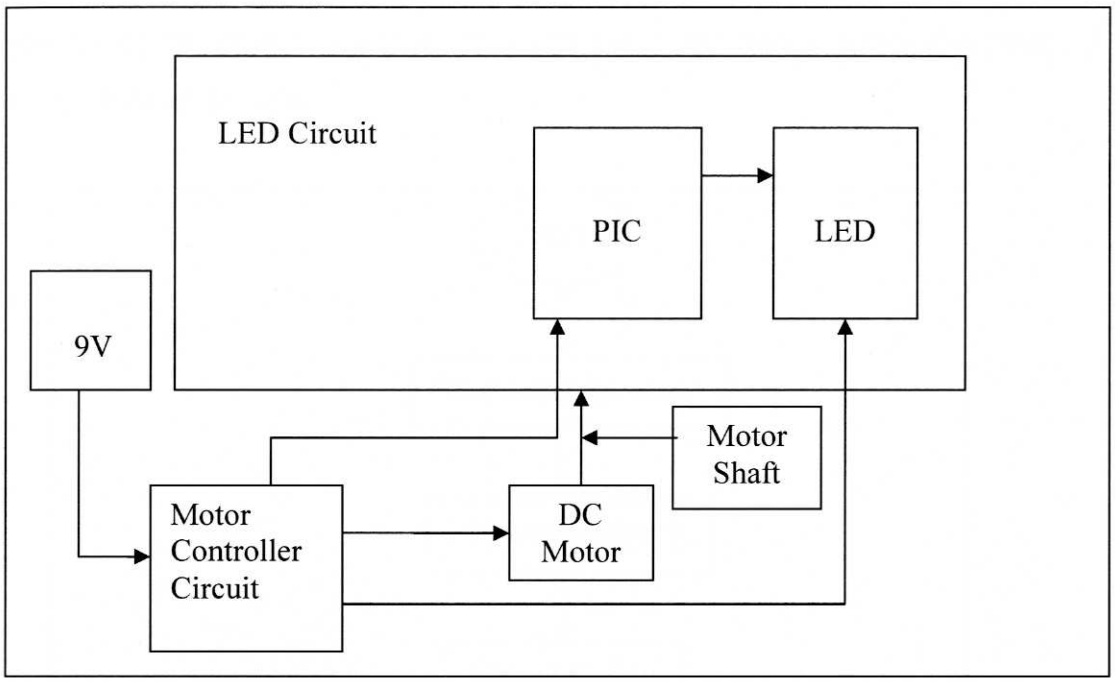

Figure 3.2: Block Diagram of Propeller LED Display.

From the Figure 3.2, the 9V DC is supplied to Motor Controller Circuit. Motor Controller circuit is controlling the DC motor speed and the speed is adjustable. In order to rotate the circuit, DC motor is used. PIC microcontroller purposed is to execute the program and transmit the signal to LED. As output, a line of LED is used to transmit the desired signal. In order to display the images, DC motor will rotate the circuit board. If the displayed image is not clear, the DC motor speed is adjusted until the displayed image is visible.

3.3 ACTIVITY FLOW CHART

With the aim of completing this project on time, all activities have been planned as shown in the activity flow chart with the intention that everything is completed step by step.

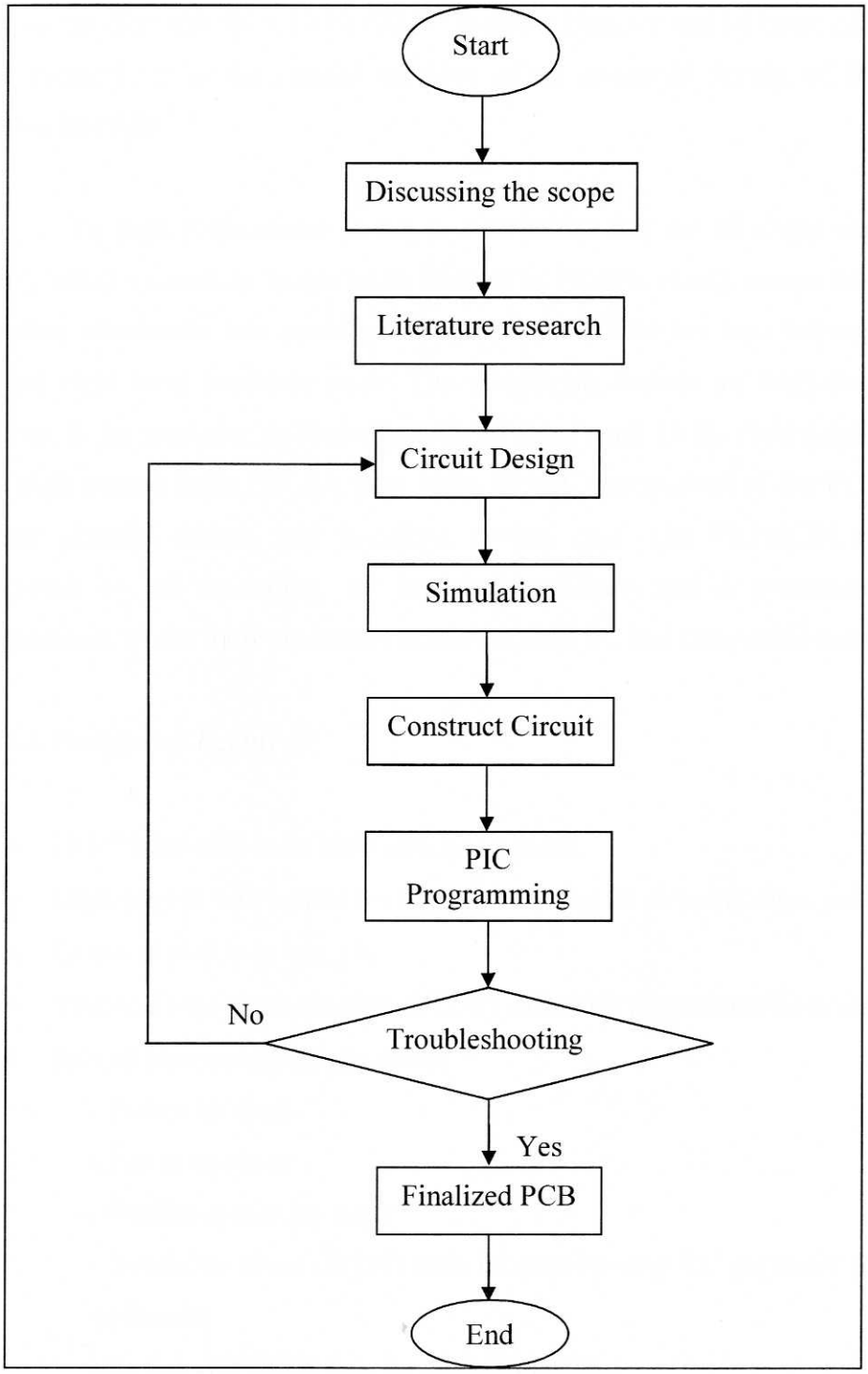

Figure 3.3: Project Activities Flow Chart