SMART FLASH LED DISPLAY

NORSYURIATIE ABD AZIZ

Laporan ini dikemukakan untuk memenuhi sebahagian daripada syarat penganugerahan
Ijazah Sarjana Muda kejuruteraan Elektronik (Elektronik Industri) Dengan Kepujian

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NORSYURIATIE ABD AZIZ

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

Faculty of Electronic and Computer Engineering
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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
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ABSTRAK

"Smart Flash LED Display", adalah tajuk dan juga projek pilihan bagi projek sarjana muda tahun 2008/2009. Projek ini mengabungkan pengetahuan dalam bidang elektronik, mekanikal dan juga elektrik. Projek ini juga merupakan kombinasi diantara perkakasan dan perisian. "Smart Flash LED Display" adalah satu projek yang menghasilkan imbasan paparan diudara menggunakan 17 LED dimana ia memaparkan masa dalam bentuk analog dan digital, paparan mesej dan juga suhu. 17 LED ini diletakkan dalam keadaan satu baris lurus yang dikawal menggunakan PIC kawalan mikro 8 bit. Kawalan mikro PIC16F84A digunakan sebagai sistem kawalan, dimana 17 LED akan dikawalan bagi "ON" dan "OFF" pada sudut – sudut tertentu. PIC16F84A juga akan sentiasa mengawal dan menyemak masa dan perubahan corak paparan pada 17 LED. Bagi menghasilkan ilusi seperti yang dikehendaki dan memberikan bekalan kuasa pada litar, motor AT digunakan. Motor akan berputar 360 darjah dan 17 LED akan berputar sambil menghasilkan paparan ilusi dengan kelajuan motor yang tetap. Litar ini juga mempunyai litar pengera yang akan aktif pada tiap - tiap satu jam mengikut waktu yang dipaparkan oleh 17 LED. "Smart Flash LED Display" memerlukan perkakasan dan perisian tambahan dalam menyokong pengoperasian litar ini, dimana perkakasan yang diperlukan adalah litar dan motor AT, manakala perisisan adalah program MPLAB.

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ABSTRACT

This project knows as “Smart Flash LED Display” final year project 2008/2009. The project is combination of the knowledge of, electronic, mechanical and electrical. This project are combination between hardware and software, which it will give the illusion analog time, digital time, message display and also temperature display in the air using 17 LED that been design in one straight line based on PIC with 8 bit microcontroller. The PIC 16F84A microcontroller will be used as the control system, where the 17 LED will be control to turn ON, and OFF with certain angle and PIC 16F84A also keep tracks of time and changes the pattern on 17 LED. The DC motor will be use to make the illusion and give the supply to the circuit. The motor will rotate 360° and 17 LED spin with the constant speed of motor. Inside this circuit also have alarm will activate every one hour. “Smart Flash LED Display” needs additional hardware and software to support the operation. The hardware is the circuit and DC motor itself and the software is using MPLAB programmer.

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CHAPTER I

INTRODUCTION

1.1 INTRODUCTION

This section will explain the overall description of Smart Flash LED Display such as the background, objective, scope, project methodology and expected result resulted through this semester. Other than that, this section will explain all the step involves from the beginning until the project is produced.

This project is an illusion display on LED. It has the PIC16F84A interfacing with the rotating motor. This project only designs circuit and implemented the software through the circuit. This illusion display system is built using PIC16F84A for control and display the clock, message and temperature. The outputs of the clock either analog or digital are shown in LED that can be used efficiently to accommodate the functionality of PIC.

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1.2 PROJECT BACKGROUND

This project is different view of holographic display made from only 17 LEDs, construct in line arrangement. It will be the coordination of electrical and mechanical engineering. This illusion is based on inertia of human eye.

The LEDs turn on and off, one after another, very rapidly. Due to the slow response of the human eye viewer get the impression that the lights are on all together and viewer can read the display.

The display consists of motor and 17 LEDs that arranges in horizontal line. The motor spins at constant rate such that the LEDs rotate around a center pivot point. As the LEDs spin around them light up sequentially such they will display short message. The motor spinning fast enough that the human eye will perceive all the display on at once and the viewer will be able to read the message correctly. If the LED formed digits with periodically and frequently enough flash, they will appear solid and steady.

A microcontroller is used to keep time and blink the LEDs in an appropriate pattern to show the display. It has to be programmed so that it will both keep time and also send the appropriate signals to the LEDs light them in the correct sequence. It looks like the displays are floating in the air.

1.3 PROJECT OBJECTIVES

Objective of this project is to design control circuit using microcontroller that able to produce a readable message based on single column 17 LEDs. It will be the coordination between electrical and mechanical engineering. The project comprises of four main parts which are hardware design, software design, motor modification and integration.

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First part of this project is to design and construct the PIC-based controller board to control the LED through I/O ports. DC motor must be selected and able to spin the LEDs fast enough so that the display will be readable. Because of the high speed rotation, there goes the responsibility of mounting the motor and building an enclosure that will protect the LED display wing.

The second part of this project is to design and implement software application. Programming will be downloading into the PIC microcontroller and will both keep the message is displaying and also send the appropriate I/O signals to the LEDs to light them in the correct sequence.

Third part is DC motor modification processes that taking power from the ball bearing which is mounted on shaft of the motor. The ball bearing acts as sliding contact that allows 12 Volts DC is transferred to the 5V voltage regulator.

The final objective need to achieve is integration of hardware and software to this project. After that, the analysis and experiment will be assigning in order to get the result.

1.4 PROBLEM STATEMENTS

Based on surveyed done through the magazine not forgettable in internet, there is no such this project has been sold at market. So, that makes it become interesting to study more about this project, including the electronic, motors and mechanical things.

Firstly, LED display system still very expensive because numbers of LED's, drivers, high speed processor in example 16-bits Microprocessor running at 20MHz in order to maintain scanning time. So, this project is the solution of those problems. Only using just 17 LED's in a row and it will make a display same with those LED display system.

Secondly, this project are combination of the hardware and software, so have to study about the programming for the PIC 16F84A. The programming is to control

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the 17 LED's that display the analog and digital clock, message and temperature. The flow of the programming should be the same as what been setting to the circuit and address must be correct due to the input/output connection on the circuit.

About the motor, must not directly use the DC motor that have in market but modify it to make it feed with the circuit. The motor must be setting cycling constant and rotate smoothly to make sure get the clear illusion of number.

1.5 SCOPE OF PROJECT

The project is mounted on top of rotating DC motor. A proper DC motor should be choose to make the display is proper shown. The display consists of 17 LED's was arranged in horizontal which show sequence numbers from hours, minutes and seconds.

For mechanical part, it uses a 12V permanent magnet DC motor as a motor to spin the LED's. The LED's is driven by transistors to get high peak current. The voltage regulator allows rotation speed change with no effect on the circuit. Other than that, to synchronous and timing to ensure the correct numbers and message are displayed is most critical in this project. The project should have grid to display numbers or message and also to on and off the display. A proper set up timing for LED to the display sequence number and angular speed of the spinning.

LED's, is an important things realized first and then lighting them at the correct intervals.

PIC 16F84A is used as the controller for the project utilizing assembly language programming. The features of microcontroller as below:

- Use 35 RISC (Reduced Instruction Set Computer)
- Block Diagram of Memory divided:
    1. Flash Program(1K x 14 bits)
        - Used to store the program

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2. RAM(160 bytes)
    - SFR: used to record the operating states of the PIC, the input/output (I/0) port conditions and other conditions
    - GPR: used to temporarily store results and conditions while the program is running.
3. EEPROM (64 bytes)
    - Used to store data which will not change frequently.

1.6 METHODOLOGY

There are several steps that will be use to achieve the objective for these projects are, firstly it will be searching for the information about the "Smart Flash LED Display" and explore about the circuit, explanation about the project and the component that will be to be use. The information been analyze and discuss with the supervisor for some advice.

Secondly after all the information about the project been approve by supervisor, the process been moving to the next stage, all of the component data sheet been find out from text book and internet source including the DC motor and PIC 16F84A.

Thirdly, when to the electrical and electronic outlet to find all the components and small motor that suitable to be use in the project and start rebuilt the circuit of this project and the circuit for the PIC programmer.

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