SUPERVISOR APPROVAL

"I / We admit that to have read this report and it has follow the scope and quality in Partial Fulfillment Of Requirements For The Degree Of Bachelor of Electronic Engineering (Industrial Electronic)"

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Date : 10/5/06

MECHANICALLY SCANNED CLOCK WITH LED DISPLAY

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ACKNOWLEDGMENT

I treat as valid this report is doing by myself except summary and quotation in every part that I had clear source.

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Signature : 

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DECLARATION

This Final Year Project contains information pertaining of Mechanically Scanned Clock with LED display. This project comes under the subject BEKU4983 Project offered by Faculty of Electronic Engineering & Computer Engineering, KUTKM. This documentation report aims to provide the reader about the overall information techniques about this project. The focus of the project is on display the clock with rotation of motor by using LED.

I admired that this is an original my own work with the exception which I have referenced them to explained sources.

ABSTRACT

This project is a different view of holographical clock made from only 7 LEDs, construct in vertical arrangement. It will be the coordination of electrical and mechanical engineering. This illusion is based on inertia of human eye. The clock consists of motor and seven LEDs that are arranged in a vertical line. The motor spins at a constant rate such that the LEDs rotate around a center pivot point. As the LEDs spin around they light up sequentially such that they will display the current time. The motor spinning fast enough that the human eye will perceive all of the display is on at once, and the viewer will be able to read the time correctly. If LED formed digits will periodically and frequently enough flash, they will appear solid and steady. A microcontroller is used to keep the time and blink the LEDs in an appropriate pattern to show the numbers. It has to be programmed so that it will both keep time and also send the appropriate signals to the LEDs to light them in the correct sequence. Its looks like the digital numbers are floating in thin air.

ABSTRAK

Projek ini adalah berbeza dari segi paparan jam kerana ianya hanya menggunakan 7 LED yang dibina secara menegak. Ia merupakan gabungan diantara elektrik dan mekanikal. Projek ini berdasarkan bayangan secara inersia oleh mata manusia. Jam ini terdiri daripada motor dan 7 LED yang disusun secara menegak. Motor akan berpusing pada kadar yang sama dimana LED akan akan berpusing pada satu titik. Apabila LED perpusing, ia akan menyala secara berperingkat dan akan memaparkan paparan jam semasa. Motor tersebut akan bergerak laju seolah-olah pada mata kasar paparan berlaku pada masa yang sama dan masa yang dipaparkan akan dilihat dengan betul. Format jam ini beroperasi secara 12-jam. Pengawal Mikro digunakan untuk menyimpan dan memberikan denyut pada LED supaya ia memaparkan nombor. Ia perlu diprogramkan supaya ia dapat memberikan isyarat yang mengikut susunan yang betul. Ia dlihat seperti papran jam yang bergerak di udara.

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LIST OF ABBREVIATION

PCB	-	Printed Circuit Board
LED	-	Light Emitting Diode
MCU	-	Microcontroller Unit
PIC	-	Peripheral Interface Controller
	-	Programmable Integrated Circuit
EEPROM	-	Electrically Erasable Programmable Read Only Memory
IC	-	Integrated Circuit
PICC	-	Peripheral Interface Controller Card
BCD	-	Binary-Coded Decimal
DAC	-	Digital To Analog Converter
ADC	-	Analog To Digital Converter
UART	-	Universal Asynchronous Receiver-Transmitter
CPU	-	Central Processing Unit
ROM	-	Read-Only Memory
I/O	-	Input / Output
SPI	-	Serial Peripheral Interface
RISC	-	Reduced Instruction Set Code
Hz	-	Hertz
MHz	-	MegaHertz
DC	-	Direct Current
RAM	-	Random-Access Memory
PWM	-	Pulse Width Modulation
SSP	-	Synchronous Serial Port
I2C	-	Inter-Integrated Circuit
USART	-	Universal Synchronous / Asynchronous
		Receiver / Transmitter
SCI	-	Serial Communications Interface
PSP	-	Parallel Slave Port

RD	-	Read
WR	-	Write
CS	-	Case Series
BOR	-	Brown-out Reset
SRAM	-	Static Random Access Memory
HC	-	High Capacity
CMOS	-	Complementary Metal-Oxide Semiconductor (transistor type)
PLL	-	Phase-Locked Loop
TTL	-	Transistor-Transistor Logic
VDC	-	Volts Direct Current
DIP	-	Dual Inline Package
WWVB	-	NIST longwave (60 Kilohertz) Standard Time Signal (Radio station callsign)
ASCII	-	American Standard Code for Information Interchange
SCL	-	Serial Clock
SDA	-	Serial Data
GPIO	-	General Purpose Input/Output
LCD	-	Liquid Crystal Display (display technology)
IEEE	-	Institute of Electrical & Electronics Engineers

LIST OF APPENDIX

CHAPTER 1

INTRODUCTION

This section will explain the overall description of Mechanically Scanned Clock with LED Display by using PIC such as background, objective, scope, project methodology and my thesis summary. Other than that, this section will explain all the step involves from beginning until the project succeeds before go through other section in detail.

This project is a mechanically clock 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 mechanically clock display is built using PIC16F84Afor control and display the clock. The output of the clock is shown in LED that can be used efficiently to accommodate the functionality of PIC. The clock can be set to correct time using the switches buttons

1.1 PROJECT BACKGROUND

This project is a different view of holographic clock made from only 7 LEDs, construct in vertical arrangement. It will be the coordination of electrical and mechanical engineering. This illusion is based on inertia of human eye.

The clock consists of motor and seven LEDs that are arranged in a vertical line. The motor spins at a constant rate such that the LEDs rotate around a center pivot point. As the LEDs spin around they light up sequentially such that they will display the current time. The motor spinning fast enough that the human eye will perceive all of the display is on at once, and the viewer will be able to read the time correctly. If LED formed digits will periodically and frequently enough flash, they will appear solid and steady.

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

1.2 PROJECT OBJECTIVES

Objective of this project is to design a circuit that can display the current time by using LEDs. The clock consists of motor and 7 LEDs that are arranged in vertical line. It will be the coordination between electrical and mechanical engineering. The clock has three main tasks that need to be accomplished in order to be successful project.

First is to design and construct for Mechanically Scanned LED Display, where the DC motor must be selected that will be able to spin the LEDs fast enough that the display will be readable. Along with this task, goes the responsibility of mounting the motor and building an enclosure that will protect the clock. Next, the circuitry has to be built so that the LEDs will be connected with the PIC16F84 so that the light up appropriately. Also there needs to be capacitors so that the time will be accurately kept even when the clock's isn't plugged into the wall.

Secondly is to learn the functional and characteristics of PIC16F84 and apply it to the circuit. The programmed will both keep time and also send the appropriate signals to the LEDs to light them in the correct sequence.

Thirdly, to test the synchronization and timing to ensure the correct numbers is displayed. The proper angular speed of the spinning LEDs should be known so that it will light them in correct intervals.

1.3 SCOPE OF PROJECT

The project is mounted on top of a rotating DC motor. A proper DC motor should be choose to make the display is proper shown. The display consists of 7 LEDs that arranged in vertical which show sequence numbers from hours, minutes and seconds.

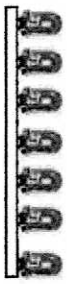

Figure 1.1: 7 LED that arranged in vertical

For mechanical part, it uses a 12V automotive fan as a motor to spin the LEDs. The LEDs is driven by transistors to get high peak current. The voltage regulator allows rotation speed change with no effect on the circuit. Other that, to synchronous and timing to ensure the correct numbers is displayed is most critical part in this project. The project should have grid to display numbers and also to on & off the display. A proper set up timing for LED to the display sequence number and angular speed of the spinning LEDs, is an important things to realized first and then lighting them at the correct intervals.

PICF84 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 :
  - i) Flash Program(1K x 14 bits)
    - used to store the program
  - ii) RAM (160 bytes)
    - SFR: used to record the operating states of the PIC, the input/output (I/O) port conditions and other conditions
    - GPR: used to temporally store results and conditions while the program is running.
  - ii) EEPROM (64 bytes)
    - used to store data which will not change frequently.

1.4 THESIS SUMMARY

This thesis includes five chapters that will explain in detail of this project. The first chapter is the introduction that will give description of this project likes objective, scope and methodology project.

The second chapter will concluded all the literature review that connected to this project. All the fact and information that obtain from the variety of references will be substance to choose one of the best technique and method for this project.

The next chapter will explain about all the technique and method that had been choose in second chapter in detail. The technique and method that been choose separate into two section, hardware and software

Chapter four is about analysis and results. The objectives of this project are comprised. By this, the circuit is designed by using PIC16F84a with LED to display clock. After this, the circuit is explanation in each part of the project. All the results like circuit diagram, and programmed analysis. The analysis is done for all the equipment that used in the circuit.

The last chapter is the conclusion for the whole project. From this chapter, it includes the conclusion and also the further improvement that can be made in future.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will discuss about theory and concepts of the project in detail. This discussion is to explain perspective and method that being used in the research before and survey how far this project interconnected with the research and theory that already have. Other than that, this chapter also will show the theory and concepts that being used to solve project problem. Understanding about the theory is very important as a guide line through out the research. Final results of research are not valuable if not compare with theory.

2.2 MICROCONTROLLER

'Microcontroller is a revolution in computers since 15 years ago, where the size is more small and high speed performance. This revolution has build up as a decision in producing the technology of Large-scale Integration (LSI) and Very Large Scale Integration (VLSI) where thousands of transistors put in the one chip. With this technique, the application of control system will be easier and efficient. Because of that, microcontroller, is call "computer brain" or microcontroller. This microcontroller have input and output pin, timer, memory and other features.

2.3 DECISION TO USE MICROCONTROLLER

The main factor using microcontroller is because it is low price and its availability in the market. Even though it can support multiple application, the price is low compared other integrated circuit such as IC MC14528B where functioning for pulse. Microcontroller also can provided pulse at the lowest cost.

The second factor using the microcontroller is because of the capability to reprogram by user. User can programmed the microcontroller depends on the application of the project that being build. As an example, microcontroller can be programmed depending on the input and output pin provided.