MULTI-LEVEL LED DOT MATRIX DISPLAY PANEL

KIM LING SHENG

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

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SANI IRWAN BIN MD SALIM
Ketua Jabatan (Kej Komputer),
Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200
Ayer Keroh, 75450 Melaka

Tarikh : 12/5/08

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DECLARATION

"I hereby declare that this report is the result of my own work except for quotes as cited in the references."

Signature :.....

Author :KIM LING SHENG.....

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"I hereby declare that I have read this report and in my opinion this report is sufficient in terms of the scope and quality for the award of Bachelor of Electronic Engineering (Industrial Electronics) With Honours."

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: SANI IRWAN SALIM

Date :12/5/08

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ABSTRACT

This project is about design and development multi-level LED dot matrix display panel. Microcontroller programs are developed to generate characters and graphics to for this module. The objectives of the project are to design a display panel by using several dozens of LED dot matrix display and it accessible to the user to change and modify the display pattern. This project consists of two major components, which are the microcontroller and the LED dot matrix display. LED dot matrix displays are well known as an effective and economical means of data distribution to the masses. The encoded characters and graphics data are stored into the memory of microcontroller. During the process, the data are sent to the LED dot matrix for display. User can be change the character and pattern from the source code and reprogram into the microcontroller.

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ABSTRAK

Projek ini adalah berkenaan merekacipta dan membangun sebuah panel berbilang aras paparan dot matrik. Sebuah program pengawal-mikro akan dibangunkan untuk menghasilkan huruf dan grafik untuk modul ini. Objektif projek ini adalah untuk merekacipta sebuah panel paparan dengan menggunakan paparan dot matrik dan data corak yang diprogramkan mudah di ubah suai oleh pengguna. Projek ini mengandungi 2 komponen utama, iaitu pengawal-mikro dan paparan dot matrik LED. Paparan dot matrik LED adalah alat yang berkesan dan ekonomi dalam penghantaran data untuk paparan umum. Data huruf dan grafik yang dikodkan akan disimpan ke dalam memori pengawal-mikro. Dalam proses ini, data akan dihantar ke dot matrik LED untuk paparan. Pengguna boleh mengubah huruf dan corak daripada kod program dan diprogramkan ke pengawal-mikro.

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LIST OF ABBREAVIATION

ADC	- Analog-to-Digital Converter
CAN	- Controller Area Network
CLK	- Clock
CMOS	- Complementary Metal–Oxide–Semiconductor
COFF	- Common Object File Format
CPU	- Central Processing Unit
DIN	- Data Input
DIP	- Dual In-Line Package
DOUT	- Data Output
EEPROM	- Electrically Erasable Programmable Read-Only Memory
ELF	- Executable-and Linking File
GUI	- Graphical User Interface
HEX	- Hexadecimal
IC	- Integrated Circuit
I2C	- Inter-integrated circuit
IEEE	- Institute of Electrical and Electronic Engineers
I/O	- Input / Output
LED	- Light-Emitting Diode
MCU	- Microcontroller
MIPS	- Million Instructions Per Second
MUX	- Multiplexer
OTP	- One-Time Programmable

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OMF51	- Object Module Format
PCB	- Printed Circuit Board
PC	- Personal Computer
PCI	- Peripheral Component Interconnect
PIC	- Peripheral Interface Controller
RAM	- Random-Access Memory
RAID	- Redundant Array of Inexpensive Drives
RD	- Read
ROM	- Read-Only Memory
SDI	- Single Document Interface
SRAM	- Static Random Access Memory
TV	- Television
TTL	- Transistor-transistor Logic
USB	- Universal Serial Bus
UV	- Ultra-violet
WR	- Write

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CHAPTER 1

INTRODUCTION

1.1 Introduction

LED display has become popular to convey all types of message to the public. With its attractive and interesting displays, including wide-variant of pattern. Text or even graphics can be easily conveyed to the public either during the daytime or midnight. However, previous signboards basically are produced in banner or poster type. This is an ineffective method to convey information that able to attract attention from the public especially during nighttime. LED displays also provide power efficiency compound with any other type of electronic display board. The development of this project will prevent the limitation of current signboard display. The LED will turn ON once to display information for the whole day and the lifespan is much longer than bulb and others lighting source. Therefore it can save the cost of frequently changing the bulb, poster and also the energy used.

So in this project, a display panel using 18 pieces of 8x8 LED dot matrix display will be designed. 18 pieces of 8x8 LED dot matrix display will be used to give a large space to create more attractive numeric, alphanumeric and animation.

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The display produces numeric, alphanumeric and also image characters for the benefit of the mass. The design is user-friendly and easily- accessible to the user to change and modify the display pattern.

1.2 Problem Statement

Small size of LED dot matrix display has a limited character to perform. Limited character will cause hard to convey the message to the public clearly and perform in attractive way. Therefore, this project had extend the size of the LED dot matrix display by using 18 pieces of LED dot matrix which can be overcome the problem of limited character.

1.3 Objectives

The main goal of this project is to allow us to implementation and design a LED dot matrix display in the software and the hardware. Beside that there are others objectives to be achieved in this project which are:

i) To design and develop a Multi-level LED Dot Matrix Display Panel using PIC Microcontroller.

ii) To display the numeric, alphanumeric and image characters.

iii) User interactivity to modify / change pattern for display.

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1.4 Scope of Project

The scope of work in this project is stated as given:

i) Using 18 pieces of 8x8 LED dot matrix to design the display panel.

ii) Using Assembly language as programming language to program the microcontroller.

iii) The LED display is utilized Red colored LED dot matrix.

iv) Display alphanumeric and graphic character.

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CHAPTER 2

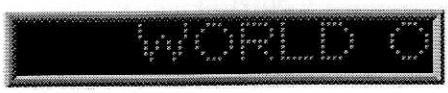
LITERATURE REVIEW

2.1 Background Study

Hardware development is very important towards the success of integrating both software and hardware. There many types or microcontroller and LED matrix dot display can be found on the market. Therefore, a literature review was done to develop the suitable component for the project. Besides, the application program is debugged and modified to ensure that it runs accordingly to the program algorithm.

2.2 Review of Previous Studies

2.2.1 Moving Message Display



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2.1 Background Study

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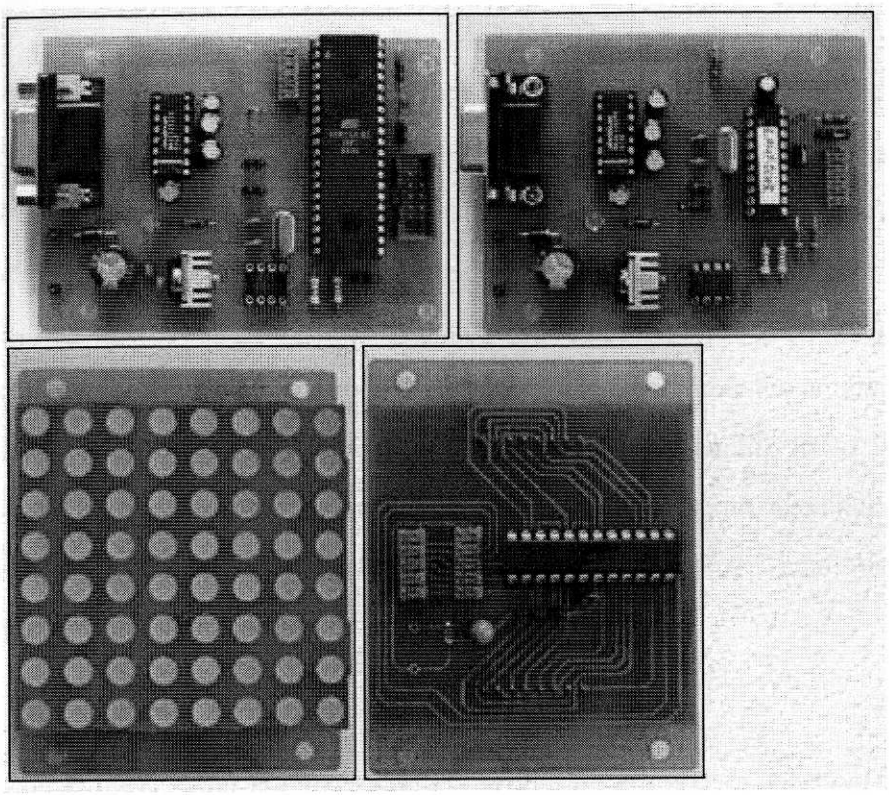

Figure 2.1: LED Moving Font

The LED moving font is built up of separate modules consisting of 64 LEDs each (8x8 matrix). The modules can be cascaded according to the desired size of the font. Each module is controlled by the LED display driver MAX7219 (or MAX7221) which can drive 64 LEDs. The display data is transferred serially to this display driver via the pins DIN, CLK and LOAD. The pin DOUT can be connected to the input DIN of the following display driver, all CLK and all LOAD pins are connected together. The datasheet is available on Maxim's homepage.

The modules are controlled by an 8051-compatible microcontroller AT89C51 (LED moving font controller variant 1) or AT89C2051 (LED moving font controller variant 2) from Atmel which provide 4 kB or 2kB flash memory on-chip. The LED display driver MAX 7219 CNG is available from Reichelt or Segor, a free sample can be ordered on the homepage of Maxim. The LED display driver is mounted together with a LED module (8x8 matrixes) on the LED module PCB.

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The display text is stored in an EEPROM. The text can be downloaded via a serial RS232 connection from a PC. From the PC a text file containing the text is sent. The baud rate can also be set to 600 Baud (via additional jumper), because some PCs have problems with hardware handshaking, which would be necessary at 1200 or 9600 Baud download speed. Dependent on the storage size of the EEPROM up to 2045 characters can be stored. It is also possible to store the text in the flash ROM of the microcontroller. But then it is necessary to reassemble the program code if the text is changed and to reprogram the flash ROM. If an EEPROM is used, changes of the text can be done easily via serial downloading. A maximum of 11 LED modules (each module consisting of 8x8 LEDs) can be used. The moving font is already working with 1 module.

2.2.2 LED Displays Datalines

Figure 2.2: LED Displays Datalines

Data Display designs and manufactures a large selection of both indoor and outdoor moving message displays, using LED (Light Emitting Diode) technology, which is known for its reliability, legibility and ease of maintenance.

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