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VISUAL INTERFACE TO CONTROLLING A DOT MATRIX LED DISPLAY

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Bachelor of Mechatronics Engineering
May 2010

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"I hereby declared that I have read through this report entitle "**Visual Interface for Controlling a Dot Matrix LED Display**" and found that it has comply the partial fulfillment for awarding the Bachelor of Mechatronic Engineering."

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VISUAL INTERFACE FOR CONTROLLING A DOT MATRIX LED DISPLAY

THANG JUN BOON

This Report is Submitted in Partial Fulfillment of Requirements for Bachelor of Mechatronic Engineering.

Faculty of Electrical Engineering

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APRIL 2010

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Thank You.

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ABSTRACT

Visual Interface for Controlling a Dot Matrix LED Display is a project to built up an user friendly software to control a dot matrix LED display by using Visual Basic .Net. Dot matrix LED displays have become very popular because of their ultra-low power consumptions and high contrast ratio under high ambient light levels. Dot matrix LED display is use to display some useful information such as message and graphical signs. This system may be use in shopping mall, road sign board or airport. The proposed of this project is built up a Graphical User Interface (GUI) program to help user key in any word or alphabets to the system by the easy way. It is easier when user interface the display using keyboard compare to using the micro-controller software. In micro-controller software, user needs to convert the word into hexadecimal or binary before key in. By using the keypad or keyboard, it is more user friendly for user. After develop this interface, some animation effect such as blinking, scrolling left and right, move up and down and emoticon pattern will be added.

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ABSTRAK

Pengantaramuka grafik untuk mengawal dot matrix papan LED adalah satu projek untuk membina satu perisian yang mudah diguna oleh pengguna untuk mengawal papan LED. Papan LED subah menjadi begitu popular kerana kegunaan jumlah tenaga yang rendah. Perisian ini dibina dengan menggunakan Visual Basic .Net. Papan LED digunakan untuk memaparkan maklumat-maklumat penting. System ini boleh digunakan di tempat membeli-belah, papan tanda jalan raya ataupun lapangan kapal terbang. Tujuan utama projek ini adalah membina satu Pengantaramuka Grafik Pengguna (GUI) untuk membantu pengguna menaip perkataan dalam papan LED dengan cepat dan mudah. Dalam perisian mikropengawal, pengguna perlu menukarkan perkataan itu ke dalam hecadecimal ataupun binary sebelum pengguna boleh menukar mesej di atas papan LED. Selepas perisian ini siap dibina, animasi seperti berkelip-kelip, pergerakan dari kiri ke kanan ataupun bawah ke atas. Selain itu, emosi icon juga akan ditambahkan supaya fungsi perisian ini dipertambahkan serta menarik perhatian pengguna.

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ABBREVIATION

LED	-	Light Emitted Diode
FYP	-	Final Year Project
GUI	-	Graphical User Interface
UTeM	-	Universiti Teknikal Malaysia Melaka
ASCII	-	American Standard Code for Information Interchange

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CHAPTER 1

INTRODUCTION

This chapter will explain about the objectives, problem statement and scope of the project.

1.1 Project Overview

Visual Interface for Controlling a Dot Matrix LED Display is a project which is based on interfacing PC with microcontroller to control a dot matrix LED display. The overall concept is built up an user friendly Graphical User Interface(GUI) to control a dot matrix LED display by using Visual Basic .NET. Normally, dot matrix LED display is use to display useful information such as message, road signs, world clock or even advertising board. This system may be use in shopping mall, road sign board or air port. The proposed of this project is built up a GUI program to help us key in any word or alphabets to the system by the easy way. It is easier when we interface the display using keyboard compare with changing the micro-controller programming which need some expert programming skill. In micro-controller coding, it just can processing hexadecimal and binary code only. To make it easy, we can design a GUI program to convert the alphabets into ASCII code before sending to micro-controller. After develop this interface, we can add some extra features such as: animation effect such as blinking, scrolling left and right, move up and down. For security proposed, an username and password request page will provide before user can changing the dot matrix LED display. Figure 1.1 illustrates the overall diagram for the project.

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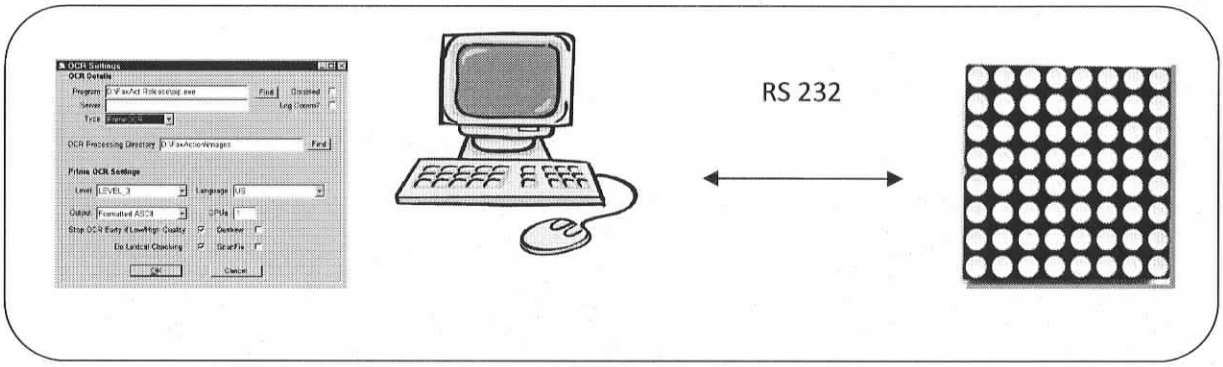

Figure 1.1: Overall Diagrams for Visual Interface for Controlling Dot Matrix LED Display

1.2 Project Objectives

The main objective of this project is to design a Graphical User Interface (GUI) program to control a dot matrix LED display. We can change the dot matrix LED display thru computer. In order to achieve the goal of this project, several knowledge about Visual Basic .Net, microcontroller communicate, design base on user request are need to determined. Beside the main objectives, this project also aims to meet the following objectives:

1) To study about the communication protocol (serial) between computer and micro-controller.
2) To create a multi-functional software on controlling a dot matrix LED display. The GUI program adds some extra features to make it more advances.
3) To control the light intensity and movement of display content.
4) To design a more security program for user. A pair of username and password required before the owner can change the display massage.

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1.3 Project Scope

The scope of this project is to design a GUI program to controlling a dot matrix LED display which develops by using Visual Basic .Net. It consists of designing the GUI to integrate between computer and micro-controller (dot matrix LED display). It uses serial port to communicate between computer and micro-controller. RS232 serial port cable will be use to transmit data. The GUI program must content text box, effect control, port settling, emotional icon (emoticon) and so on. Figure 1.2 shows the early concept of the GUI project.

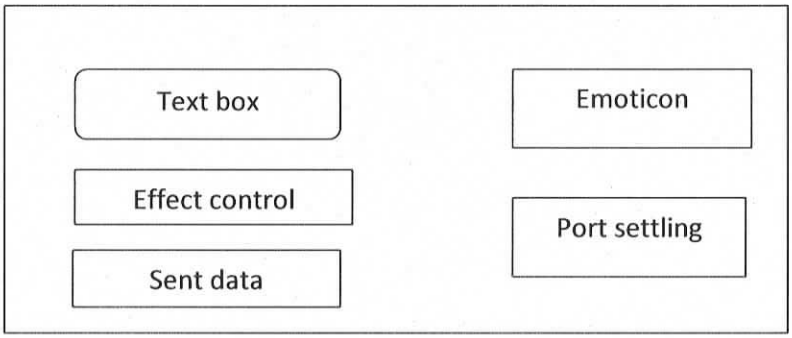

Figure 1.2: Content of GUI (early concept)

1.4 Problem Statement

Nowadays, dot matrix LED displays become very famous for displaying massage or advertisements. However, many dot matrix LED display company did not provide a GUI program for user. It will get the user into trouble when they want change the display massage. The user need to familiar with micro-controller programming skill before they can change the display massage. It is because without a GUI program, users need to change the source code to change the display massage. Once they have provided a GUI for user, that GUI just will only suitable for specific LED display product.

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Lack of function is another problem inherent in the existed dot matrix LED display. Lot of dot matrix LED display can do simple task only, they cannot doing complexity task such as blinking, scrolling, light intensity controlling and so on. Less of LED display GUI will provide emoticon for user. This emoticon will easily attract public's attention.

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CHAPTER 2

LITERATURE REVIEW

This chapter introduces and explains the source of idea for design, concept, specifications and other information that are related to the project. It is found based on the research in the form of previous similar project, past paper or thesis, surf internet to get the related information and also the help and explanation from supervisor. There are two similar projects and two related paper that are included in this project.

2.1 Visual Basic .Net for VB 6.0 Developers [1]

VB.NET, the following version of VB 6.0 is an improved, stable, and full Object Oriented language. In VB 6.0 was not a true object-oriented language because there was no support inheritance, overloading and interfaces. Microsoft .NET is a new programming and operating framework introduced by Microsoft. All .NET supported languages access a common .Net library to develop applications and share common tools to execute applications. Programming with Visual Basic using .NET is called VB.NET. in VB.NET, you can develop multithreaded applications as you do in C++ and C# and it also supports structured exception handling.

VB.NET features:

- Object Oriented Programming language
- Support inheritance, overloading, interfaces, shared members and constructors

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- Supports all CLS features such as accessing and working with .NET classes, interaction with other .NET languages, meta data support, common data types and delegates
- Multithreading support
- Structured exception handling

Difference: VB.NET and VB 6.0

Data Type	VB 6.0	VB.NET
Integer	16 bit size	32 bit size
Long	32 bit size	64 bit size
Currency	Currency was used to store large floating point values	Replaced with decimal, supports more precision
Variant	Can hold any type of data	Replaced with Object type. Can hold any type of data. Provide better results
Date	Date used to store as double	Introduces Date Time data type designed to store date in different formats

Table 2.1: Difference between VB.NET and VB 6.0

2.2 How to Code for RS232 in Visual

The article explain that the coding for the serial port (RS232) in Visual Basic (VB) to communicate between computer and micro-controller.[5] There are two major methods to get data from serial port: polling method and event driven method. Polling method is the

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simplest method but you may get your data in partly. So, you may need to write extra code to comb out different data packets received consecutively. Event driven method is more convenient, fast and less CPU consuming.

Before start write the coding in VB, that have some settling port parameter that we need to take note such as: communication speed (9600, 19800), number of data bits (7, 8), type of parity (even, odd, none) and so on. He is strongly recommend to code some error handling routines to catch any possible errors to prevent from running time error and program shut down.

For event driven programming, use the event triggered on receiving data. Below is the pseudo code for receiving a data:

Step 1: Continue if event is really triggered by received data.

Step 2: Disable event generation

Step 3: Wait for a while to get possible remaining bytes.

Step 4: Read and concatenate the data into a dummy static variable.

Step 5: If expected data received completely, use it and clear the dummy static variable.

Step 6: Enable event generation

2.3 Designing an LED Dot Matrix Display Interface (National Semiconductor Application Note 350)

This article is introduced about the dot matrix LED display's background, advantages, hardware circuit, software coding and so on.[4] LED displays have become very popular because of their ultra-low power consumption and high contrast ratio under high ambient light levels. Typically a dot matrix LED display has a backplane that overlaps the entire display area and multiple segment lines that each overlaps just one segment or descriptor. This means that a separate external connection is needed for every segment or descriptor.

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The micro-controller will read the ASCII text pointed to by High/Low and display it on the dot matrix LED display starting at the column pointed to by the memory location CURSOR. The micro-controller will scroll whatever is displayed on the dot matrix LED display to the right until the screen is clear. It first reads in three columns of data. It then writes three columns of data with the High/Low pointer shifted by one byte. This will shift the displayed data by one column. This is repeated until the entire dot matrix LED display has been shifted by one column. Then the entire operation is repeated until all the displayed data is shifted off the screen. This subroutine could easily be adapted to scoll the display to the left if desired.

2.4 Software name: LED Panel Controller

This is the previous GUI project that has been done by Tiago to controlling a LED display. This GUI project will connect to server by searching the server address and port number. In this GUI, user can change the scrolling speed, LED brightness, display massage, scrolling direction and so on. User can edit the display font by using the Font Editor function that is design for changing the font pattern. It will be save the changed font in a library, so once change, user can use it permanently.

Beside that, this GUI also can use to display a picture on dot matrix LED display. User can design their favorite graphic by pointing on the provided LED display board. Once finish design, user can save it and load it back when needed.

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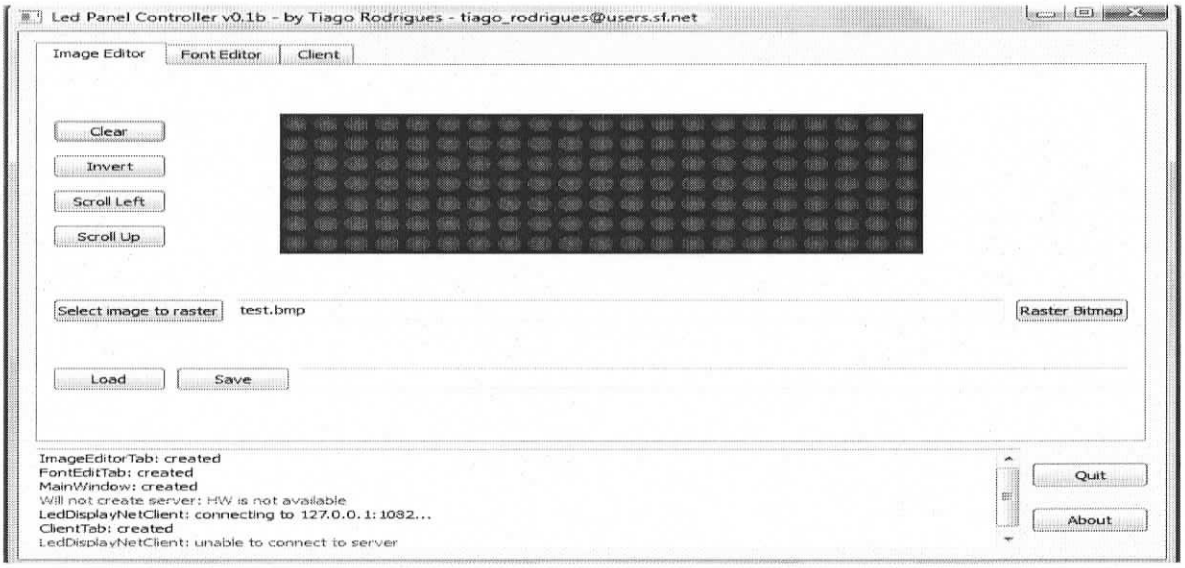

Figure 2.1: GUI project by Tiago for controlling a LED display

2.5 Software Name: FANCY_LEDS

This is the previous project that developed by Olivier de Broqueville for controlling a LED display. In this GUI, user can create own image by pointing the screen. This GUI can control the dot matrix LED display to change the display image. Total 6 scenes that can be display at the same times. User can control the changing speed and timer. The disadvantages of this GUI are lack of the key in text box and no have animation effect. User need to design the word themselves.

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