Pedestrian Signal System

Project Description

Western Washington University

Electronics Engineering Technology

ETEC 471
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Introduction:

LED displays are getting popular to use these days. Sometimes we go to a store, and we can see what is special and what is on sale today. In the government office, the LED display system always says the latest news and what the big events are coming. In the casino, they use the display system to tell the prize of jackpots and new coming games. Some casinos even have bigger display screens to display moving pictures to catch people eyes. For those LED display system, there are a lot of LEDs used in one system, the bigger ones use thousands of them. LED displays are almost everywhere.

I propose to create a pedestrian crossing signal for crossroads. The difference between the one I create and the ones on the street now is that I am going to use bi-color dot matrix LEDs to display count down numbers and moving picture to notice people how much time they have left to cross the street. Because it is easier to notice a subject that is moving for a human, it will be much safer for pedestrians when they want to cross the street. It can be used on any size of streets. It will count down number and show a little green guy walking on the screen. As soon as the count down is over, the guy will turn red and stop walking to let people know that they should stop walking and there might be cars coming.
Functional Description:

The basic block diagram of this project is shown in Figure 1. This project has few parts: Traffic Light, a microcontroller with keypad, and an output pedestrian crossing signal. The traffic light and the pedestrian crossing signal will be controlled by the microcontroller. The traffic light will be going green, yellow, and red as regular traffic lights we see on the street, and the pedestrian crossing signal will notice if pedestrian should walk cross the street or stop and wait for the next green light. The microcontroller will be collecting the input form the keypad and resulting on the pedestrian crossing signal.

![Figure 1: Pedestrian Signal System Block Diagram](image)

Hardware Description:

This Pedestrian Signal System will use the MC9S12DP256B MCU as shown in Figure 2. I am going to use 256K Flash EEPROM, 12K bytes RAM, and 4K bytes of EEPROM from 9S12. A 16MHz Crystal will be also used to generate the clock signal of the
Because I will put 4 dot matrix LEDs on the same board, the actually size of 4 LEDs will about 10cm x 8cm x 1cm, and with microcontroller and traffic lights together will be about 20 cm x 15 cm x 10 cm as shown in Figure 3.

Figure 2: Hardware Connection Diagram

For the traffic light, I will use three LEDs, green, yellow, and red, instead of areal traffic light, and it represents real traffic lights. I am going to have two bottoms, PEDESTRIAN key and TEST key. When the PEDESTRIAN key is pressed, next time the green light is on, the pedestrian signal will start running to notify people. And When the TEST key is pressed;
it will run to test the LEDs to check if there is any LED broken. Note that it will be checked by human eyes, and it will now affect the traffic lights.

The LEDs I am going to use are 5 x 7 bicolor dot matrix LEDs, and I am going to use 4 of them, so it will be 10 x 14 dots. Each dot has 2 different colors, green and red. I am going to use 2 LED drivers to control the LED display. The LED drivers will be programmable so I can input any kind of picture I wish to display.

![LED Displays](image)

**Figure 3: Pedestrian Signal System**

**Software Description:**

The Pedestrian Signal System will be using the C program language and assemble language. The program will include the following modules: Kernel module, Main module, LED module, Traffic Light module, and Keypad module.

- Kernel Module will include MicroC/OS-2 to manage the tasks.
Main module will control between each states and control the LED module and Traffic Light module is running in the correct time period.

LED module will have all the functions we need to program the LED drivers and display the pictures.

Traffic Light module will control the green, yellow, and the red light for noticing car on the crossroad.

Keypad module will be using to collect user’s input, such as PEDESTRIAN key, and TEST key.

**User Interface Description:**

Because it is Pedestrian Signal and traffic light, as soon as the program starts running, the traffic light will run in an endless loop, and there will be only three keys for users to press, PEDESTRIAN key, and TEST key. The PEDESTRIAN key is for everyone who wants to across the street, but TEST key are for technical staff only. The Flow diagram is shown as in Figure 4.
Red Man state

It will display a red man on the LEDs as showed in Figure 5 to notify people it is red light so people can not across the street.

Figure 4: LED display Flow Diagram

Figure 5: Red Man
Green Man state

When traffic light is on green and PEDESTRIAN is pressed. The LEDs will display the pictures in a loop as shown in Figure 6. The pictures will be switched in loop and it will look like the green man is walking to notify people that it is safe to cross the street. The green man will walk slowly and the picture changing rate is around 150~200 ms.

Figure 6: Green Man
Count Down state

When there is only 10 seconds left, it will go to count down state. LED will be display in Yellow. In this state, LEDs will display a number as shown in Figure 7 to notify people how much time left for people to across the street. The number will be counting down from 10 to 1, and then it will go back to Red Man state.

Figure 7: Numbers
TEST state

It is for technical staff use only when the TEST key is pressed. It will test the system by displaying every dot on the LEDs as shown in Figure 8. Each picture will be shown for 1 second, so the whole test will take 6 seconds to finish. This testing is only for the pedestrian signal, and it will not affect the traffic light.

Figure 8: Test State
Project Schedule Timeline:

<table>
<thead>
<tr>
<th>Spring Quarter 2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 01</td>
</tr>
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<td>Week 02</td>
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<td>Week 03</td>
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<tr>
<td>Week 09</td>
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<tr>
<td>Week 10</td>
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Prototype Demonstration:

I will be using 4 dot matrix LEDs for the demonstration. For the input, I will be using 16 keys keypad, which has number 0-9, #, *, and letter A-D buttons, but only letter D, and # key will be used in Pedestrian Signal System. I will set D key to be PEDESTRIAN key, and # will be the TEST key. The pedestrian crossing signal will be standing up and keypad on the side. People will easily see the picture is moving and changing in color both green and red.

Project Specification:

Power Requirements

Power Supply……………………….Wall Transformer Power Supply, UL/cUL standard

Input………………………………120VAC, 60 Hz
Output...........................................5VDC, 1000mA

Worst Case Power Dissipation.......371.2mA

PCB Size Limits

Maximum PCB dimensions.........7” x 5” x 4”

LED

LED Size.................................53mm (2.0”)

LED Brightness.........................10mA
Preliminary Parts List:

<table>
<thead>
<tr>
<th>Part</th>
<th>Quantity</th>
<th>Source</th>
<th>Lead Time</th>
<th>Price/Unit</th>
<th>Max Current</th>
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Total Cost of Parts: $87.45  
Maximum Power: 154mA