Introduction to Microcomputers

Lab7: Using the LCD

The goal of this lab is to make use of the LCD on PICSIM and display some text data on the LCD screen.

Assignment

You are asked to simply extend your project from Lab6 that implements a counter counting from 0-20 and increments every second.

Recall that in your previous project, you used to display the two digit number on the two SSDs on the experiment board. In this project you will display the counter value both on the LCD and on the two SSDs as follows:

As usual, your counter value starts at 0, increments every second by 1 up to 20 and then rolls over back to 0. On the first line of the LCD, you will display the two digits. For example, if the counter value is 12, then the first line must show "Counter Val: 12". The second line of the LCD will show the message "Counting up…" if the counter is less than or equal to 20. When the counter rolls over from 20 to 0, the counter value will display 00, and the second line will show "Rolled over to 0". At the next increment, you then show "Counting up…" as usual.

Recall that both the LCD and the SSDs use PORTD to get data from PIC16F877A on the experiment board. To display the digits both on the LCD and on the SSDs, first disable SSDs by setting their select bits to 0. Then display the messages on the LCD and then display the digits on the SSD in a loop.

Here is the pseudocode for this project in C:

```c
// Counter is represented as <digit1><digit0>
#define NO_ITERATIONS 90  // Experiment with different iteration counts to find the right value
digit0 = 0;
digit1 = 0;
char *message = "Counting up…";

Initialize_LCD();
while (1){
  PORTA5 = 0;   // Disable DIS4
  PORTA4 = 0;   // Disable DIS3
  LCD_Display("Counter Val: ");
  LCD_Display(digit1);
  LCD_Display(digit0);
  LCD_Move2SecondLine();
  LCD_Display(message);

  for (int i=0; i<NO_ITERATIONS; i++){
     PORTA5 = 1;                 // Select the first SSD
     PORTA4 = 0;                 // Second SSD is not selected
     PORTD = SSDCodes [digit0];  // The code to display the first digit
     DelayMs(5);                 // 5 millisecond delay
```

```
      PORTA5 = 0;                    // First SSD is not selected
      PORTA4 = 1;                    // Select the second SSD
      PORTD = SSDCodes[digit1];   // The code to display the second digit
      DelayMs(5);                    // 5 millisecond delay
   } //end-for

   digit0++;
   if (digit0 == 10){
      digit0 = 0;
      digit1++;
   } //end-if

   message = "Counting up…";
   if (digit1 == 2 && digit0 == 1){
      digit1 = digit0 = 0;
      message = "Rolled over to 0";
   } //end-if
} //end-while
```