

COE 0147 Spring 2014

Lab 8: LED with Keypad Again

Each of you should submit your own solution via email, according to the instructions on your TA's website. You may collaborate with your partner, but each person must turn in their own copy of the lab, with the name of their partner.

In this lab, we will use the specially modified version of MARS from Lab 4, which is available at:
<http://www.pitt.edu/~dbd12/teaching/files/Mars-4.1-With-Keypad-LED128x8.jar>

Please review Lab 4 to see how you worked with LED simulator. To brush up your knowledge, you have to enable the LED simulator by choosing “Keypad and LED Simulator” from the tools menu. Once it has been enabled (click, “Connect to MIPS”), you may draw to the display by writing to its memory. You may read from the display by reading from its memory. Its memory begins at address 0xFFFF0008. Recall that each LED row consists of 128 LEDs. Each LED is 2 bits, which is 256 bits. 256 bits is 32 bytes (8 words). There are eight rows of LEDs. To represent a LED, we will use the x-y coordinate system. The columns are represented in x-values ranging from 0 to 127 and the rows are represented in y-values ranging from 0 to 7.

In this lab you have to place 5 random GREEN LEDs on the display. Once you placed your GREEN LEDs, you have to place a single RED LED in the middle of the display. The (x,y) location for this RED LED will be (64, 4). Once you have this setup, you have to move the RED LED around the display using the arrow keys which are to the left of the display. When the RED LED is on a GREEN LED, you have to show the RED LED only. When the RED LED moves out from top of GREEN LED, the GREEN LED is shown again. But if the center button in the keypad is pressed, then the GREEN LED goes away. So, if you move the RED LED from top of GREEN LED will not show up. Your program ends when all the five GREEN LEDs are gone. Name your file **lab8.asm**. Please follow the solution demo given by your TA during the recitation session.

How to detect a keypress:

When there is a keypress, the lowest bit of the word at address 0xFFFF0000 is set to 1. Reading the word at that address resets the bit. To find out which of the five keys is pressed, another word at address 0xFFFF0004 will help you. This word contains a value corresponding to each of the keys. If the UP key is pressed, the value will be 224. The DOWN, LEFT, and RIGHT arrows have the values 225, 226, and 227 respectively. The CENTER key has the value 66. Look at the **basic_keypad.asm** in the extra files for this lab for an example how to use the keypad properly. To turn on/off a LED at location (x,y), use the **setLED** function from **set_led.asm**.