Electrical and Computer Engineering
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MSP432 Lab 1: Joystick to Seven-Segment Display

EEDG/CE 6302 Embedded Systems

Contents

1. Introduction to MSP432P401R

1.1 - Introduction

The SimpleLink MSP432P401R LaunchPad is the development kit with a 48MHz Arm Cortex-M4F as core. This launchpad enables you to develop high-precision sensor node applications. Energia is an open-source electronics prototyping platform (supports Mac, Windows and Linux) including an integrated development environment. We will use Energia to compile the program and upload to the board.

1.2 - Upload code to the LaunchPad

If you have not already done so, follow the guide to set up Energia for the MSP432P401R LaunchPad. Once you have done so, verify that you can upload a program (the blink example) to the board following the steps in Section 3 of the quickstart guide.

1.3 - Educational BoosterPack MKII

The BoosterPack is a module integrated with a variety of sensors including an analog joy- stick, environmental and motion sensors, RGB LED, microphone, buzzer and more. It is easy to use connecting it to the top of the MSP432P401R LaunchPad. (Power and Ground pins should be corresponded. Do not connect them in wrong direction.)
In Energia, there are example programs to setup the communication between BoosterPack MKII and MSP432P401R. On Energia IDE, select **File → Examples → EducationalIBP_MKII.**

2. Lab Procedure

In this lab, we will write the program to control the screen Educational BoosterPack MKII by the MSP432P401R board.

2.1 - Procedure

1. Introduction.
   There are multiple sensors on the MKII. In this document, we will use joystick as the sensor to control the display on the LCD. We will use the LCD to represent seven segment display (If you are not familiar with seven-segment displays, check figure 1). You will select either the x or y axis of the joystick for your experiment.

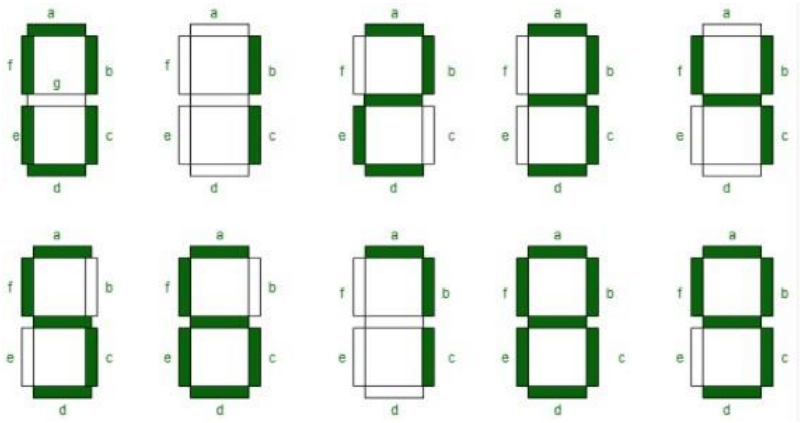

Figure 2.1: seven segment display.

The goal of this lab is to get the input value of one axis of the joystick, convert that value to the range 0 to 99 from the ADC value, and output that value on the LCD screen (shown in Figure 1).

Figure 2.2: An example of the seven segment display on LCD.

2. Modify the given code.
   (a) Open the Energia file given to you on eLearning.
   (b) This code is the basic framework you need to complete this project.
   (c) There are a few variables provided to you that will be helpful to you:
      - **joystickXPin** - The pin that the x-axis of the joystick is connected to.
      - **joystickYPin** - The pin that the y-axis of the joystick is connected to.
   (d) Additionally, there are two functions provided to you which control the simulated seven-segment display:

- **setOnes()** - Sets the output of the ones digit on the LCD display.
- **setTens()** - Sets the output of the tens digit on the LCD display.

Each of the above functions takes one input, the value to display (a one digit integer ranging from 0 to 9). For example, the following code snippet would display the number 28 on the LCD screen:

```
...
setTens(2);
setOnes(8);
...
```

Note 1: It is a good idea to use the serial monitor to get useful information about your program. The given code will automatically tell you if an invalid number is being set to the LCD screen.

Note 2: There are multiple examples in Energia that specifically use the joystick on the MKII BoosterPack. These examples can give you some inspiration if you aren't quite sure where to start with your code.

2.2 - Lab Report

Before submitting your lab report, please ask TA to check your program is working correctly. Include the following in your lab report.

1. Describe how to design the seven segment display in your code.
2. Figures to prove you have correct serial monitor output.
3. Copy your code at the bottom of your report. **Add clear comments in the program to make it readable.**
4. Separately submit the code that TA could run (the .ino file).
5. **DO NOT SUBMIT A ZIP FILE. SUBMIT EACH FILE SEPARATELY!**