	ECGR 4101/5101 LAB 3 Report	09/19/2023
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Lab Objective:

The objective of this lab was to build on top of the previous lab's application and complexity by using analog to digital conversion (ADC) values in addition to interrupts and timers to first determine what the digital values are based on the analog inputs and then display HEX digits (0-F) accordingly. The goal was to code as efficiently as possible, while keeping the number of executable lines of code within the limit of 40, thus making the program optimized in terms of memory and ultimately making it easier to read and follow through.

Lab Figures/Tables:

Table 1: PORT 1 PIN Mappings to Potentiometer

PIN # on PORT 1	Purpose
PIN 3	Analog input

In addition to connecting PIN 3 on PORT 1 as the input to read analog values, the Vcc and Gnd were also connected to the Potentiometer. Table 1 shows the same.

Table 2: PORT 2 PIN Mappings to Segments on the 7-Segment LED

PIN # on PORT 2	Specific Segment
PIN 0	a
PIN 1	b
PIN 2	c
PIN 3	d
PIN 4	e
PIN 5	f
PIN 6	g
PIN 7	dp

To connect the 7-Segment LED with MSP430g2553, pins 0-7 on port 2 were used and the connections as shown in Table 2 were made. Pin 0 was connected to segment a, and so on until the last segment, the point (dp) was connected to Pin 7.

Table 3: Hex Digit's Binary and Hexadecimal Values Used

Hex Digit	Binary Combination	Hexadecimal Combination
0	1100 0000	0xC0
1	1111 1001	0xF9
2	1010 0100	0xA4
3	1011 0000	0xB0

4	1001 1001	0x99
5	1001 0010	0x92
6	1000 1001	0x82
7	1111 1000	0xF8
8	1000 0000	0x80
9	1001 0000	0x90
A	1000 1000	0x88
B	1000 0011	0x83
C	1100 0110	0xC6
D	1010 0001	0xA1
E	1000 0110	0x86
F	1000 1100	0x8E

To make the code efficient and smaller in length, an array with 16 elements was declared and the hexadecimal combinations of the 16 unique digits (0-F) was stored in as separate elements. The connections were made for the Anode. i.e., 0 represented OFF state and 1 represented ON state. To display different digits, a predefined combination in terms of Hexadecimal values was used and every time, a different element was turned ON. Table 3 shows a list of the hex digit and its binary as well as hexadecimal representation.

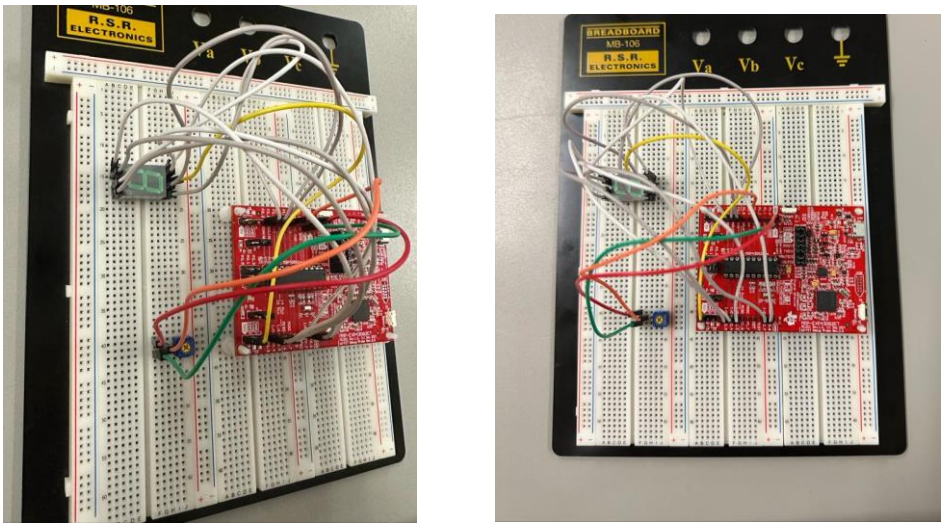

Figure 1: Connections made between the Breadboard and MSP430g2553 for 7-Segment LED Display to display HEX Digits (0-F) using Potentiometer's Input

Commentary and Conclusion:

Lab 3 was straightforward due to the fact that the connections and code to display HEX digits (0-F) was to be used from the previous lab. The only thing that was new was connecting the potentiometer to the board by making connections to Vcc, Gnd and to an Input PIN on PORT 1.

With all the connections made, the potentiometer was tested for only 0 and F display. With that part working, calculations were made to determine which digital values represent which HEX digits that were then to be display based on the digital values calculated using the analog values received as inputs. As this lab had to be built up on the previous lab, the code for timers and interrupts was also used.

In conclusion, the lab went as expected. Initially OFF, and when started the program, the 7-Segment LED displayed the digits 0-F based on what analog input was received from the potentiometer. No significant problems were encountered along the way, thus making the entire code process in general easier to follow.