Microcontrollers with Assembly

Capstone Project Description | ECE 3362 | Fall Semester 2023

Project Description

Using the MSP430, create a variable speed counter using the following:

- Display decimal values (9999 – 0000) on the 4x7 Segment Display
- Control the rate of counting using the potentiometer
    - Frequency Range = [0-50] Hz.
- Button 3 (S3) creates a lap time. Upon pressing, the display will show the captured count, while the counter continues to increment in the background
    - When pressed again, lap mode ends, display reverts to regular counting
- Button 2 (S2) resets the counter to 0. This takes precedence over the lap feature
    - When triggered, lap mode ends (if enabled), count = 0, and regular display continues
- Button 1 (S1) reverses the counting direction (increment <-> decrement)

As extra credit, you may attempt to utilize the onboard LCD display to show the current frequency of the counter.

Pinout

Potentiometer – P9.2 (Analog In A10)

7 Seg Display

Segments

- a: P2.0
- b: P2.1
- c: P2.2
- d: P2.3
- e: P2.4
- f: P2.5
- g: P2.6
- DP: P2.7 (should remain off at all times)

Common Cathode Digit

- Digit 1: P3.0
- Digit 2: P3.1
- Digit 3: P3.2
- Digit 4: P3.3

Note: Digit 1 corresponds to the 1000s, digit 4 corresponds to the 1s. Don't let it confuse you

Pinout (cont.)

Buttons

- S1: P4.7
- S2: P1.3
- S3: P1.5

Grading Scheme

Category	0	10	15	20	Category Total
7Seg Display	No implementation	At least one digit is displayed	At least 2 digits are displayed	4 digits displayed correctly	20
Buttons	No implementation	at least 1 button functions	At least 2 buttons function	All three buttons function AND are debounced	20
Potentiometer	No implementation	N/A	Some speed control	Proper range control	20
Timer Counter	No implementation	Some attempt at T/C use	Timer Counter functions correctly	Timer Counter uses interrupt capabilities BONUS (+5) – All features operate on one T/C	20 (+5 EC)
Code Cleanliness	Not commented	Commented somewhat	Some use of CCS techniques* and quality commenting	Good use of CCS techniques	20
BONUS – LCD display	No implementation	+4: correct LCD use	+1: includes sign to show direction		+5
				TOTAL:	100 (+10)

* CCS techniques include labeling, section division, register/variable renaming, macros, subroutines, etc.