## ECE 376 - Homework \#5

Keypads in C, Stepper Motors in C.
Please make the subject "ECE 376 HW\#5" if submitting homework electronically to Jacob_Glower@yahoo.com (or on blackboard)

Design an embedded system which uses the keypad and the stepper motor. Some suggestions are...

## Combination Lock

1) Requirements:

Inputs:

- Keypad


## Outputs:

- Stepper Motor


## Relationship

- Input a four digit number on the keypad
- Press*
- If the number is 1234 , then
- Rotate the motor 100 steps at a rate of $20 \mathrm{~ms} / \mathrm{step}$
- Pause 1 second
- Rotate back 100 steps at a rate of $20 \mathrm{~ms} / \mathrm{step}$
- Then wait for a new input
- If the number is not 1234 , then do nothing.

2) C code, flow chart, and resulting number of lines of assembler

```
< insert C code >
```

Memory Summary:
Program space
Data space
EEPROM space
ID Location space
Configuration bits

3) Validation: Collect data in lab to verify you met the requirements.

- In theory, check all possible combinations.
- In practice, to a random sample

Verify that the requirements are met
Input numbers from 0000 to 9999

- 1234 accepted
- 5678 accepted
- 1932 accepted
- 9999 accepted

Press *. If the code is incorrect, nothing happens

- 7341 * resulted in no action (incorrect code)
- 8312 * resulted in no action (incorrect code)
- 2222 * resulted in no action (incorrect code)

If the code is correct, step 100 times at 20 ms per step, wait 1 second, return

- 1234 * is input
- Motor steps 100 times at 20 ms per step
- Motor turned 180 degrees
- LCD display indicated that it made 100 steps
- Oscilloscope indicated that each step is 24.7 ms (timing isn't quite correct)
- Pauses 1.0 second
- Measured as 1.0 second on an oscilloscope
- Motor returns to original spot at 20 ms per step
- Motor returns to original position (check)
- LCD indicated that it's back at 000 position
- Oscilloscope indicates that it's actually 24.7 ms per step (timing isn't quite right)

Each sequence should take 5.0 seconds total

- Stopwatch app measured the total time as 6.0 seconds
- The timing isn't quite correct (probably the 20 ms steps actually take 24.7 ms )


4) Demo. Video or in person.
