ECE 1001 Introduction to Robotics
Lab #10: Display ‘n Sounds

Objectives

Write your own programs including loops and variables

Introduction

Review basic information about while loops and variables. Your programs must:

- ***Use at least one while-loop***
- ***Use at least one integer variable***

likely you will use more of each in your programs, but failure to make reasonable and proper use of at least one while-loop and one variable will cause serious loss of points.

You will need an Arduino with a display and buzzer-speaker.

Tone function help is located at
https://www.arduino.cc/reference/en/language/functions/advanced-io/tone/

Time is counted in milliseconds (divide by 1000 for seconds!) from last reset as:
https://www.arduino.cc/reference/en/language/functions/time/millis/

Requirements

Each item must be demonstrated to the instructor or lab helper and signed off, see the signoff sheet.

1) Row of “f.” The LCD display can show two rows of characters, 16 characters long. Write a program which displays the letter “f” in the Lower-Left corner (0,1) of the display for 0.75 seconds and then erases the letter f. Right away, the letter f should be displayed over one, that would be (1,1). Again, after 0.75 seconds the f must be erased and placed over one more column (2,1), for 0.75 seconds. Etc, and on down the line. When f reaches the last column, the program should repeat from the first column lower row. Only one "f" is displayed at a time. You ***must*** use a while() loop to move the letter f.

Besides a while() loop, you will need to use the LCD functions:

```
lcd.print();        //(inside the () goes a variable name or text you want to print enclosed in quotes: "this prints"
lcd.setCursor(X, Y);      //tell the display which location to display in
lcd.clear();              //erase the entire display
```

The display (x,y) column and numbering follows this scheme:

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0																
1																

2) Bouncing f. Modify your program from part 1 so that the "f" is displayed on row 1 and row 0 alternately: (0,1) then (1,0) then (2,1), then (3,0) on down the line. Each time the "f" should be displayed for 0.75 seconds, except in the last position (15,0), where the "f" should remain visible for 1.5 seconds before the display is cleared and the and the display should remain clear until the Arduino is reset.

3) Bouncing f and e back. Modify your program from part 2 so that now once the f reaches the last position, (15,0), it becomes an “e” bouncing back from (15,1) to (0,0), pausing for 0.25 seconds in each position. The program will then start with "f" again.

4) e and f with sound. Modify your program from part 3 so that the speaker plays a 200Hz sound for 0.25 seconds when the first f is displayed, and the frequency increases by 25 Hz for each e displayed (200, 225, 250…). When the e’s start displaying, the sound should keep increasing in frequency by 25 Hz for each e displayed. The f’s should be displayed for 0.75 seconds, and the e’s for 0.25 seconds as in part- 3. Note that although you can keep the tone on with a duration, that duration does not pause the program:

```
tone(pin, frequency, duration);
```

You should add a delay of the same amount of time as the duration, for example:

```
tone(5, 300, 250);
delay(250);
```

Turn-ins

Hand in your completed signoff sheet by the deadline
Submit the code from each program to the Canvas Lab-10 code submission portal by the deadline