Introduction to Robotics: Homework

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1 Homework #4 - 7 segment display drawing

Deadline (hard): Your respective lab in the week of October 6th - November 12th, 2023. You must have the Git ready and the assignment turned in before the start of lab.

- **General description:** You will use the joystick to control the position of the segment and "draw" on the display. The movement between segments should be natural, meaning they should jump from the current position only to neighbors, but without passing through "walls".
- **Example video:** `https://www.youtube.com/watch?v=03NsXO1_Q_4`
- **Components**: 1 7-segment display, 1 joystick, resistors and wires (per logic)
- **Requirement:** The initial position should be on the DP. The current position always blinks (irrespective of the fact that the segment is on or off). Use the joystick to move from one position to neighbors (see table for corresponding movement). Short pressing the button toggles the segment state from ON to OFF or from OFF to ON. Long pressing the button resets the entire display by turning all the segments OFF and moving the current position to the decimal point. **Interrupts are required for CTI and bonus for Computer Science**.

  Be careful:

  1. Joystick movements should be done with toggle, as in the lab (joyMoved, etc)
  2. For CTI, it is part of requirement to use interrupts. For Computer Science, it is a bonus.
  3. The code in the lab for joystick movement is not perfect and can be improved. The code should be wrapped in a function and the constraint between 0 and 9 can be simplified.

Current segment	UP	DOWN	LEFT	RIGHT
a	N/A	g	f	b
b	a	g	f	N/A
c	g	d	e	dp
d	g	N/A	e	c
e	g	d	N/A	c
f	a	g	N/A	b
g	a	d	N/A	N/A
dp	N/A	N/A	c	N/A

- **Publishing task:** You must add the code to the Github repo and continue updating the readme with at least the following details (but feel free to be more creative). I recommend using dropdowns in the readme, for each project, if you feel the readme is too cluttered:

  `https://gist.github.com/citrusui/07978f14b11adada364ff901e27c7f61`

  1. Task Requirements
  2. Picture of the setup
  3. Link to video showcasing functionality (I recommend youtube, but anything I can access is fine)
  4. Remember to publish the video in the correct orientation. Don't do this: `https://youtu.be/Y8H0PlUtcto`
  5. **Hand in the homework on MS teams when done - aka when Git is up to date**

- **Coding task:** Coding style is of utmost importance. You must have a perfectly clean code in order to receive the maximum grade. An important coding challenge present in this task is using **millis() or micros()** and **interrupts** instead of **delay()**. Do not use repetitive structures such as **while()**. You can use **for()** in certain cases where it removes repeated code (such as addressing all the segments, changing the pinMode() etc.).

  However, remember that the bulk of the grade is if the projects **works**. Do not tend to small details unless you have the entire functionality done.

- **Possible bonus points:**
  - Add other components, such as sounds, other LEDs etc. Be creative.
  - Computer Science students, you can use interrupts for bonus. For CTI it is part of the basic requirement. Make sure you use it correctly. It's best to have a functional homework without interrupts rather than one with interrupts that does not work.