Lab 7 for CSE121, Spring'23

Due Date: 06/02/23

This lab is to program the ultrasonic range.

https://lastminuteengineers.com/arduino-sr04-ultrasonic-sensor-tutorial/
https://media.digikey.com/pdf/Data%20Sheets/Adafruit%20PDFs/4007_Web.pdf

Lab 7.1: Read distance (20 points)

Use the SR04 to measure the distance, AND also use the temperature sensor to "adjust" the speed of sound based on the current temperature. Assume that the temperature is always between 0 and 50C.

The temperature (C) and distance (cm) should be shown in the monitor printed once per second. E.g:

Distance: 3.5 cm at 23C
Distance: 4.5 cm at 23C

The distance to measure by the TAs would be from 10 to 20cm. You can calibrate the sensor, but there should be less than a 2 cm error. The distance is computed from the PCB board (not the sensor itself) to a flat surface

NOTE: To get accurate results, you may need to generate multiple pulses, you may also want to look for counters in the hal/cpu_hal.h that has more precision.

Lab 6.3: Faster speed (7 points)

This is a variation of the 6.2, here the idea is to increase the transmission speed. You can do digital GPIO (not ADC) and/or change the ADC settings. You have to increase the speed in the sender and measure up to “what speed” is working and when it starts to fail.
Part of the work is to find a “sequence” that may fail, and you have to report “close” speeds that show when it passes and fails. The speed should be reported in characters per second.

- E.g: it can send 10 characters/second but fails at 12 characters/second.

The difference between pass and fail should be less or equal to 25%. To compute the difference (max-min)/min.

- E.g: If you report 12 fail, 10 pass means (12-10)/10 or 2/10 or 20% which is fine (less than 25%). If you report 15 fail and 10 pass, it is not OK (5/10 or 50%).

The 5 labs submitted on time with the fastest transmission rate in the class will get extra credit (1st 10 points, 2nd 8 points, 3rd 6 points, 4th 4 points, 5th 2 points).

What/How to submit

Same instructions as lab1. Upload the zip with the code and report.pdf to Canvas.