**CPEN 291 - Lab 3 Questions**

*Lab section: \_\_\_L2A\_ (example: L2A) Team (Bench) #: \_\_A\_T20\_\_\_ (example: A-T2)*

Answer the following questions. Submit the completed document (in word or pdf, one per team) to Canvas by the deadline.

Q1 – Teamwork: Explain in details the methods your team has used for the labs so far to communicate effectively among team members.

For effective communication, our team used facebook group chat, and sometimes met in person to discuss division of work, parts that we needed to work on.

Also, we used trello (app) to keep track of which tasks are already done, to be done, who is currently working on it.

We each commited our work to github. Using branches, we each worked on different parts and merged them together after.

Q2 – Ultrasonic Sensor: Include the portion of your Python code for interfacing with the ultrasonic sensor here, and explain in plain English how it is implemented.

    # turn off the trigger pin

    GPIO.output(TRIGGER, False)

    time.sleep(2)

    # turn on the trigger pin

    GPIO.output(TRIGGER, True)

    #send out the 10us pulse

    time.sleep(0.00001)

    # turn off the trigger pin

    GPIO.output(TRIGGER, False)

    # record last lowstamp for ECHO

    while GPIO.input(ECHO)==0:

      start = time.time()

    # record last highstamp for ECHO

    while GPIO.input(ECHO)==1:

      stop = time.time()

    # calculate pulse length

    elapsed = stop-start

    # calculate the distance

    length = (elapsed \* (33150.0 + 0.6 \* temp / 2)) / 2

We first turn on the trigger to send out the 10us pulse.

We time the last moment the Echo pin is goes high (right after transmission of pulse),

Then we time the last moment the Echo pin goes low (end of receiving the echoed signal).

This time difference would be the time it takes for the pulse to hit the object and come back.

We then calculate time \* speed to find the distance.

Q3 – Shift Register:

1. Explain what the RCLK signal is for.

RCLK signal is a storage register clock input. RCLK signal signals when to store the data to the shift register.

Whenever the signal goes high, it will send the data 0 or 1 according to the Data signal to the shift register.

1. Explain what the signal is for.

OE singal is used to enable or disable the outputs all at once. It is a active low pin.

1. From the datasheet explain what values we can use for tw (used in slide 3-26)?

The pulse duration of RCKL for 2V is 100ns, and 4.5V is 20ns. Since we are using 3.3V in this lab, tw could be in between 20-100ns.

Q4 – DHT11: The DHT11 sends a sequence of 40 bits for the measurements. Refer to the datasheet and explain how we can differentiate between a 0 and a 1.

The bits are sent to the GPIO input pin in pulses with buffers on each end. The host sends the start signal by setting the signal to the DHT11 to 0 for more than 18 ms. Next, the slave (DHT11) will send data as a wave, with an initial 50 microsecond low, then depending on the signal, either be a 0 or a 1 by the time the slave signal is high. A 1 bit is read when the initial 50 microsecond low is followed by a 70 microsecond of high, whereas a 0 bit is read when the high is only 26-28 microseconds long.

Q5: In your implementation explain and justify the followings:

1. How long does it take for your sonar to scan 0 to 180? State the default as well as the possible range.

default = 22 seconds Fastest 5 seconds Slowest 55 seconds

1. How often do you read the DHT11 sensor? Why?

We measure the temperature every full cycle or 180\*. The temperature reading slowed down the program, so to avoid slowing down the program too much we didn't continuously read, but to remain accurate we kept reading the temperature value. Reading in-between cycles minimized the effect of the temperature reading delay, by not suddenly stopping mid way through a cycle

1. What are the servos steps (in degrees and/or dutyCycle)? (in other words, going from 0 to 180, how do you increase the servo position?)

We increase the servo angle by 3 degrees each time (in total 60 steps)

Q6 – Challenges: Explain at least one aspect of the lab that was challenging for your team to make it work.

ARC in Tkinter Canvas: The coordinate system and labelling took lots of time to fine tune and make presentable. Although difficult, we managed by trial and error to have a final implementation that looked like a radio scanner. DHT API: Our team tried to reconstruct aspects of the adafruit library and attempt to take the input from the GPIO-pin to retrieve data. However, the data using our method did not work and we suspect it to be the timing being off. Ultimately, we were unable to complete our own individual implementation, and for the sake of the demo will be using the Adafruit\_DHT library.