EE/CprE/SE 491 WEEKLY REPORT 06

10/18/2024 – 10/24/2024

number: 36

Project title: ***Ultrasonic Object Detector***

Client &/Advisor: Professor Jiming Song

Team Members/Role:
Nathaniel Clarke - Project Software Designer
Brock Dykhuis - Circuit Analysis
Nicholas Jacobs - Electronics
Jonathon Madden - UI Designer & Software Tester

Weekly Summary

This week we received our transducers we ordered, and discussed the potential of adding more receivers in the future for clarity. Further planning is needed for the other parts to order for the array hardware. We need to look into what microcontroller and power supply to order.. The next steps are to start working on creating a more official circuit design or sketch keeping in mind the specifications of the (MA40S4R/S) transducers. Using the new specifications, the software side of the project can look into adapting display to new values.

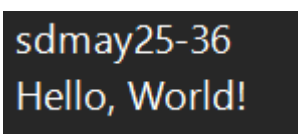
Past week accomplishments

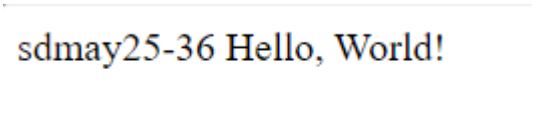
Took notes on last year's (sdmay24-24) implementation of the radar display (major variables and functions) - **Nathaniel Clarke**

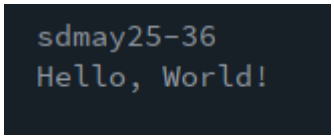
- Examples include**:**
  - **data:** is used to store canvas image data (allows access to data field which is a 1D array describing every pixel's color ratios and opacity)
    - data = ctx.getImageData(0, 0, xs, ys); provides canvas data
    - ctx.putImageData(data, 0, 0); applies new data to canvas
  - **maxx:** The number of angular sections
    - Value is 64, a larger number means more accuracy (smaller slices)
  - **serialPortArray**: Port allows for interaction with a hardware device
    - In our case the display will read from the Raspberry Pi server, and the Raspberry Pi will read from the radar device directly.

Used the processing IDE to pull data from the web server- **Brock Dykhuis**

- used the loadstrings function to read data from the web server
    - found that no formatting is required as the loadstrings method reads what is in the html file
        - if there are returns in the html file, the web server will not show them, but processing reads exactly what is written in the html file. So the output will be on multiple lines. These strings can be added into 1 line for testing.







Theoretical test of transducer performance- **Nicholas Jacobs**

- Evaluated the TR40-16 transducers' performance, specifically checking their ability to transmit and receive signals effectively. Focused on achieving the correct pulse-echo detection timing
- Identified and resolved issues in the microcontroller's simulation to ensure proper pulse detection and system response

Verified power stability under load- **Nicholas Jacobs**

- Monitored power consumption and ensured that the system remains stable when operating under load conditions

Continued testing different display with the Processing IDE - **Jonathon Madden**

- Tested different displays based on previous years code. Display was run with simulated data.

Individual contributions

NAME	Individual Contributions	Hours this week	HOURS cumulative
Nathaniel Clarke	Worked on documenting variables and functions from sdmay24-24's radar display implementation. Made some updates to the team website.	6	39
Brock Dykhuis	Worked with the raspberry pi and with processing IDE. Stored the information from a mock server into a string.	8	36
Jonathon Madden	Created mock displays with simulated data.	6	32
Nicholas Jacobs	Theoretically tested the TR40-16 transducers for signal transmission and pulse-echo timing, resolved microcontroller simulation issues, and verified power stability under load conditions.	6	35

Comments and extended discussion

The MA40S4/R transducers arrived 10/24/2024. Further research is needed into other components to order (microcontroller, power supply, etc.)

Plans for the upcoming week

Nathaniel Clarke: Take notes on sdmay23-22's display implementation, and compare it with sdmay24-24's implementation. Determine consistent values and formulas, and determine which variables are prone to changes.

Jonathon Madden: Figure out the variables and methods used in previous years code. Learn how the previous code runs.

Brock Dykhuis: Begin researching how to connect raspberry pi to the microcontroller. Look into which microcontroller we are going to order.

Nicholas Jacobs: Finalize signal amplification and processing to improve radar detection range and accuracy. Conduct further testing of the transducers and fine-tune pulse-echo timing for optimal detection. Verify full system integration with the microcontroller and radar system, ensuring accurate data processing and timing synchronization. Run additional simulations to enhance the overall system's performance, focusing on increasing detection accuracy and minimizing errors.

Summary of weekly advisor meeting

During this week's meeting we discussed the transducers we decided to order. Our client addressed the concerns regarding the high dB value (120). The value should drop quickly which should prevent damage to hearing, and reducing voltage could also reduce this value. It was also discussed that more receivers could be used to increase the radar image quality.