EE/CprE/SE 491 WEEKLY REPORT 10

11/15/2024 – 11/21/2024

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 discussed creating a one-transmitter radar demo for the faculty panel presentation, and we signed up for a timeslot. We began work on creating the radar circuit, and coding the Raspberry Pi and MCU.

Past week accomplishments

- Took notes on the sdmay24-24 (2024) .ino file MCU code implementation and compared to 2023 implementation - **Nathaniel Clarke**
    - This implementation uses FreeRTOS tasks rather than utilizing coroutines.
    - Data values are sent as a chain of hexadecimal digits, and they are processed in the display code rather than in the MCU code.
    - MCU Code Analysis (2024 Project)
- Tested flashing code to the MCU with flashing light test and began looking into how to code single transmitter radar demo code - **Nathaniel Clarke**
- Data Collection - **Nicholas Jacobs**
    - Collected baseline data to establish initial performance metrics for future testing.
- Transmitter Research - **Nicholas Jacobs**
    - Researched proper wiring and efficient system setup for the MA40S4S transmitters and MA40S4R receiver.
- Schematic Work - **Nicholas Jacobs**
    - Finalized the circuit schematic and ran additional simulations to validate design accuracy and identify necessary adjustments.
- Connected to the MCU through and IDE - **Jonathon Madden**
    - Downloaded an IDE and worked on connecting

- Connected the MCU to the raspberry Pi using a MQTT server -**Brock Dykhuis**
    - Used the mosquitto to setup the MQTT server
    - Wrote code using Arduino IDE to send data to the MQTT server
    - Wrote 2 python scripts to receive data from the MCU and display it in command line on the raspberry pi

Individual contributions

NAME	Individual Contributions	Hours this week	HOURS cumulative
Nathaniel Clarke	Reviewed 2024 implementation of MCU code and practiced flashing code to MCU. Began looking into coding the MCU for a single transmitter radar demo.	6	64
Brock Dykhuis	Setup the MQTT server, this allows for the MCU to send data to the raspberry pi. This data will eventually be sent to the server	8	61
Jonathon Madden	Worked on getting the MCU connected through an IDE	6	50
Nicholas Jacobs	Focused on gathering baseline data, researching efficient wiring and setup for the transmitters and receiver, and validating the circuit schematic through additional simulations.	6	60

Comments and extended discussion

We will begin working on a one-transmitter radar implementation to demo in the remainder of this semester.

Plans for the upcoming week

Brock Dykhuis - Write a script to move the data sent from the python file and it in the webserver folder.

Nicholas Jacobs- I will transition to testing the MA40S4S transmitters and MA40S4R receiver to evaluate their functionality in a controlled environment. I will also focus on refining the signal amplification and filtering stages to balance strength and reduce noise, ensuring clarity in the processed signals. Additionally, I'll fine-tune the pulse-echo timing to optimize detection range and accuracy while verifying each component's performance and compatibility with the system. Addressing any discrepancies identified during these tests will be a priority as I prepare the system for integration.

Jonathon Madden - Work through what code we need to connect the MCU and how to program it correctly

Nathaniel Clarke - Continue to work on single transmitter radar code for MCU.

Summary of weekly advisor meeting

During this week's meeting we discussed when to schedule our presentation to the faculty panel. We also discussed demoing a one-transmitter radar system (using one of the ten transmitters).

https://raw.githubusercontent.com/espressif/arduino-esp32/gh-pages/package_esp32_index.json