Weekly Summary

This week we continued making the phased array steering code for the MCU, completing and initial implementation. We also began altering the circuit design, and planning for the circuit to allow for individual transmitter pulsing, which is required for beam steering. We hope to do more testing later at our next meeting to determine if the receiver placement is sufficient, and not picking up unwanted signals due to being too close to the transmitters.

Past week accomplishments

Brock Dykhuis -
- Finished the Python scripts to communicate with the MCU and the raspberry pi
  - This included putting the data on the local server the raspberry pi hosts
- A static IP can be requested by full time staff/faculty, this can be used to simplify connecting to the server as since it is hosted locally, the IP will be needed to access it.
  - Found the form to request this (must be done by a faculty member): https://asw.iastate.edu/cgi-bin/acropolis/request/dns/ip/update
- Looked into pin assignment for the ESP32, this will be needed when we add more pulses to the radar

Nicholas Jacobs-
- **Tested and reoriented the MA40S4S transmitters and MA40S4R receiver to optimize detection accuracy and signal clarity.**
  - Adjusted amplifier settings to balance signal strength and noise reduction.
- **Researched new components for implementing a phased array system.**
 - Explored transducers with improved directivity and response time.

- ○ Evaluated phase-shifting techniques and signal processing methods to enhance resolution and detection capabilities.

Jonathon Madden -
- **Went over code for single transmitter**
  - ○ Tried to figure out where it was going wrong at.
- **Began looking into how 10 transmitter code will be implemented**
  - ○ Looked into the steering code that Nathaniel found and how it will work

Nathaniel Clarke -
- **Updated receiver connection In single transmitter code**
  - ○ Intended to fix unexpected readings from past testing.
- **Completed Initial Implementation for Beam Steering Code**
  - ○ Currently has an option for a small set of angles or a whole sweep in 1 degree increments.
  - ○ Awaiting testing once the circuit design has been updated.
- **Implemented Cursor Tracking In Radar Display**
  - ○ Provides a way to more precisely determine past reading locations.
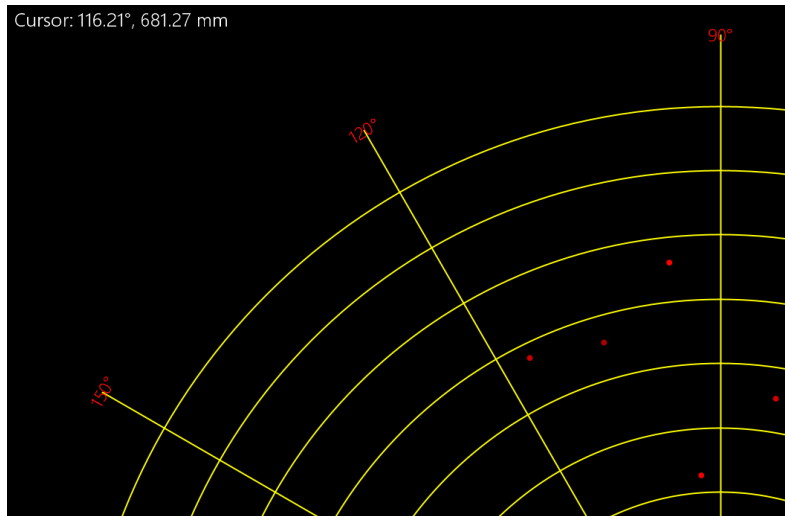
Baoshan Liang -
- **Familiarized with the overall project workflow and current objectives.**
  - ○ Gained a clearer understanding of the project structure and development stages.
  - ○ Identified key milestones and the next steps needed to achieve the current goals.
- **Studied phase adjustment and prepared for testing.**
  - ○ Researched methods to modify phase for signal optimization.
  - ○ Planned experimental tests to evaluate the impact of phase shifts on system performance.
- **Verified and analyzed the gain of the analog amplifier circuit.**
  - ○ Conducted tests to ensure the amplifier gain met theoretical expectations.
  - ○ Adjusted amplifier parameters to balance signal strength and minimized noise.

Individual contributions

NAME	Individual Contributions	Hours this week	HOURS cumulative
Nathaniel Clarke	Completed the first implementation of phased array MCU code, fixed receiver connection, and added cursor tracking for the radar display.	10	85
Brock Dykhuis	Finalized communication between the MCU and the Raspberry pi. Looked into static IP for the server on campus.	7	78
Jonathon Madden	Worked over the single transmitter code. Began working over code fro 10 transmitters	6	60
Nicholas Jacobs	Tested and reoriented the ultrasonic sensor components, adjusted amplifier settings for optimal signal clarity, and researched new transducers and phase-shifting techniques to implement a phased array system.	8	68
Baoshan Liang	Verified amplifier gain, explored Git and microcontroller code, studied phase adjustment, and familiarized with the project workflow.	7	7

Comments and extended discussion

We have an additional team member starting this status report period.

Plans for the upcoming weeks

Brock Dykhuis - Test the ultrasonic sensor with 1 transmitter, work on the MCU code to work with multiple transmitters. Will be a short delay between each of these pulses.

Nicholas Jacobs- I will assess whether reorienting the receiver is necessary for improved performance and continue testing the components, eventually comparing different designs to determine the most effective configuration.

Jonathon Madden - Test single transmitter code. Work on the code for 10 transmitters and figure out the correct delays needed.

Nathaniel Clarke - Test MCU code on the object detector hardware, implement object groupings on the detector display, and start migrating the display to C++.

Baoshan Liang - Continue reviewing microcontroller code and refining phase adjustment techniques. Gain deeper insight into project objectives and workflow for better integration.

Summary of weekly advisor meetings

During our weekly meetings, we discussed our progress toward preparing the circuit for steering. We also discussed the potential changes based on insights from our instructor review meeting. These included the potential need to move the receiver further from the transmitters to prevent picking up unwanted signals, and initially testing a small collection of directions (angles) rather than the whole sweep at once.