Prototyping

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Ultrasonic Object Detector
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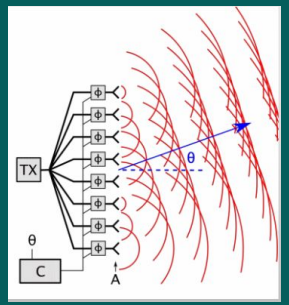
Project Overview

- Design an ultrasonic radar



- Array of transducers
- Rely on reflected sound waves to determine object distance
- Use of time-delay (phase) to control scanning direction and location

Problem Statement

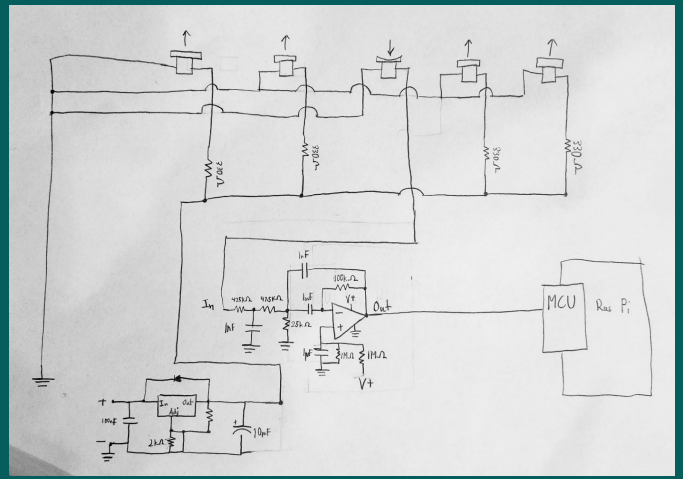
- Design an Ultrasonic Radar System which can detect small objects
- Accurately detect two side-by-side objects
- Effectively convey an image through the use of an intuitive display

Functionality

- Our radar can be used for simple object detection
    - The transducer we picked cannot be used for military or security purposes, and it is not rated for outdoor use.
- The user will get the location of the object on a on the radar display
    - They can decide what they what further analysis is needed, depending on their use case.
- The radar will be able to detect two or more separate objects in close proximity
- The radar will be accurate up to a range of 1 meter.

Prototype (Radar)

- Our hardware prototype consists of testing to make sure the sensor can send and receive signals.
    - Currently we have only been able to test one transducer at a time

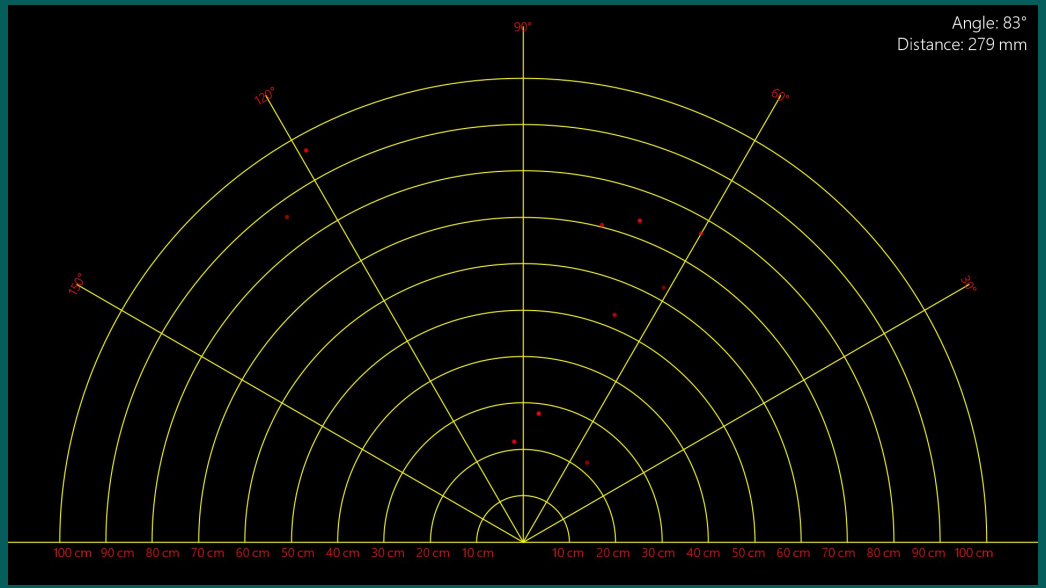


Next Steps (Radar)

- Implementing phase delay to take advantage of constructive interference to improve signal to noise ratio for readings.
- Processing data to follow easy to use format for the computer to use for the display.
- Transmit data values to the Raspberry Pi server through WIFI.
- Design filters to remove unwanted frequencies, can clean the received signal.

Prototype (Display)

- Displayed randomly generated data to simulate object detection
- Older points become faded to represent relative time of read(readings are limited to 10 at a time)
- Displays current reading in top right corner
- Label angles and 10 cm distance increments



Next Steps (Display)

- Have mouse location be tracked displaying coordinate being hovered on.
    - Allows the viewer to understand the location of prior detections
- Highlight the effective FOV which is expected to be 80 degrees (45 degrees in either direction)
- Determine an efficient method (must not lead to major delays) for object grouping. This may include grouping readings with close proximity based on point color
- The display must be changed to read from the Raspberry Pi server
- Minor changes must be made to improve the readability of labels

Demonstration

Future Implications

- Determine if two or more receivers are better than one based on the transmitter tests
- Potentially migrate the display to C++ with OpenGL or SFML for faster data processing
- Use concurrency to implement phase pulses (potentially using Coroutines)
- Consider expanding radar range based on image clarity

Questions?