

# Ultrasonic Radar

## Week 1 Report

Feb 20th – March 4th

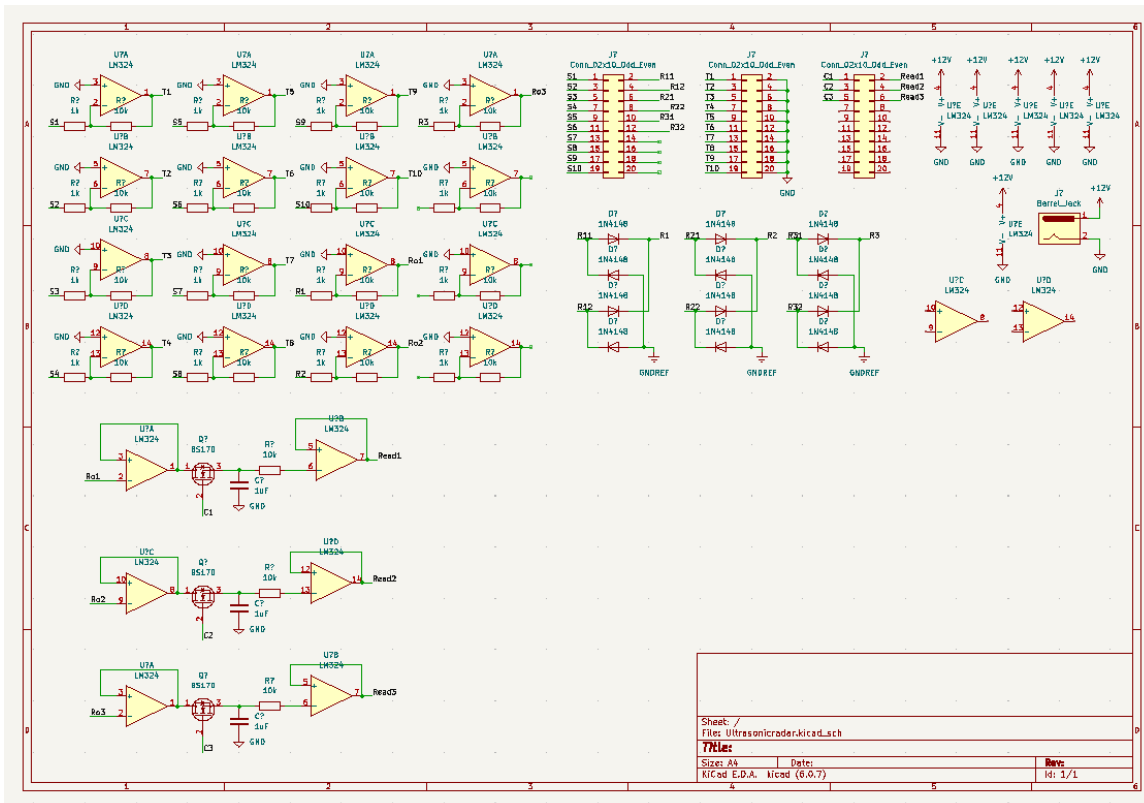
Client & Faculty Advisor: Jiming Song

### Team Members:

- Kevin Czerwinski - Electrical Engineer
- Derek Thomas - Computer Engineer
- Ryan Foster - Electrical Engineer
- Samuel Rosette - Electrical Engineer
- Jack Riley - Electrical Engineer
- Abubaker Abdelrahman - Electrical Engineer

### Past Week (s) Accomplishments

- We have begun working on the circuit that we plan on using for the final implementation of our project. It consists of a number of amplifiers connected to the transmitters to have a stronger output signal as well as at the output of the receivers to amplify any incoming signal.
- We are using a rectifier at the input of the receiver to eliminate the negative voltages that are present whenever a signal is picked up because the arduino cannot take a negative input.
- We have gone through much testing of the transmitters and receivers and still need to perform further testing to decide whether or not more op amps need to be added into the final circuit to smooth out the data.
- We plan to create a 10 element array with up to 5 receivers, only 3 are shown in the circuit.



This circuit board is meant to connect up to the arduino directly through a number of pins. The bottom portion of the schematic is a collection of memory circuits that we will use at the receiver input to be able to hold onto the recorded value for a longer period of time. With the entire transmission and receiving of the signal, the recorded input pulse will be very brief, so a memory circuit like the one pictured would hold that voltage level for longer to allow the arduino to record the value.

### Pending Issues

- We have a lot of issues with the signals during amplification, they become much more noisy and harder to work with. We plan on using different capacitors or other components to eliminate some of this interference which requires further testing.
- In the implementation of the phase shifting for the radar we still have not decided whether we want to implement this via hardware or software. By using a collection of multiplexers we could simplify the code required to perform the phase shift and scan at different angles, but this would require ordering more parts and testing. We could also implement the phase shift through coding which would be complex. The arduino has a 6Mhz clock speed and we could code each of the ports directly through manipulating registers which would allow us to have speeds of up to 4Mhz which is still an order of magnitude higher than the 40kHz signal we need. With these kinds of speeds we would be able to code each of the different pins to jump between high and low with enough time to record data and account for the phase shift.

### Individual Contributions

| Team Member      | Contribution   | Weekly Hours | Total Hours |
|------------------|--|--------------|-------------|
| Derek Thomas     | <ul style="list-style-type: none"> <li>- Updated website</li> <li>- Contributed to the bi-weekly report</li> <li>- Attended meetings and figured out possible next steps to tackle phase array</li> </ul>        | 3            | 15          |
| Kevin Czerwinski | <ul style="list-style-type: none"> <li>- Performed testing with the transmitters and receivers to determine important circuit elements that we will need.</li> <li>- Began design of the PCB on Kicad</li> </ul> | 5            | 18          |
| Ryan Foster      | <ul style="list-style-type: none"> <li>- Testing of amplification circuitry (Input and Output)</li> <li>- Transducer testing</li> </ul>  | 3            | 15          |
| Samuel Rosette   | <ul style="list-style-type: none"> <li>- Researched for more accurate transducers</li> <li>- Assisted with the testing of the amplification circuitry(input and output)</li> </ul>                               | 3            | 15          |
| Jack Riley       | <ul style="list-style-type: none"> <li>- Researched shift registers</li> </ul>   | 3            | 15          |

|                         |   |   |    |
|-------------------------|---|---|----|
|                         | <ul style="list-style-type: none"> <li>- Made block diagram of full circuit</li> <li>- Researched better transducers</li> </ul>   |   |    |
| Abubaker<br>Abdelrahman | <ul style="list-style-type: none"> <li>- Attended this week and past week meeting</li> <li>- Researched for ideas to put on the circuit design</li> <li>- Met with the client and figured out using amplifiers in Arduino input.</li> </ul> | 3 | 15 |

### Plans for Coming Week

- Figure out the best way to turn it into an Arduino input
- Look into what other parts we may need to purchase
- Start working on the software portion so the data can be read and analyzed