

Introduction to Sensors, Measurement and Instrumentation

Lab 9: Ultrasonic Range Finder

Sparsh Gupta

Olin College of Engineering

April 9, 2023

Circuit Diagram

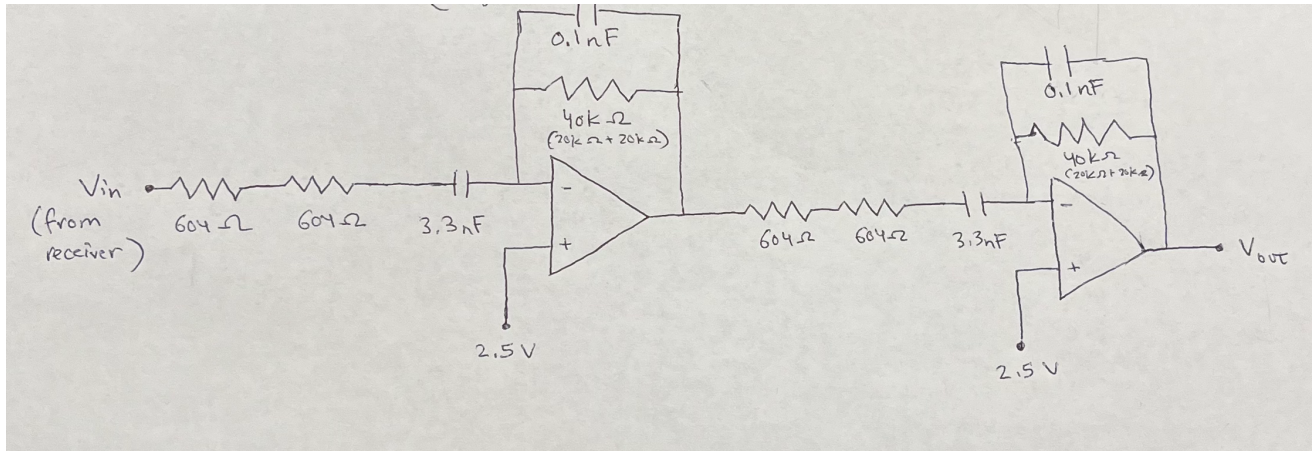


Figure 1: The circuit diagram demonstrates an ultrasonic range finder utilizing a transmitter and receiver.

Oscope

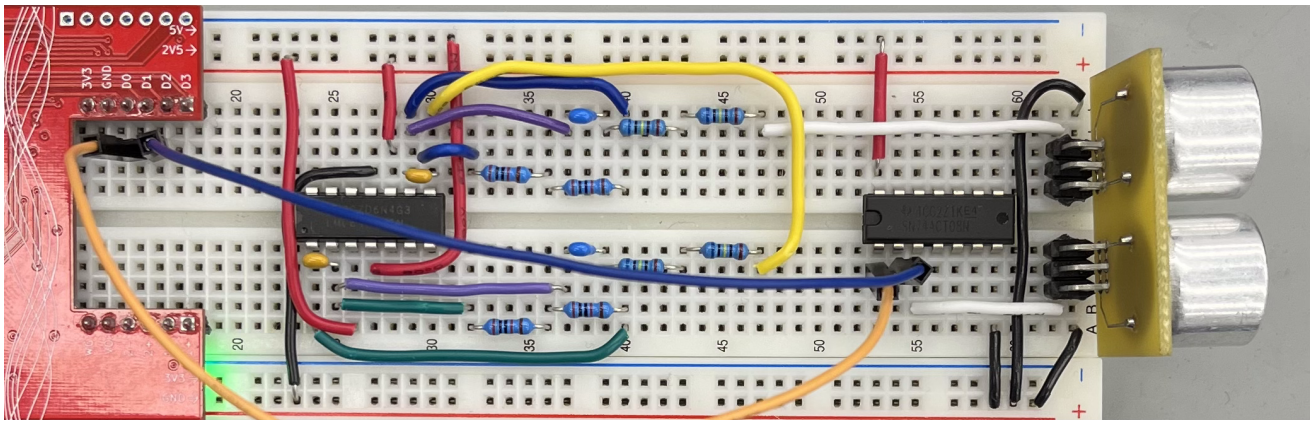


Figure 2: O-scope photo of the Ultrasonic Range Finder circuit.

Bode Plot

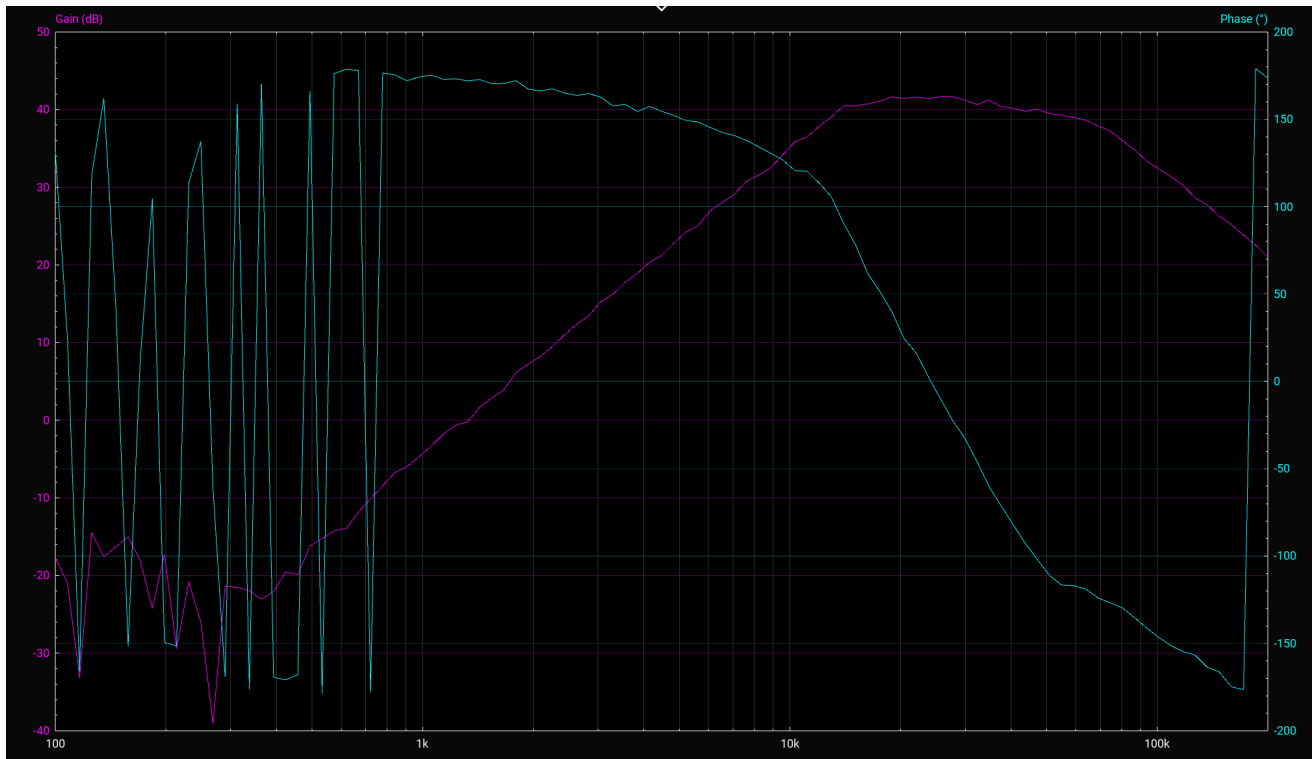


Figure 3: The Bode plot (Gain(dB) vs Frequency (Hz)) for the receiver circuit gives an amplification/gain of almost 50 dB.

Ultrasonic Range Finder Signal Plot

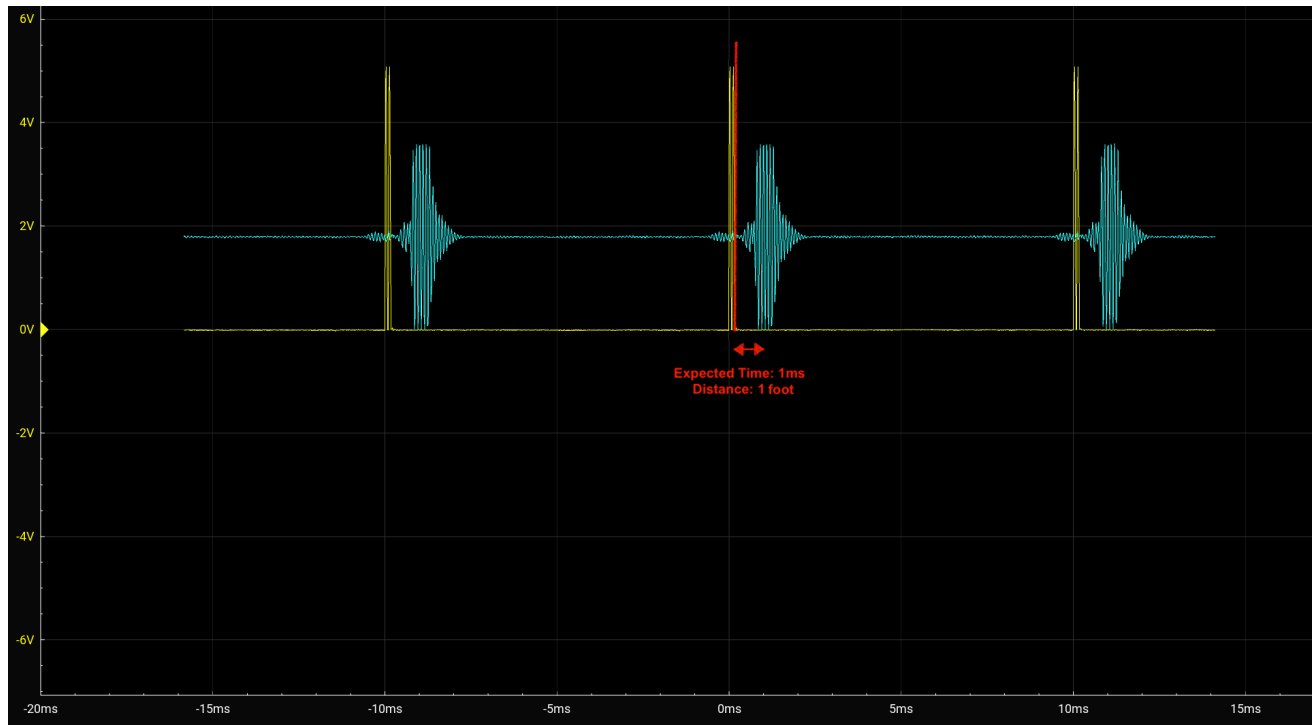


Figure 4: A plot for the ultrasonic range finder with the transmitted and received signals. The echo is expected after 1 ms because the total distance is 1 foot (0.5 feet to the wall and 0.5 feet back). The red line indicates where the echo is expected to return.

Ultrasonic Range Finder Distance

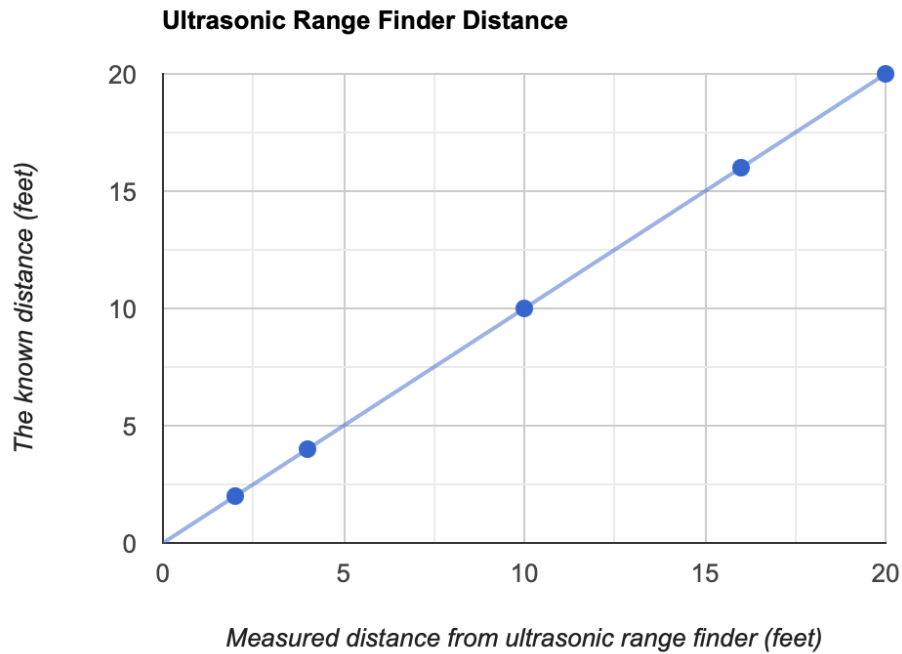


Figure 5: A plot which indicates between the relationship the known distance from the wall and the measured distance using the ultrasonic range finder in feet.

The plot indicates a linear relationship which shows that the ultrasonic range finder works very good. It gives a very accurate resultant distance where the recorded data points demonstrate that the known distance and the measured distance are almost same.

We know that the ultrasonic wave/signal/echo travels at ~ 1 foot/ms. We observed from the signal plot in the above section that signal was indeed traveling at ~ 1 foot/ms. So, we can conclude that the ultrasonic range finder is pretty accurate.