



Truck-railroad bridge collision prevention system



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Background & Objectives

For many years, over-height vehicles such as trucks, buses, RVs have collided with low clearance bridges when their drivers are not fully paying attention to the clearance.

The goal of this project is to analyze, design and build a truck bridge collision prevention system that will :

- Provide adequate warning to drivers before truck hit bridge
- Perform well in all outdoor condition
- Easy to operate and mounted
- Easy to manufacture and produce

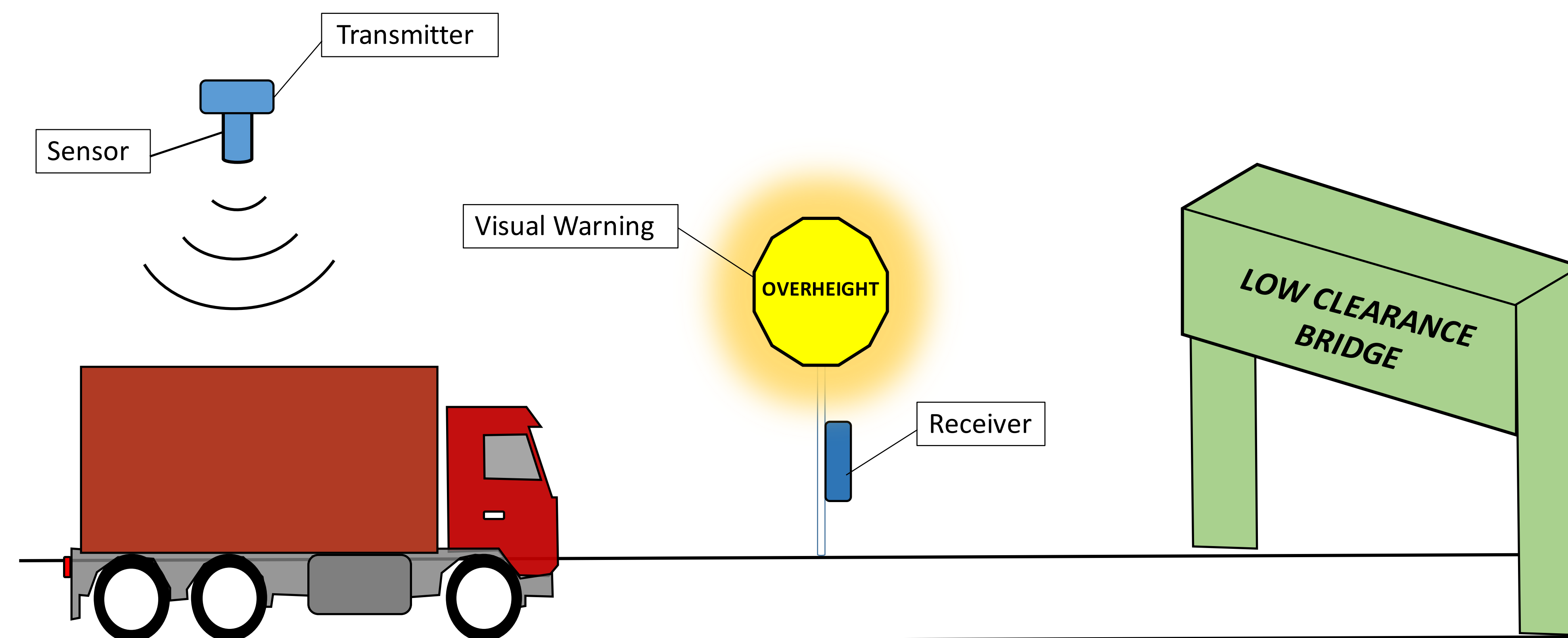


Photo 1: Passengers got injured during accident (ABC news)

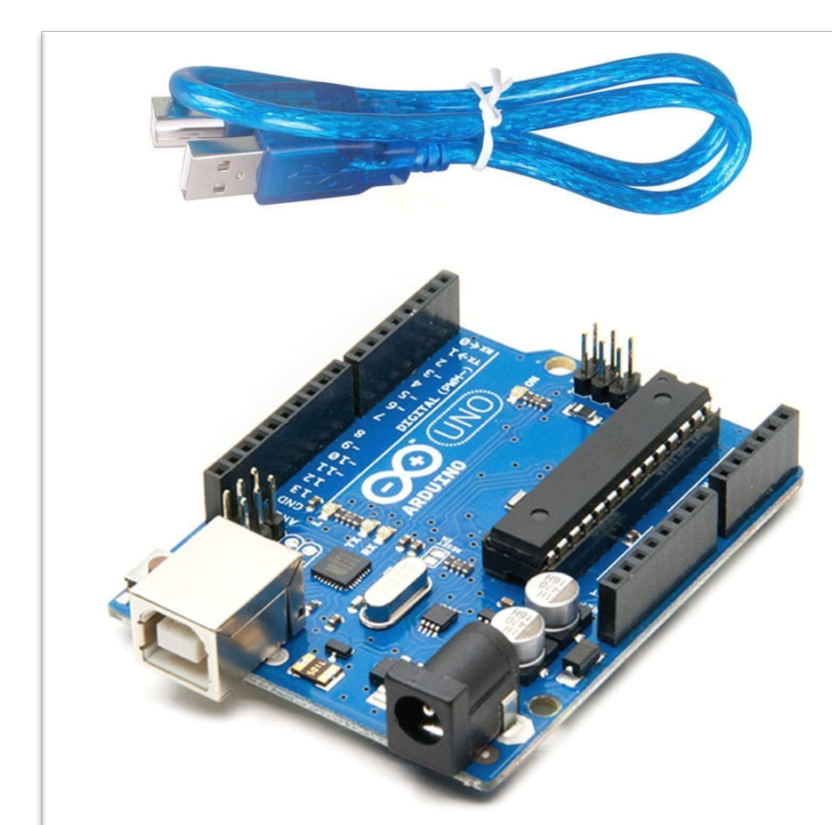
Method

A High Performance ultrasonic sensor will be implemented above the road before the low clearance bridge to detect the height of passing vehicle. If the ultrasonic sensor detects an object less than certain distance away, which means the objects that may collide with the bridge, a signal will be sent by a pair of RF Transmitter and Receiver to trigger the warning sign. Each elements are programed with Arduino Uno R3.

Configuration



Equipment



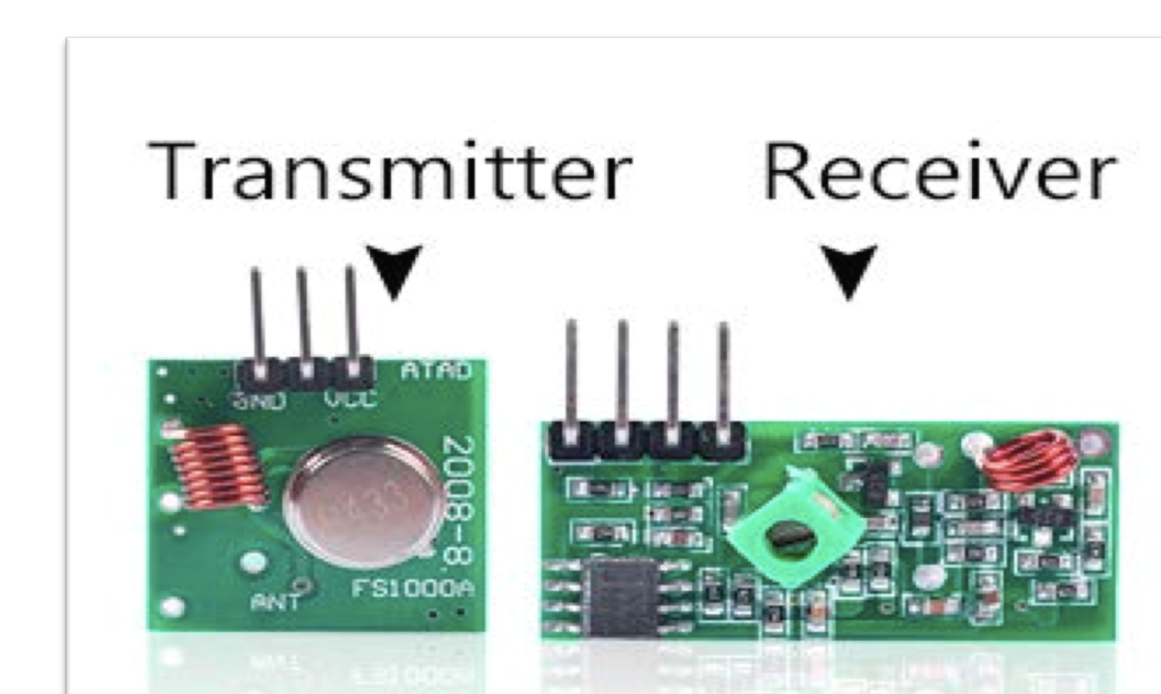
- Operating Voltage:5V
- Input Voltage (recommended): 7-12V
- Input Voltage (limits): 6-20V
- Analog Input Pins: 6 DC Current per I/O Pin 40 mA DC Current for 3.3V Pin 50 mA

Photo 2:
Arduino Uno R3 Development Board



- Small, light weight
- 42kHz Ultrasonic sensor measures distance to object
- Resolution of 1 inch
- Maximum Range of 254 inches (645 cm)
- Operates from 2.5-5.5V
- 20Hz reading rate

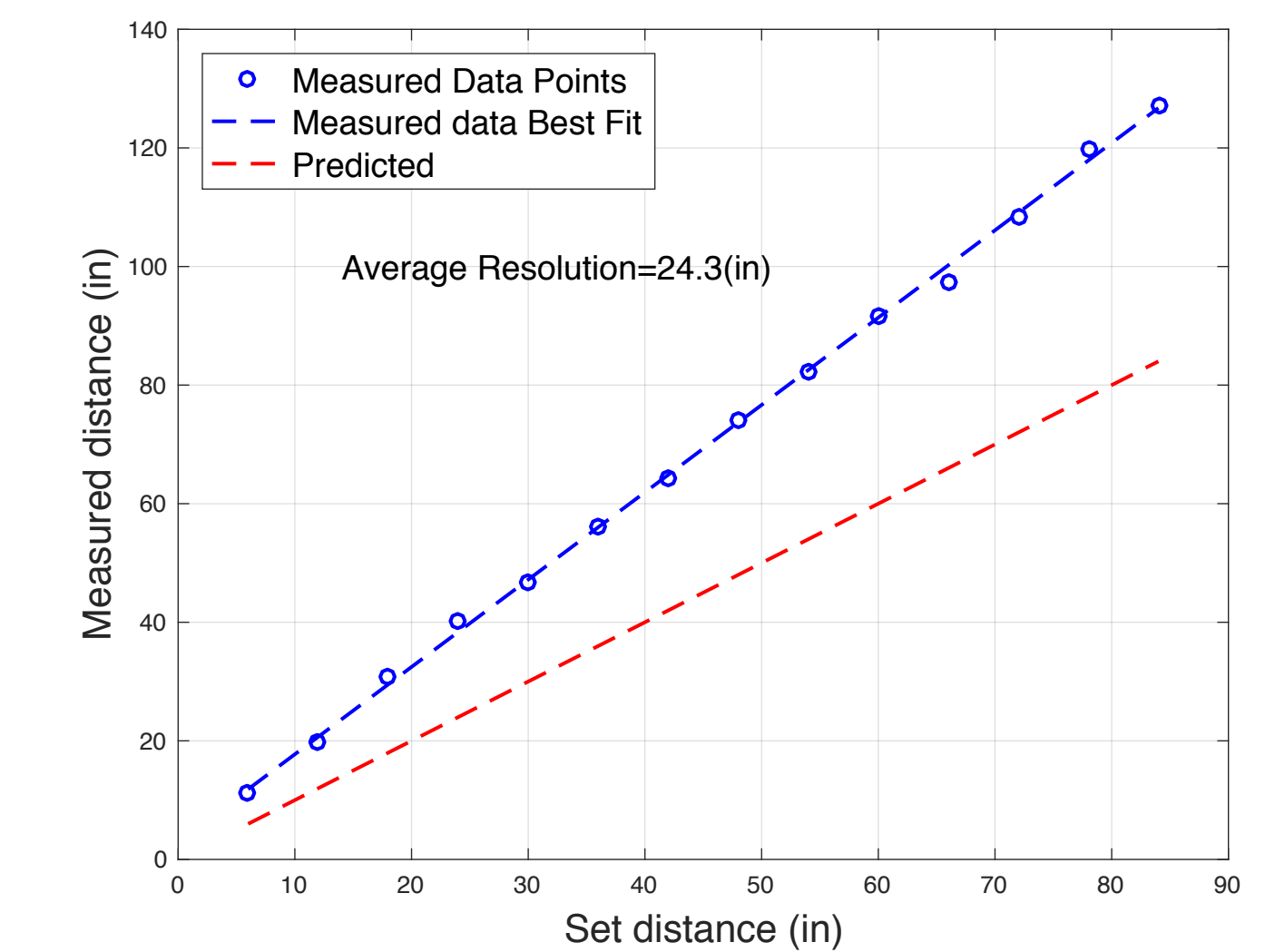
Photo 3:
LV-MaxSonar-EZ1 High Performance Ultrasonic sensor



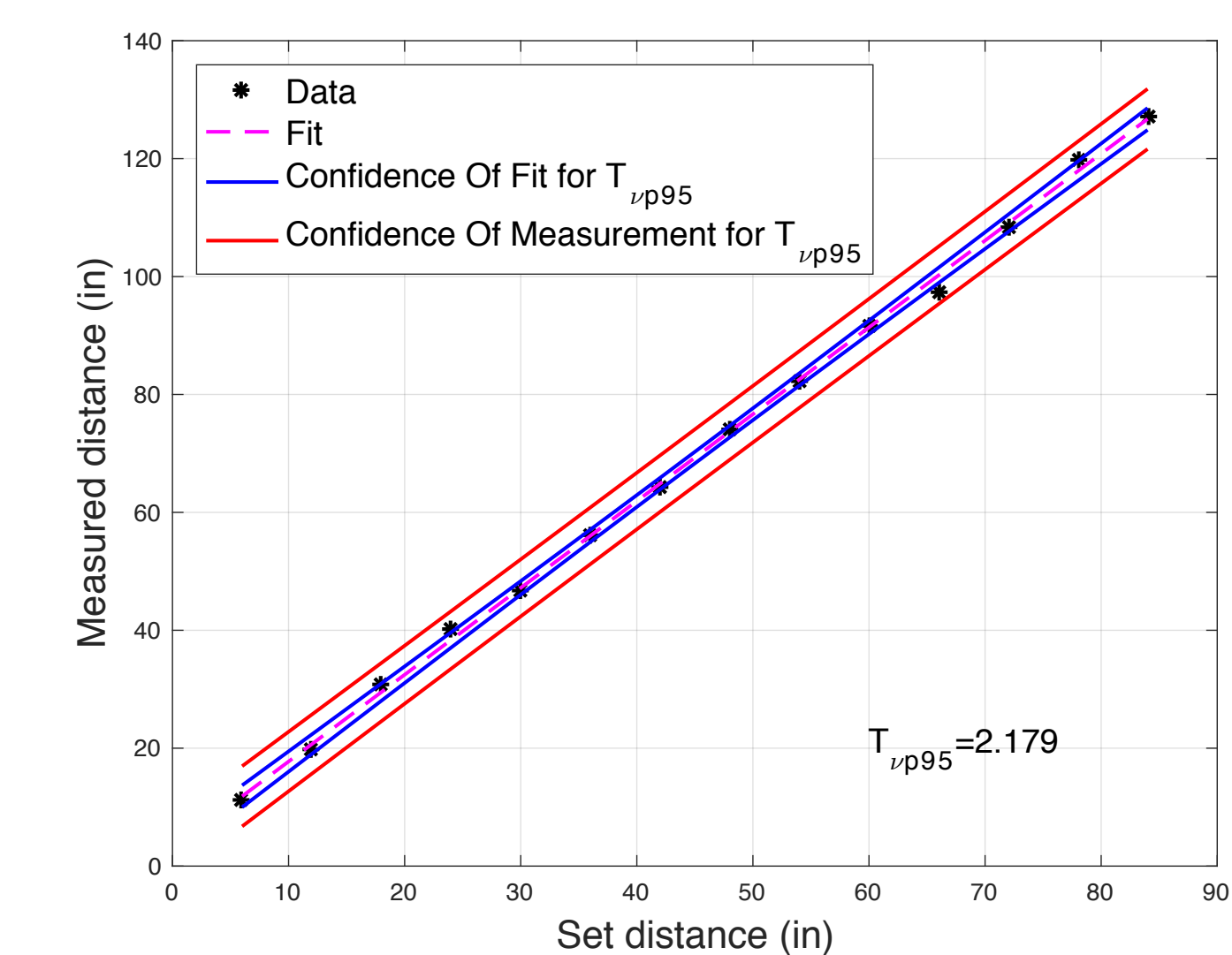
- Working voltage: 3V-12V
- Working current: 20-28mA.
- Working temperature: -10 degree to +70 degree
- distance: 20-200m, sensitivity to -103dBm, in open areas

Photo4: 433Mhz RF Transmitter and Receiver Module Link Kit

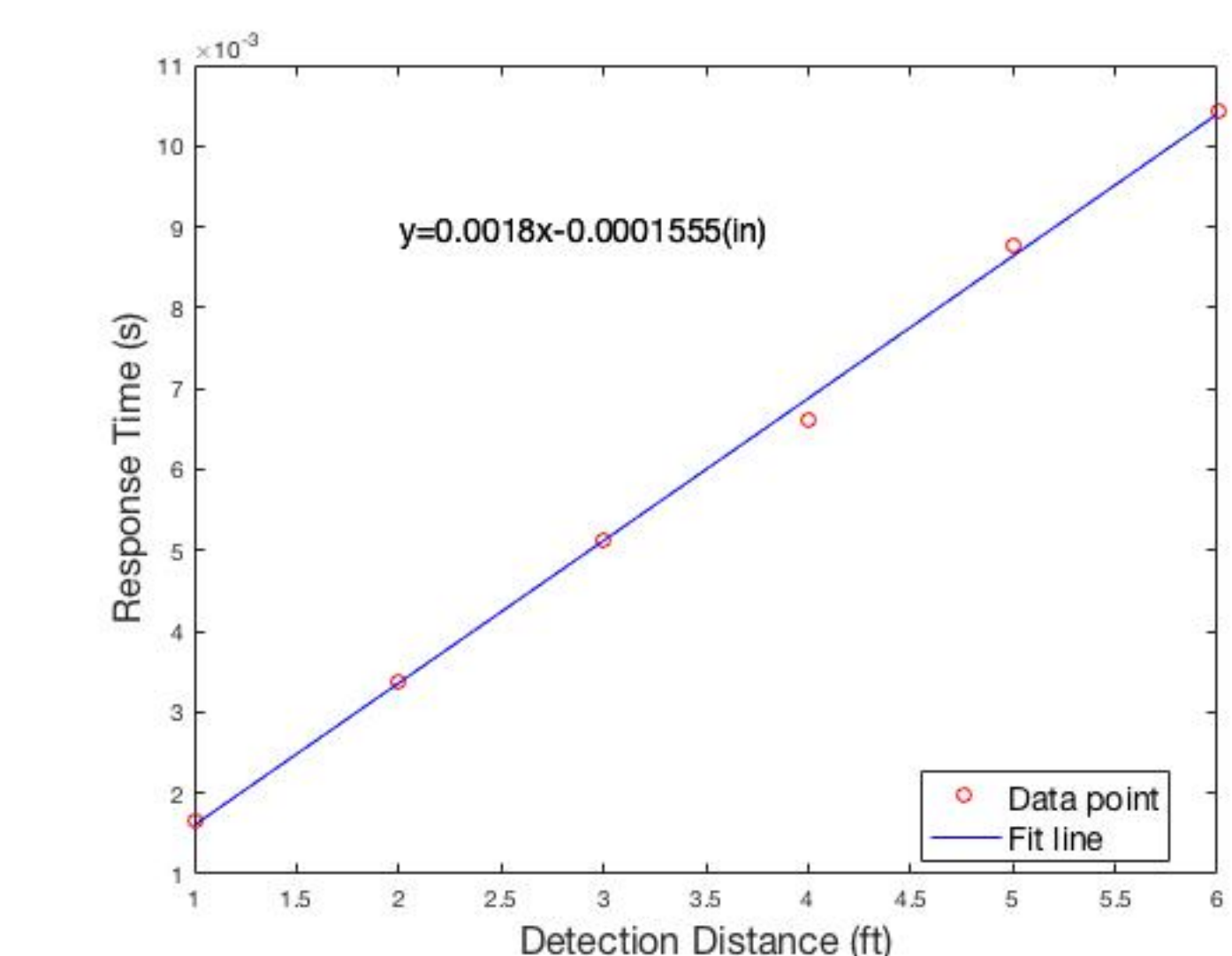
Results



Plot 1 : Resolution of Ultrasonic Sensor



Plot 2 : Confidence Interval of the Fit and the Measurement of Ultrasonic Sensor



Plot 3: Average Response Time of Ultrasonic Sensor in Different Detection Distance

Future Development

- Packaging with waterproof box
- Solar panel for power supply instead of traditional battery
- Preventing interfaces and optimizing the quality of signal