



# Reverse Parking Sensor

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## BACKGROUND

Older and cheaper vehicles lack the tools needed to assist with reversing and reverse parking. Development of a cheap and reliable reverse parking sensor will benefit them and help increase the safety of both the driver, other vehicles, and pedestrians.



Figure 1

Credit: GearJunkie

### Inefficient Setup of Current Aftermarket Reverse Sensors

Figure 2



Credit: ProductReviews

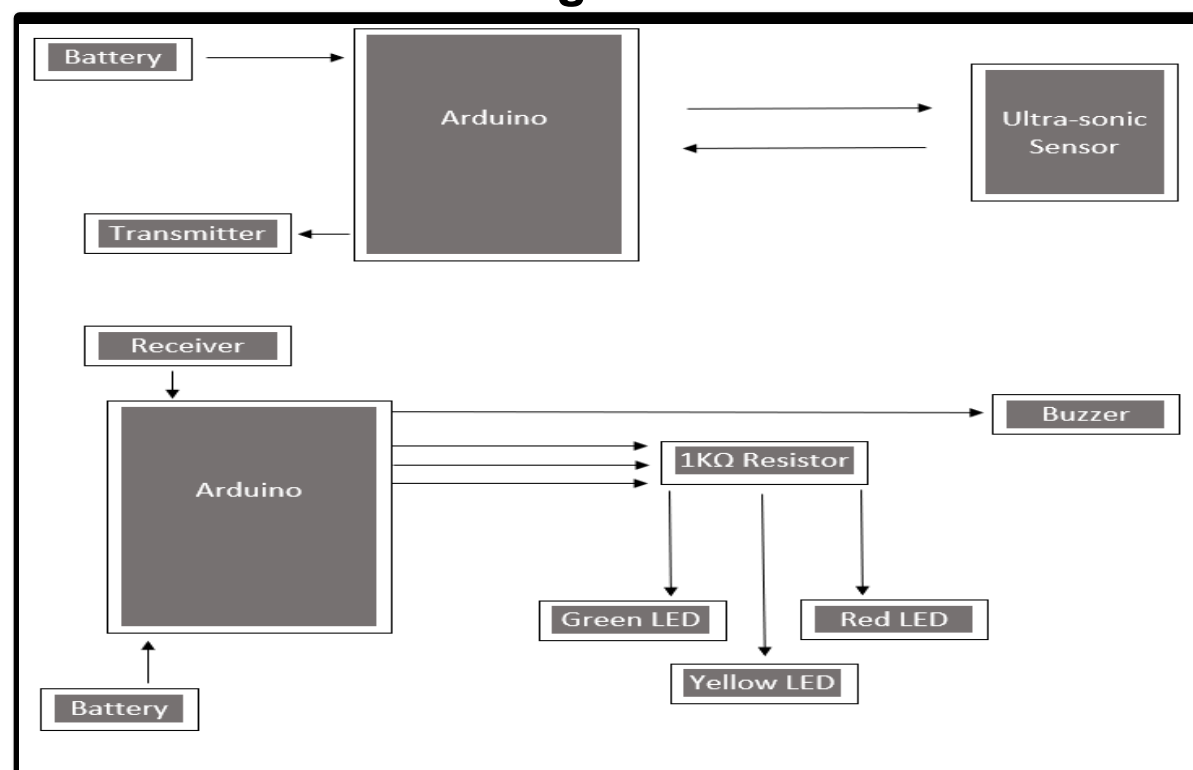
End users need to be able to setup the system with ease and have it do no permanent damage to the vehicle. Current aftermarket sensors require the drilling of holes into the car's trunk or bumper to make it work. This causes permanent damage to the vehicle lowering the vehicles overall value, while also increasing the wear and tear of the vehicle as seen in Figure 2.

### Blind Spots and Distance Perception

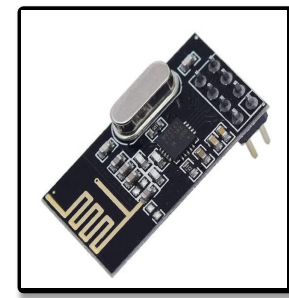
Most drivers have a hard time seeing what's behind their vehicle for low objects as well as judging distances to objects when reversing. A reverse parking sensor is a great device that can assist the driver with judging distances as well as monitor the blind spots for the driver.

## PROPOSED SOLUTION

Our proposed solution consists of designing a reverse parking sensor that is wireless. This means that the notification portion of the system is separate from the device attached to the rear of the vehicle. This then allows us to focus on a design that won't damage the vehicle since it won't require any holes to be drilled. We propose using a magnetic mount to attach the case to the rear of the vehicle. To relay information from one device to another, a pair of transceivers will be used, allowing for a wireless communication. **Figure 3**



## SYSTEM DESIGN



**Deegoo FPV Transceiver**  
Deegoo transceivers are a low power and low-cost way to transmit information from one system to another wirelessly.



**Power Management**  
9-Volt battery packs proved to be a cheap and easy way to power the Arduino. It also provides the consumer a way to power the system that is widely available and can be found in most shopping centers.

**Magnetic Mount**  
Four Neodymium Disc Magnets offer 25 lbs. of force to be required to remove the case from the vehicle. Use of magnets also means no damage will be done to the vehicle.

**Breadboard**  
Serves as the connection point between the Arduino and the various components. Allows for easy swap in/out of faulty components making repairs in the future easy.

**Light Pipes**  
The small light pipes trap the light from each individual LED and brings it to the front side of the case, allowing for the user to easily see which light is triggered.

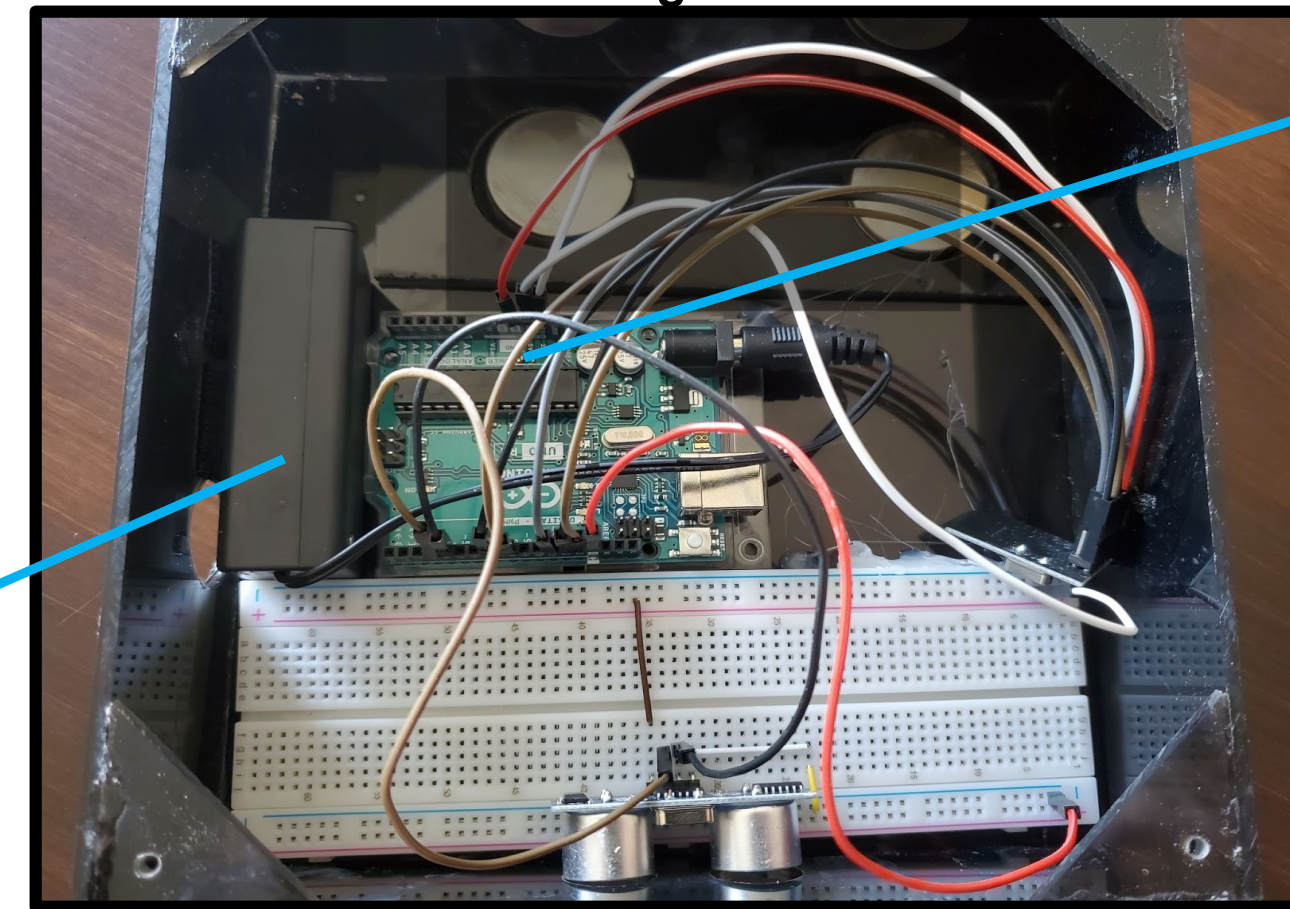


Figure 4

Vehicle Device

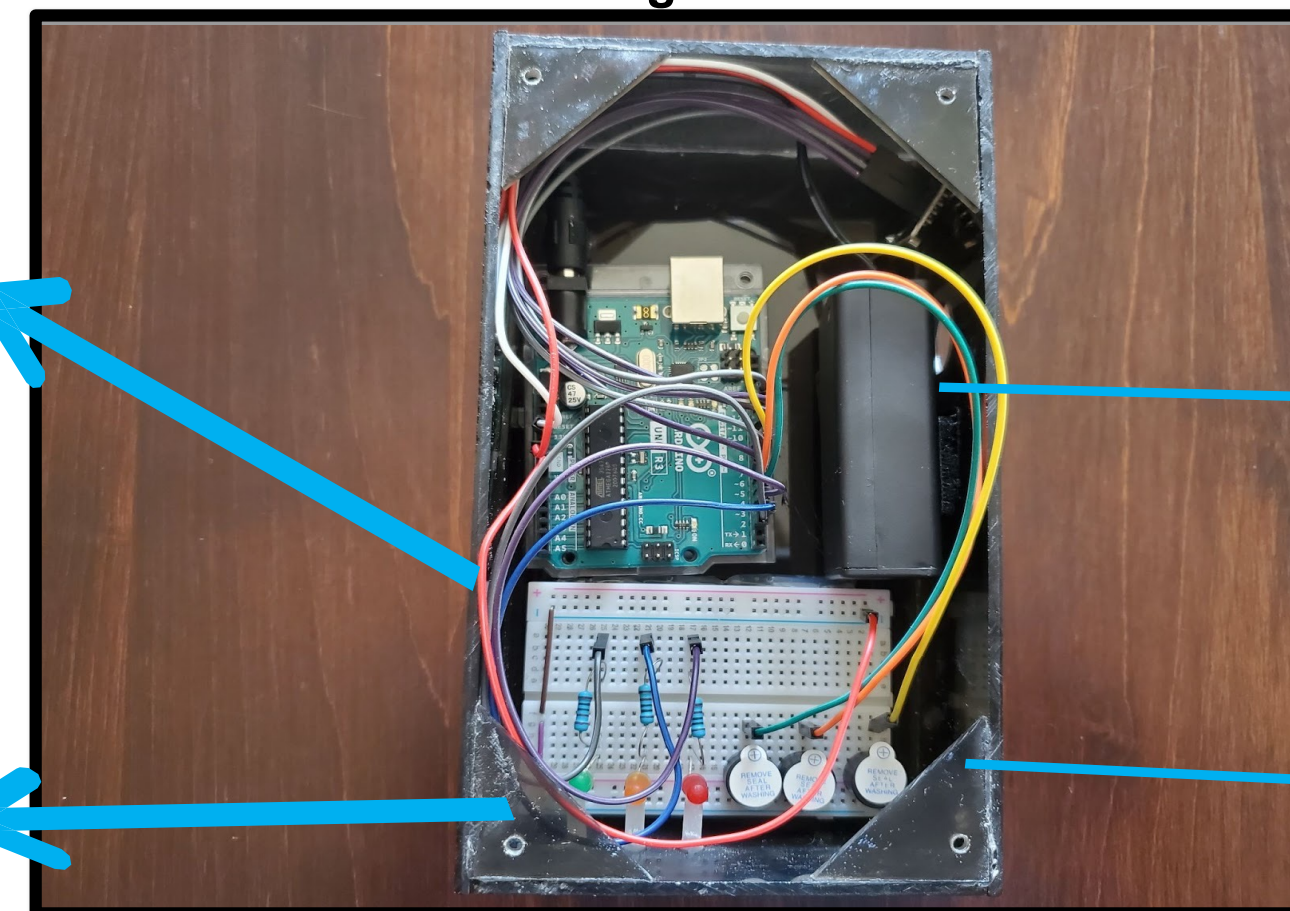
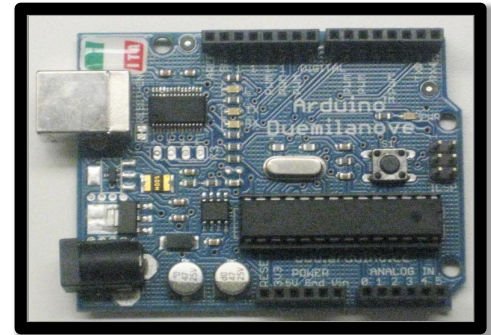


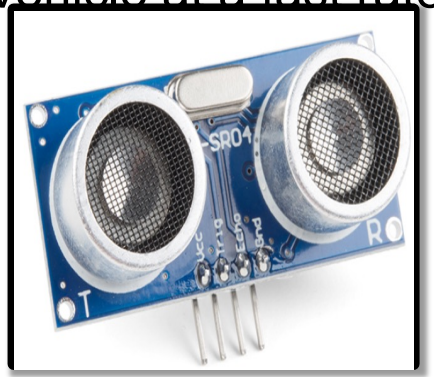
Figure 5

Notification Device

**Arduino Processor**  
Arduino-Uno provides a flexible source hardware with easy configuration. Its open software and widespread availability are additional advantages for the system.



**Ultra-sonic Sensor**  
Allows the detection of objects behind the vehicle at a fast rate. It then relays any information back to the Arduino. The ultra-sonic sensor is a cheap and very accurate sensor with widespread availability.



**Polycarbonate Casing**  
The electronics are housed in a case made of an acrylic polycarbonate plastic. This casing is weatherproof, highly impact-resistant, and does not interfere with the wireless transmission.

**Velcro Battery Holder**  
Battery holder is held down with Velcro, allowing it to stay in place when turning the battery on and off. It also allows for removal of the holder allowing the user to change the battery when needed.

**Buzzer/LEDs**  
Notify the driver when the object is getting closer to the vehicle through LEDs and buzzers.

## FUTURE DIRECTION

- Explore integrated circuit options to reduce size of vehicle device
- Reconfigure case design for smoother curves and corners
- Use a raspberry pi for a cheaper microcontroller
- Use additional sensors for more reliability and range
- Include a video camera with HD transceiver for camera guidance
- Include a grommet to cover switch holes, making device very water resistant

## REFERENCES

<sup>1</sup>Sean McCoy. Private Communication. 2021.  
<sup>2</sup>Ryan Nelson. Private Communication. 2020.  
<sup>3</sup>IEE Future Networks. 2021.

## ACKNOWLEDGEMENTS

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## CONTACT INFORMATION

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