

# Parking Partner

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# Project Objectives

- Use a microcontroller and attachable sensors to assist drivers with parking
- Use an Arduino to store the data gathered from the sensors
- Deliver instructions to the linked LED strips so that the driver can be guided
- Alert the driver that something is in the proximity of the sensors
- Promote the system to customers who lack experience with parking or access to smart features

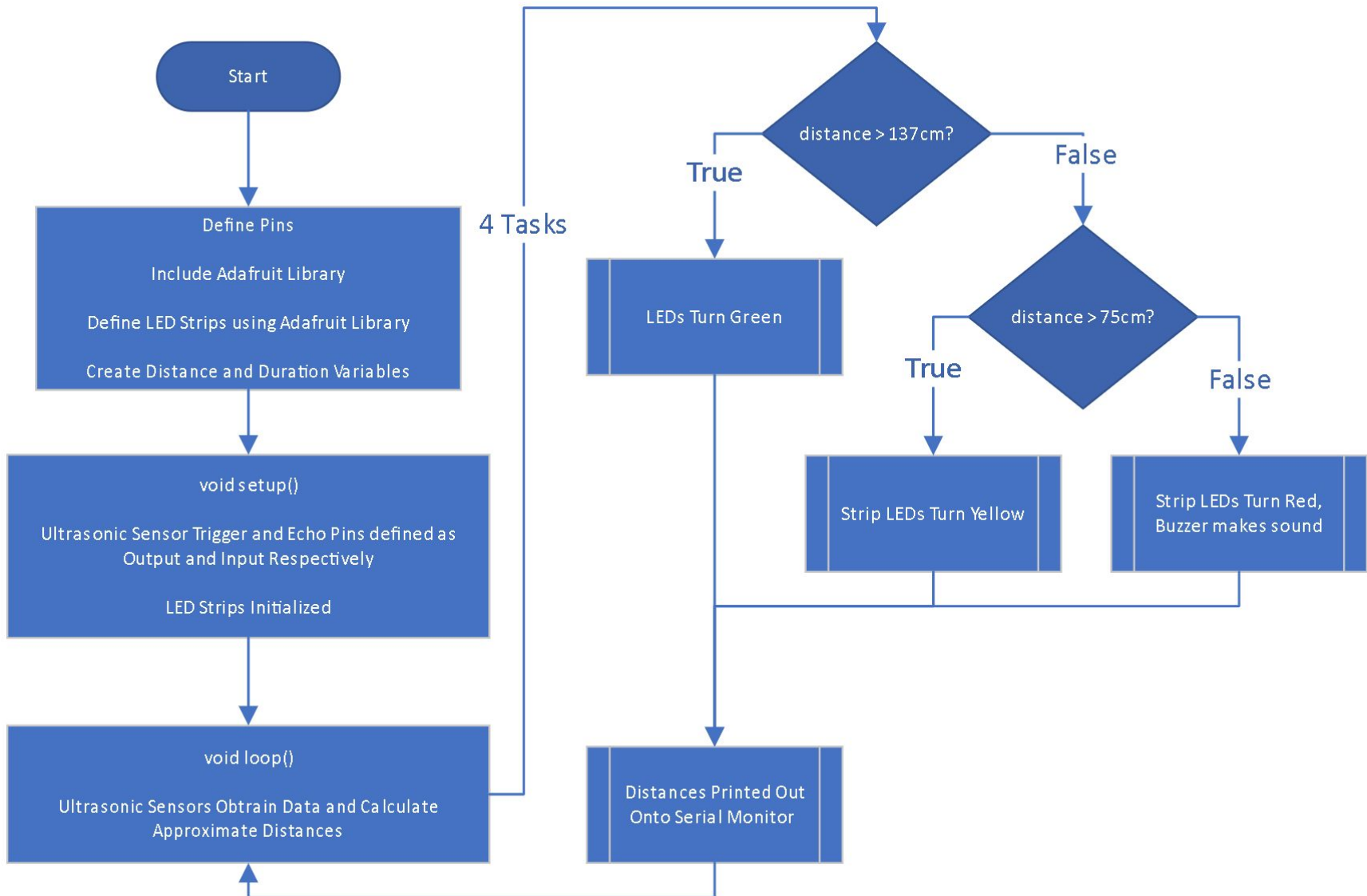
## Potential Applications and Societal Benefits

- Aid for inexperienced drivers
- Drivers with a fear of parking
- Drivers without cars that have parking assist features
- Preventing drivers from damaging other cars or their own car

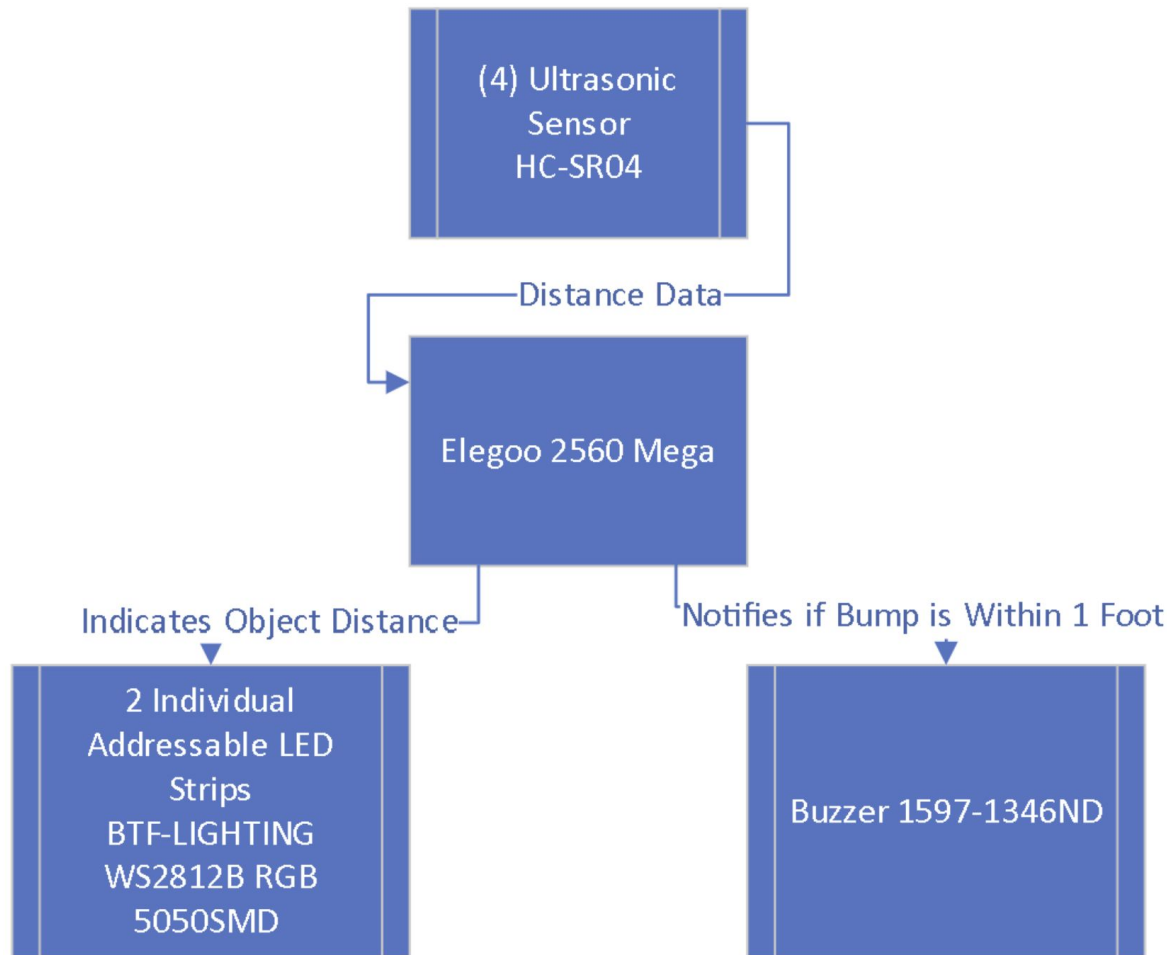
# Approach

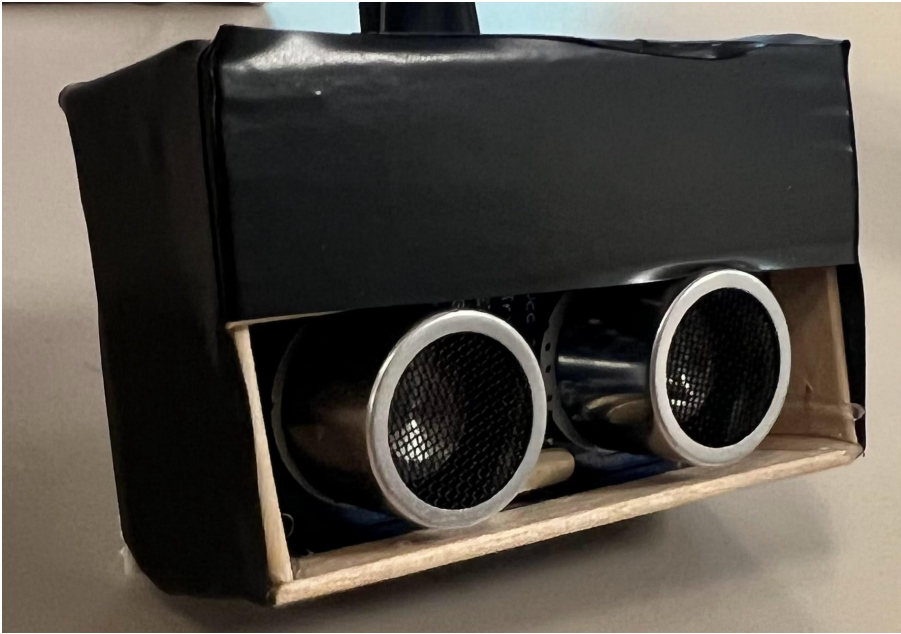
- Implemented an ELEGOO 2560 Mega Board to interact with HC-SR04 sensors, LED strips, and a buzzer
- Attach ultrasonic sensors at the corner bumpers of the car
- Created a software program in Arduino IDE
  - Takes data from sensors to interact with the LED strips
  - LED strips with light up either RED, GREEN, or YELLOW depending on the distance read
  - When the distance reaches a certain limit, the program makes the buzzer go off to alert the driver

# FlowChart



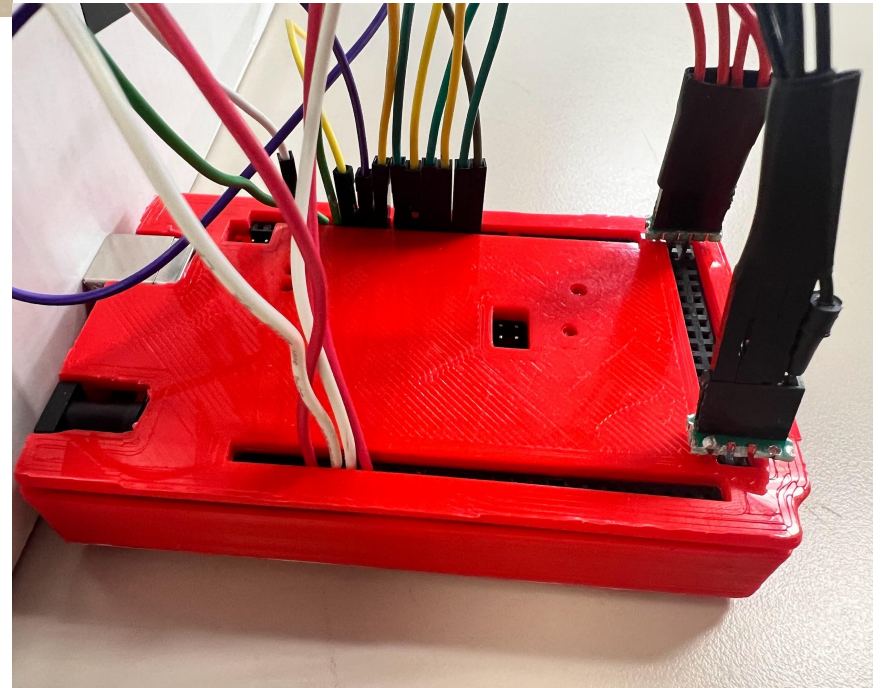
# Block Diagram





Sensor

Microcontroller



# Realistic Demonstration





# Multitasking Demonstration





# Verification and validation

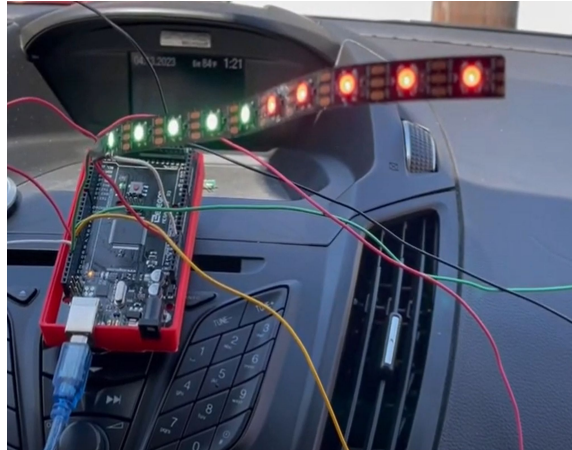
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241, 242, 240 and 204 cm  
241, 242, 228 and 203 cm  
243, 241, 242 and 201 cm  
241, 243, 242 and 201 cm  
241, 242, 239 and 203 cm
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Distances collected from the ultrasonic sensors

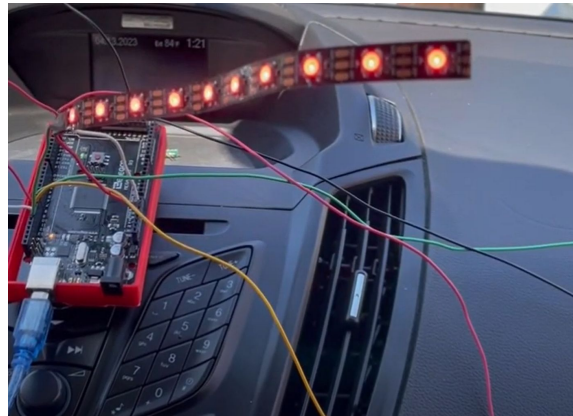


Demonstration on where the sensors can be attached

# Verification and validation



Right half of the LED strip lighting up RED, due to object detected by front-right sensor



Left half of the LED strip lighting up RED, due to object detected by front-left sensor

# BUDGET

Components	Cost
HC-SR04 Ultrasonic Module Sensors (5)	\$12.99
Mega R3 Board ATmega 2560 + USB Cable	\$20.99
BTF-Lighting WS2812B RGB (2 strips of 6.5in)	\$2.50
ELEGOO Dupont Wires	\$6.98
Adafruit Buzzer 5V	\$6.99
3-D Printed Housings	\$15.00
Total	\$65.45

# Learning Experience

- Learned how to utilize hardware and software components together to create a real-world application
- Understood and worked around design limitations
  - How far the sensors can detect?
  - What is the most efficient way to have sensors interacting with all electrical components?
- Alternative Approaches:
  - Apply a Raspberry Pi controller
  - Include a Bluetooth module
    - Phone application
  - Include more diverse set of sensors
    - Proximity sensors
    - Camera sensors

# Future potential: Development

- Hardware:
  - Add more Sensors: increase coverage area or add redundancy in case a sensor fails
  - Multi-Threaded Microcontroller: Use a microcontroller with multiple cores and a lower frequency
  - Separate Battery:
- Machine Learning:
  - Classify objects based on their shape and size
    - Cars vs Pedestrians vs Curbs
- Camera:
  - To recognize objects in real time
- Feedback Mechanism
  - Voice prompts or an LCD screen to alert the driver

# Future potential : Market

- Home application
  - Integrate with smart homes
    - Alerts when someone is approaching their home
    - Alerts when someone is approaching their vehicle
- Driving Schools
  - The device can be used by driving instructors to aid in teaching students how to drive and park
- Commercial
  - The device can be used by commercial trucks to help avoid collisions at loading docks