Aftermarket Parking Assist

Mock Design Review

TA: Ankit Jain

ECE 445

February 17, 2016

Tyler Peterson
Byung Joo Park
## Contents

1.0 Block Diagram ........................................................................................................... 2
2.0 Circuit Schematic ....................................................................................................... 3
3.0 Calculation .................................................................................................................. 4
4.0 Plot ............................................................................................................................. 4
5.0 Block Description ....................................................................................................... 4
6.0 Requirements and Verification ................................................................................. 5
7.0 Safety Statement ....................................................................................................... 5
8.0 References .................................................................................................................. 5
1.0 Block Diagram
2.0 Circuit Schematic
3.0 Calculation

The sensor sends out 10 uS trigger pulse, then 40kHz waves, and monitor outputs. While echo pulse is high, the duration of the pulse is converted into distance with the equation:

\[
\text{Distance} = \frac{\text{elapsed time} \times \text{sound velocity, 340m/s}}{100} / 2
\]

A vehicle’s speed is relatively smaller than sound velocity (340 m/s or 760 mi/h), especially slower during parking the vehicle. Therefore the speed of the vehicle will not interfere with the output of ultrasonic sensor.

4.0 Plot

Due to lack of hardware at the moment of project, we were not able to conduct an experiment or a simulation. However in the future, a possible experiment would be to measure one object from multiple sensors to triangulate its location correctly. This requires both sensors to be equidistant from the object we measure. This will inform us any error due to locating an object from different locations. We would plot distances measured from the two sensors, and compare each values and any possible discrepancy.

5.0 Block Description

5.1 Forward Ultrasonic Sensor

4 of HY-SRF05 ultrasonic sensors are to detect distances between obstruction and the front of a vehicle. They are placed one corner to the other, to cover all directions. Powered by Arduino, signal port is connected to digital input of the Arduino. Data is collected in microseconds (time taken from the sensor then back to sensor) then converted into distance.

5.2 Rear Ultrasonic Sensor

Another set of 4 HY-SRF05 ultrasonic sensors are to detect distances between obstruction and the rear of a vehicle. They are placed one corner to the other, to cover all directions. Powered by Arduino, signal port is connected to digital input of the Arduino. Data is collected in microseconds (time taken from the sensor then back to sensor) then converted into distance.
6.0 Requirements and Verification

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Verification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ultrasonic Proximity Sensor</strong></td>
<td>1. Using Oscilloscope, detect trigger and echo outputs of one period. Ensure every waves has high of 5 volt and low of 0 volt</td>
</tr>
<tr>
<td>1. Output high/low voltage correctly (0-5V)</td>
<td>2. After connecting the sensor with Arduino, test the sensor with different distances. Observe the output when the object is too close to the sensor (&lt; 2cm), and when the object is too far from the sensor (&gt;400cm)</td>
</tr>
<tr>
<td>2. Max/min distance 2cm to 400cm</td>
<td></td>
</tr>
<tr>
<td>3. Must detect an object with any size surface area</td>
<td>3. Test the sensor with objects with different surface areas and different locations within the area that sensor covers.</td>
</tr>
</tbody>
</table>

7.0 Safety Statement

Safety and health in this project is the most important aspect of this project. It’s each group member’s responsibility to insure the correct safety procedures are being followed and to report anything activity he or she deems unsafe. Even though it’s each individual’s responsibility, overall it’s a team effort and everyone needs to help maintain a safe environment to work.

8.0 References