ME5643-Mechatronics: Integrated Term Project

Biker Alarm

Aashil Togadia | Bharat Pavuluru | Anish Gupta
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Biker Alarm

- Why do we need this?
- Overview
- Goals
- How does it work?
- Cost Analysis
- Additional Feature
• There were around 4000 bike accidents in NY city in year 2013
• Simple and Smart safety feature which is economical as well
• Compact and easy to carry
Ultrasonic Sensors

- We have used Ultrasonic sensors for the measurement of distance of any object
- Currently there are three (3) sensors for the back vision, with each sensor at different angle
- The coding is done in such a way that it only detects the objects coming towards the bike and not which are going away or still

Vibrating Motors and LEDs

- As and when any object is coming towards the bike, vibrating motors will notify the rider in different ways for different notification i.e. left back, right back, center, very close, left, right, center
- LEDs also notifies in different ways

Pushbutton Feature

- There is a pushbutton by which one can go into rest mode, in which system will notify the rider for a fixed amount of time
Ultrasonic Sensor:
Sensor Angle

How does it work?
How does it work?

Calculating sensor angle

If we want less distance like 10 ft., then it would be around,

\[
\text{Angel} = \text{Arc} \tan(x) \times \frac{10}{6}
\]

If Angel is 20,
\[
x = \tan 70 \times 6 = 17 \text{ ft}
\]

and if Angel is 22,
\[
x = \tan 68 \times 6 = 15 \text{ ft}
\]
How does it work?
Logic and Coding:

- All three sensors sense the data twice every second and compare whether an object is coming towards the bike or going away.
- If something is coming near to the bike and crosses the threshold, then it compares from where it is coming towards the bike.
- There are six conditions:
  1. Very close: All three sensors below threshold
  2. Left Center: Left and Center one blow threshold
  3. Right Center: Right and Center one blow threshold
  4. Center: Only Center one
  5. Left: Only Left one
  6. Right: Only Right one
FOR counter = 1 TO 2
  c1=c
  l1=l
  r1=r
  PULSOUT 1, 5
  PULSOUT 2, 1, time_center
  PULSOUT 15, 5
  PULSOUT 3, 1, time_left
  PULSOUT 4, 1, time3
  PULSOUT 0, 5
  PULSOUT 0, 1, time_right
  cen_sen = (time_center) / 74
  left_sen = (time_left) / 74
  right_sen = 890 ** time_right
  c = cen_sen
  l = left_sen
  r = right_sen
  DEBUG CR, "Center    ", DEC cen_sen, "   Left    ", DEC left_sen, "   right     ", DEC right_sen
  PAUSE 500
NEXT
How does it work?
Vibration:
- Using two vibrating motors in left and right hang-grips of bike, (one each side) rider is notified
- Different notification for rider:
  1. Very close: Both vibrates for 5 Seconds
  2. Left Center: Left vibrates for 3.5 Seconds
  3. Right Center: Right vibrates for 3.5 Seconds
  4. Center: Both vibrates for 2 Seconds
  5. Left: Left vibrates for 2 Seconds
  6. Right: Right vibrates for 2 Seconds

Pushbutton:
- Whenever Pushbutton is pressed during notification, system sleeps for 10-15 Seconds and then again checks for the object coming closer to bike
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<thead>
<tr>
<th>Sr. No.</th>
<th>Item</th>
<th>Quantity</th>
<th>Unit  ($)</th>
<th>Price  ($)</th>
<th>Mass Production Rate</th>
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<tr>
<td>1.</td>
<td>BS2 Microcontroller</td>
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<td>44</td>
<td>25</td>
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<td>2.</td>
<td>Ultrasonic Sensor (By Parallax)</td>
<td>1</td>
<td>26</td>
<td>26</td>
<td>25</td>
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<td>3.</td>
<td>Ultrasonic Sensor (HR-SC04)</td>
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<td>5</td>
<td>10</td>
<td>5</td>
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<td>4.</td>
<td>Vibrating Motor</td>
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<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>5.</td>
<td>LED (Green)</td>
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<td>0.1</td>
<td>0.08</td>
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<tr>
<td>6.</td>
<td>LED (Red)</td>
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<td>0.1</td>
<td>0.08</td>
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<td>7.</td>
<td>Resistor (470 Ohm)</td>
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<td>0.2</td>
<td>0.1</td>
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<td>8.</td>
<td>Resistor (220 Ohm)</td>
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<td>0.1</td>
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<td>9.</td>
<td>Resistor (10K Ohm)</td>
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<td>10.</td>
<td>Pushbutton</td>
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<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
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<td>11.</td>
<td>Breadboard</td>
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<td>2</td>
<td>4</td>
<td>3.5</td>
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<td>12.</td>
<td>Jumper Wire (Female/Female)</td>
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<td>Battery Pack</td>
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<td>3</td>
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<td>Battery (AA)</td>
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<td>15.</td>
<td>Bike Handle Grip</td>
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<td>5</td>
<td>4</td>
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<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>103</td>
<td>71.34</td>
</tr>
</tbody>
</table>
Additional Feature:

- Change the angle between two sensors using servo motors
- According to road width and traffic, one can change the angle between two Ultrasonic Sensors to make it more efficient

Additional Cost:

Servo Motor : $7

Total Cost with feature : $79

It can be used for people with disabilities.
Questions