Rear Safety: Rearview Optical Awareness Device (R.O.A.D)

Objective

- General Need:
  - Increase the safety of motorcyclists by helping them to be more aware of surroundings
  - Reduce number of motorcycle accidents

- Customer Requirements:
  - Doesn’t impede forward vision
  - No false positives
  - Works in all conditions
  - Doesn’t alter riding experience

- Constraints:
  - Weighs at most 10 lbs.
  - Operates in all weather conditions
  - Measures distances of at least 10 ft

Market:

- Over 6 million people with registered motorcycle license in the U.S
- Nearly 1 million use motorcycle as primary transportation

Concept 1:

- Panoramic Video Feed
  - Video camera facing bikes rear, relaying video to a monitor at front of bike

  + Full rear view displayed
  - Issue of night time/vision
  - Large power consumption

Concept 2:

- Helmet LED Display
  - LEDs in helmet alerts rider if rear traffic is approaching from back-left, center, or right

  + Easily interpreted output
  - Non modular design
  - LEDs light could distract

Final Concept:

- R.O.A.D.
  - Sensors facing rear of motorcycle relays signals to front LED display box

  + Will work day and night
  - Modular design
  - Sensors not weatherproof

Operation:

- Sensors take distance readings to the sides and rear
- Data is transmitted to LED’s showing green, yellow or red depending on the distance reading

Satisfaction of Customer Requirements:

- Doesn’t impede forward vision
- No false positives
- Doesn’t alter riding experience

Innovation:

- Allows for motorcyclists to determine how traffic is moving behind and around them without needing to turn their head

Prototype and Testing

- Parameters Tested
  - Perform FEA to Optimize Material Selection

- Test Results and Future Work

  - Summary
    - Addressed the major concerns of motorcyclists from a 500+ person survey
    - Incremental Innovation of Ultrasonic Sensors, LEDs, and Motorcyclists’ safety
    - Optimized sub-systems of R.O.A.D.

  - Future Work
    - After conducting FMEA, we found that 4 out of our 20 possible causes for failure were responsible for over 43% of the failures. Future work is to possibly consider design changes to address those 4 causes, which can be found below

<table>
<thead>
<tr>
<th>Item</th>
<th>Potential Cause</th>
<th>R.P.N.</th>
<th>Cumulative Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display Box</td>
<td>Wiring is pulled out of place</td>
<td>515</td>
<td>14.37%</td>
</tr>
<tr>
<td>Sensor Mount</td>
<td>Rial weather reaches sensors</td>
<td>360</td>
<td>26.27%</td>
</tr>
<tr>
<td>Display Box Mount</td>
<td>Small engine isn’t securely tightened</td>
<td>156</td>
<td>41.66%</td>
</tr>
<tr>
<td>Sensor Mount</td>
<td>Mount doesn’t adequately secure sensor position</td>
<td>146</td>
<td>53.98%</td>
</tr>
</tbody>
</table>