Cyclops Ride Assist

Real-Time Monitoring System

McMaster University
ENGINEERING
Computing & Software

CYCLOPS

Background

As North America pursues greener goals, it is expected a higher percentage of people will adopt cycling as their primary method of transportation for its relatively low carbon footprint compared to automobiles. However, many roads were not designed and developed with cyclists in mind. Even with dedicated bicycle lanes, cyclists may find themselves in fear as cars, trucks, and buses dart past with a far greater speed and momentum. In the worst cases, accidents may occur leading to both physical injuries and emotional trauma for the cyclist, the automobile driver, their respective families, and the community. Therefore, it is vital that this system will be used to increase the safety of the road, allowing drivers and cyclists to share the road responsibly.

Project Scope

Cyclops Ride Assist (CRA) will be an easily mountable, and quick to set up system that adds modern car safety features onto any bike. These features include rear vehicle detection and alert, a continuous loop of the last 60 seconds of camera, accelerometer, and Lidar data, and crash identification and response. CRA is aimed at cyclists of all levels that frequently traverse road and gravel terrains. CRA is not designed to be used on extreme terrain such as downhill mountain biking.

Testing and Accuracy

The performance of CRA can be broken down into two main components: Rear Vehicle Detection accuracy and Crash Detection accuracy. The main objective in CRA's revisions is to reduce the frequency of false detections through maintaining cleaner inputs and minimizing volatility due to external factors/noise. The Rear Vehicle Detection algorithm is 96% accurate in determining a vehicle is situated in the cyclist's blind spot. The Crash Detection is 93% accurate in determining that a cyclist's has crashed.

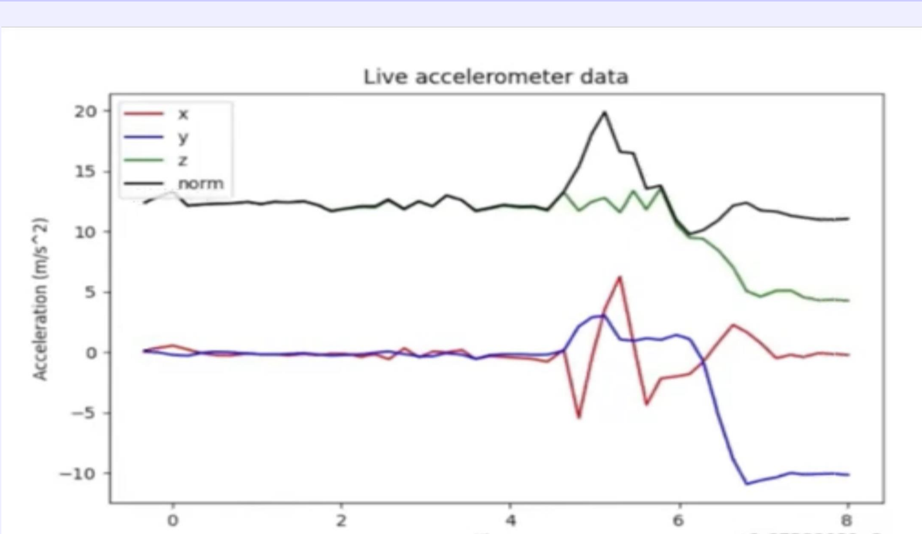


Figure 1: Accelerometer Crash Data Plot

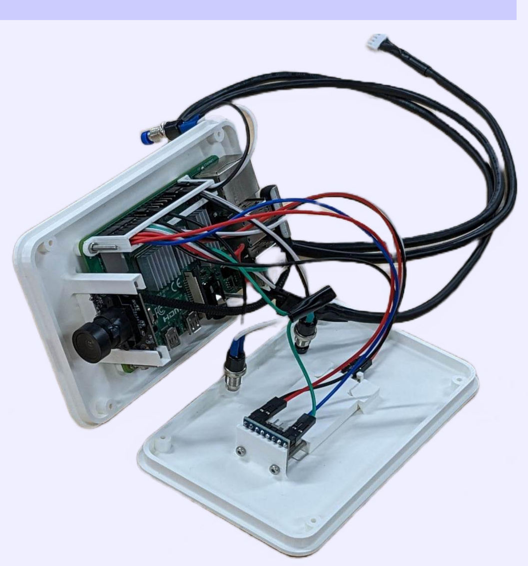
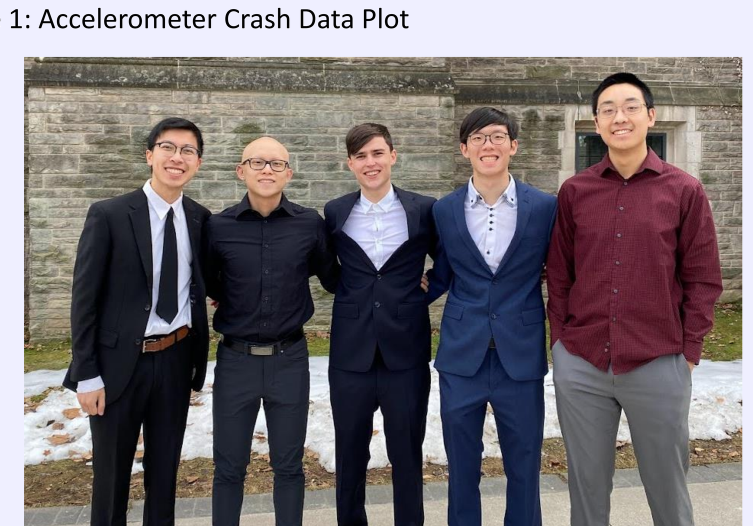


Figure 2: Front Housing Barebones Setup



Our Team (left to right): Aaron Li, Brian Le, Manny Lemos, Amos Cheung, Amos Yu

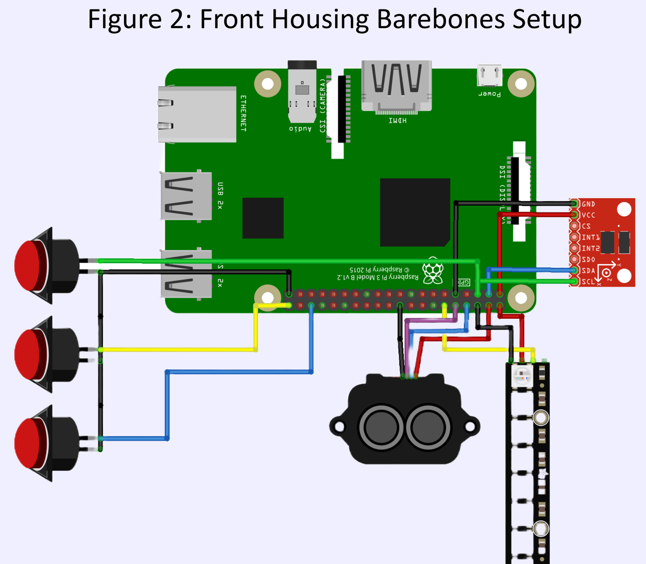


Figure 3: CRA Breadboard Schematic

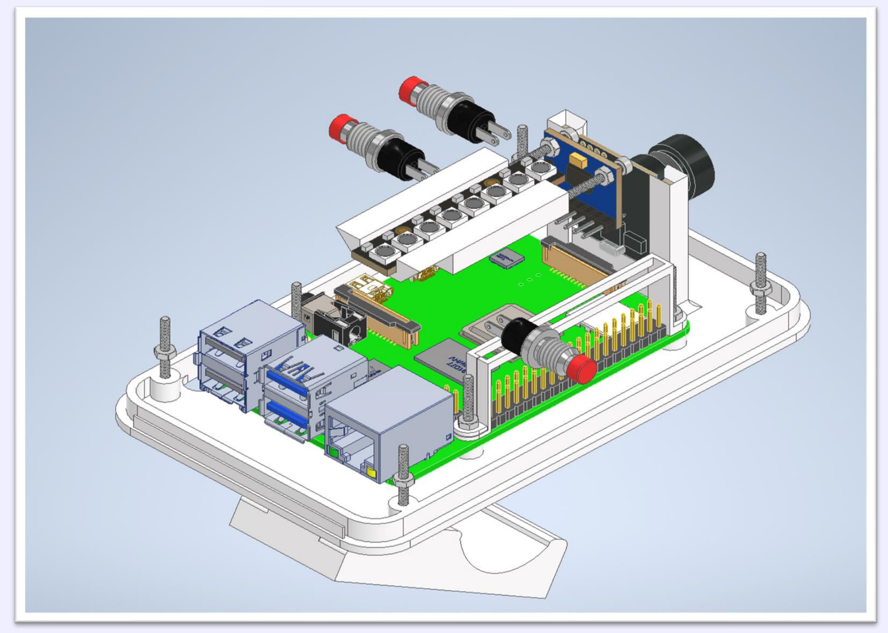


Figure 4: Front Housing Barebones Setup CAD Model

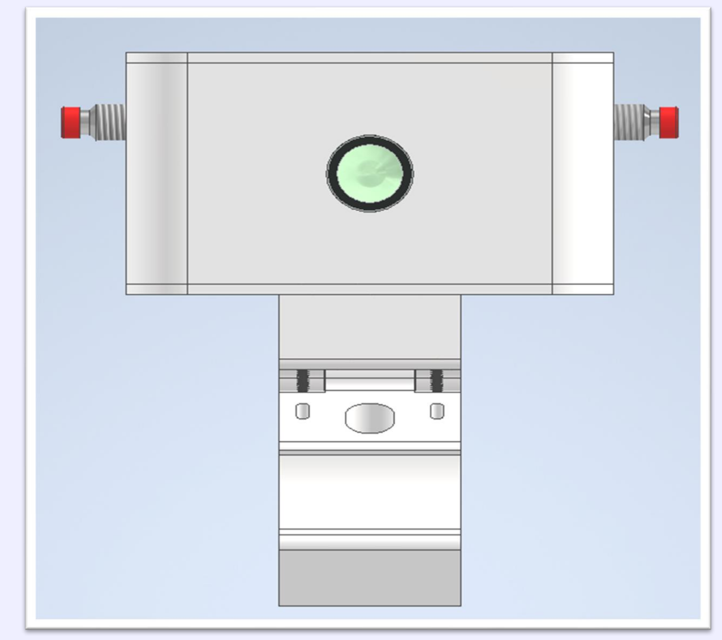


Figure 5: Front Housing Front View CAD Model

Figure 6: CRA installation on a Bike

Figure 7: Rear Housing Mounted on a Bike

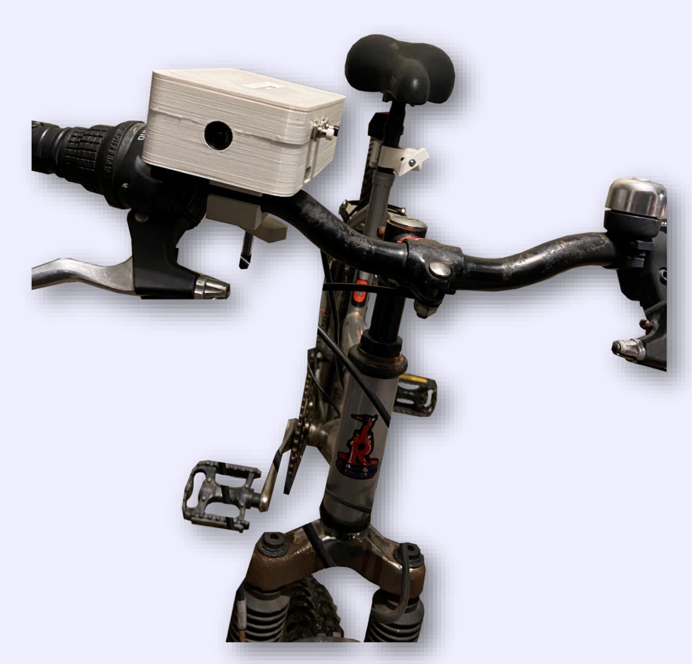


Figure 8: Front Housing Mounted on a Bike

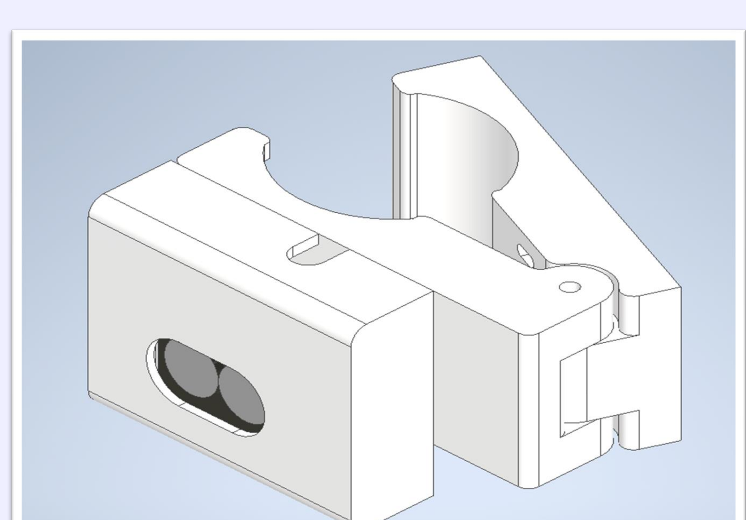


Figure 9: Rear Housing Side View CAD Model

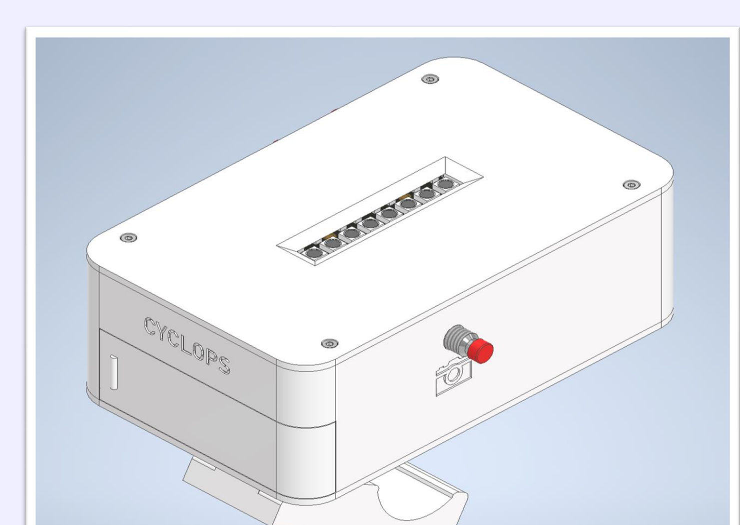


Figure 10: Front Housing Top-down View CAD Model

Rear Vehicle Detection

- A LiDAR sensor is used to detect objects behind the bike up to 8m away
- 8 LEDs light up at handlebar based on varying distances to warn user

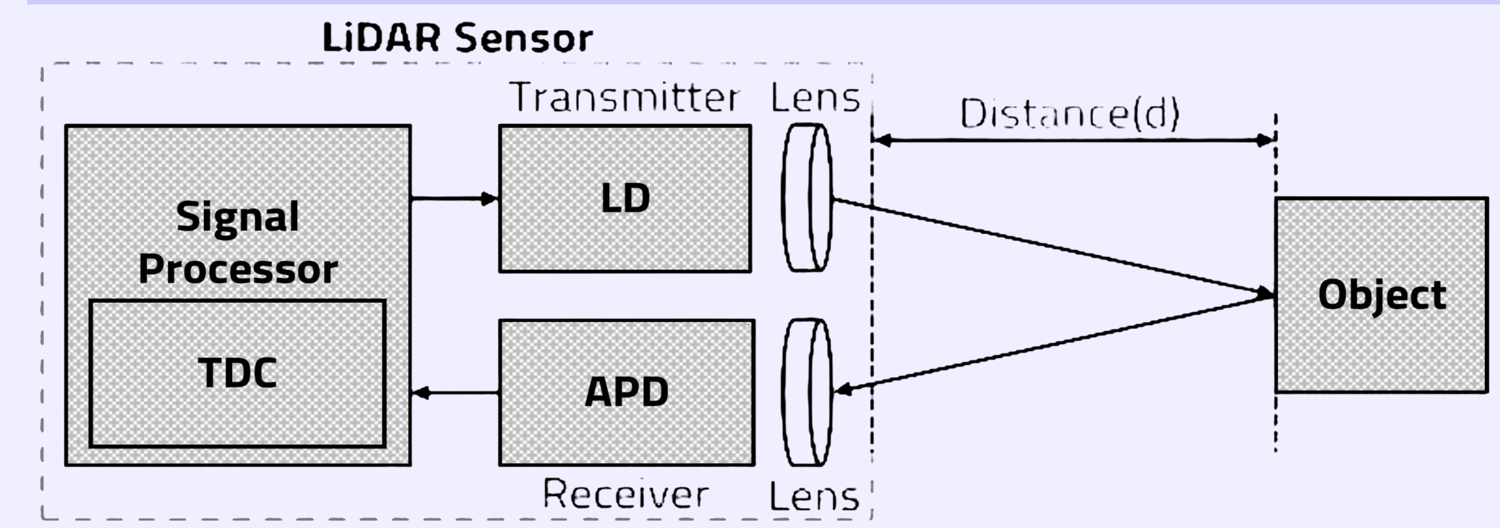


Figure 11: Structure and operation of LiDAR sensor

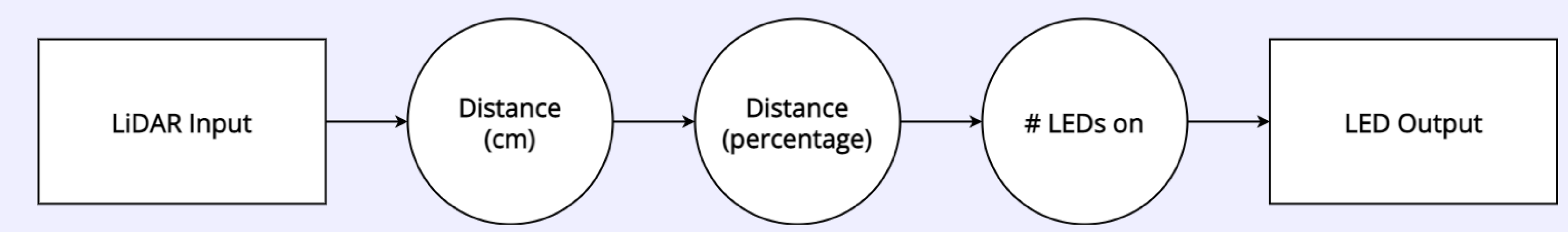


Figure 12: Rear Vehicle Detection Algorithm Flow Chart

Crash Detection

- The accelerometer can detect accidents based on the angle the bike is tilted based on the x, y, and z plane

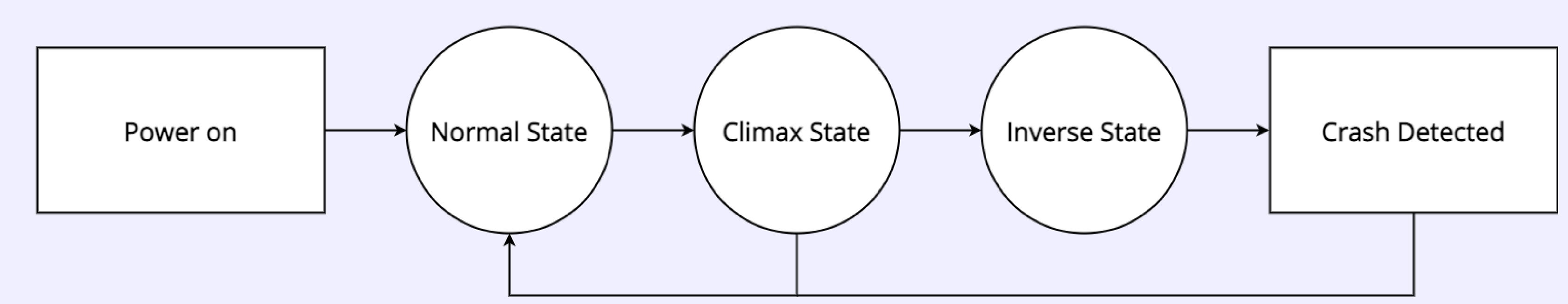


Figure 13: Accelerometer Crash Detection Algorithm Flow Chart

Video Logging

- CRA will log and maintain the past 60 seconds of footage and data while actively running. The data is then logged as soon as a crash has been detected and will be stored locally for the user to retrieve through a flash drive

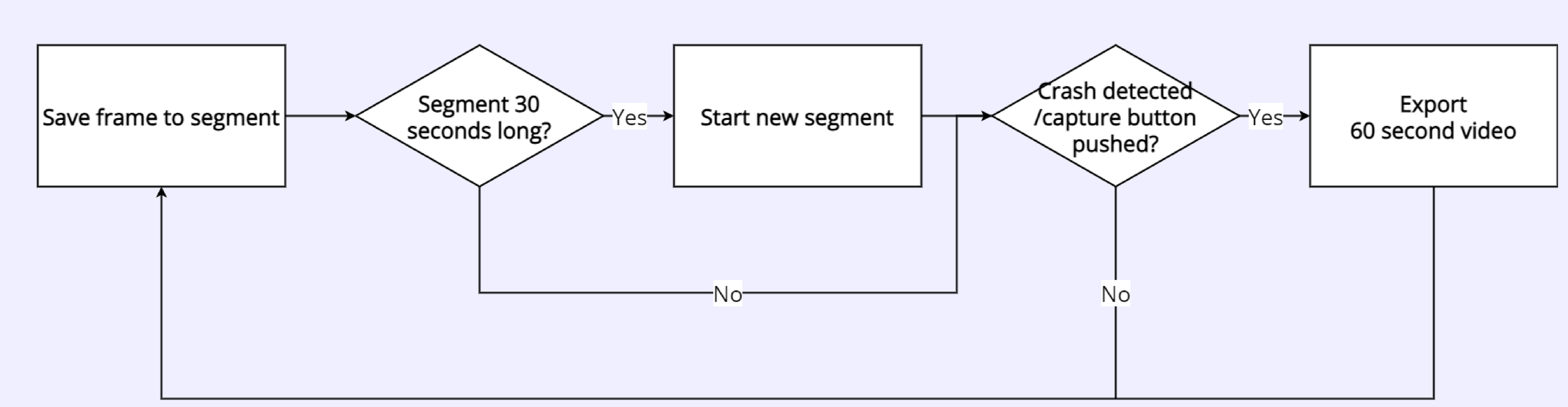


Figure 14: Video Logging Algorithm Flow Chart