Traffic Signal Color Detection Using the Pixy2 Camera

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The purpose of this experiment was to optimize Pixy2 camera parameters with the Raspberry Pi 3B+ to accurately detect and report the color of red and yellow traffic lights. Color blindness is a genetic condition that hinders the person's ability to detect certain colors. Many types of color blindness can cause difficulty in distinguishing reds and yellows, which poses a significant safety concern for those who cannot distinguish the colors of traffic lights. The Pixy2 camera was tested by mounting it on the dashboard of a car and aiming it at a traffic light. Once the camera was properly aimed, the car was driven around, and the camera was tested on many different traffic lights in many different lighting conditions (lights in the environment, eg street lights) around Midland. Varying the reference for the object recognition, the LED brightness of the Pixy2 camera, and a parameter known as the teaching threshold, the ability of the Pixy2 camera to detect and distinguish the traffic lights was assessed. The optimal operation parameters for detecting and distinguishing red and yellow traffic lights were found to be: teaching the Pixy2 camera with the camera mounted in the car pointing at a distant traffic light in a dark environment, LED brightness in the range of 0-20,000 mCd, and signature teaching threshold of 7,500. These parameters yielded the fewest false positives as well as the greatest detection distance. Thus, the goal of this project was achieved. This device is sufficiently reliable and significantly more cost-effective than corrective devices for color blindness.

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