Edge Detection in the Line of Sight

Singh, Aditya (School: Allen D. Nease High School)

Situations of low visibility make it difficult to carry out tasks safely or efficiently when it involves observing the surrounding environment. To help make said tasks easier, visual aids that outline objects in a view of sight can be used. Such outlines can be achieved with edge detection, which locates edges based on differences in patterns to determine the boundaries of objects in a field of view. This project's main engineering goal was detecting edge of objects with an average of 70% accuracy by using depth mapping techniques and C code on a Raspberry Pi(s). My final design used threshold and time of flight to determine distances, and then performed edge detection corresponding with a video feed. The testing environment was a cardboard box painted black for placing objects which had edges for edge detection. The device consisted of a USB web camera and two flashlights connected to the Pi. I counted the number of edges which did not correspond to actual edges in the video feed and used this information to get accuracy rates. After 40 trials, the average accuracy was 94.44% with a standard deviation of 0.725% which not only passed the engineering goals but proved to be consistent. To runs of 40 trials each on an improved and more detailed algorithm using infrared for less visible light interference saw average accuracies of 95.39% and 95.32%, and standard deviations of 0.78% and 0.74%, respectively. With the final algorithm, edges were able to accurately draw out objects even in the dark.

Awards Won:
National Security Agency Research Directorate : Honorable Mention "Cyber Pioneer"