



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Sohom Roy	Project Number S1018
Project Title Camera & Stabilization System to Provide Object Detection/Tracking in Real Time for Assistance of the Visually Impaired	
<p style="text-align: center;">Abstract</p> <p>Objectives The visually impaired often have trouble navigating their environments due to a lack of knowledge about the environment around them. My project hopes to solve this issue by creating a hand-held camera stabilization system that can assist the visually impaired by using multiple sensors, motors, and audio feedback, providing object recognition tracking, at a lower cost than guide dogs and more effective than canes.</p> <p>Methods To complete the object detection and tracking part of this project I tested the different tracking systems on a laptop and a Raspberry Pi to evaluate the best one, measuring them in terms of speed and ability to track effectively, recover from occlusion, changes in light, and other factors. I then designed a camera mounting system that contained 3 motors and multiple sensors including a camera, gyroscope, and rangefinders, and I collected data on the system. The initial goal was to tune PID constants quickly, less heuristically and more algorithmically. I was able to notice correlations in PID data that allowed me to complete the project.</p> <p>Results The final system was able to adequately stabilize a system (< 5-10 degree oscillation when encountering rotations (max angular velocity of 1 rad/sec). In addition, with a laptop, the system was able to track people quickly (>100 fps), perform object detection adequately quickly (>15 fps), and read information.</p> <p>Conclusions PID Constants can be tuned faster and more effectively with careful analysis of data. I also analyzed multiple tracking algorithms and object detection algorithms on constrained, low cost systems like the Raspberry Pi. The final system was able to adequately stabilize a system when encountering rotations of different speeds and in different directions. In addition, along with the assistance of the computing power of a laptop the system was able to track people and objects and perform object detection adequately quickly. It can then read out detections, helping the visually impaired navigate their environment.</p>	
Summary Statement I built a camera stabilization system to provide object detection/tracking in real time and a voice readout to help the visually impaired navigate their environment.	
Help Received None. I designed and programmed a gimbal and wrote code to detect objects myself.	