



**CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY**

Name(s) Aryansh Shrivastava	Project Number J0923
Project Title Microcontroller Based Bionic Eye for the Blind	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of my project is to create a cost-effective electronic bionic eye, which can help the blind maneuver around and complete daily activities and livelihood, without assistance.</p> <p>Methods/Materials This device includes an Arduino microcontroller board, which is the brain of the device, an ultrasonic ping sensor which resembles the eye, and a voice recognition module and push button switches, both of which are used to control the system state and change the pre-programmed unsafe distances. The ping sensor will first send out ultrasonic pings, to the obstruction in front of the user, to sense it in real time. It will then return the ping time to the microcontroller, which will then, using this ping time, calculate the distance between the user and the obstruction and determine whether or not it is unsafe and alarm the user accordingly using a vibration motor.</p> <p>Results I conducted several tests to check the accuracy and reliability of the device. The speed of sound calibration constant is found to be 344.57 m/s for the device. The maximum deviation of inaccuracy in the calculated distance is found to be .2 ft. for 8 ft. The projected error at 32 F, in the distance calculated by the device, is found to be 4%. With completely random obstacles, the reliability of the device is 96% (168 times detected in 175 observations). The duration of the battery powering the device is found to be 9 days before recharge. In the realistic human testing of the device for six untrained people, they came into contact with 11 of 48 random obstacles. After a short training session, they came into contact with none of the obstacles. Out of 25 observations of random moving obstacles, the device detected the obstacles a total of 22 times. The overall cost of the device is also found to be eighty dollars.</p> <p>Conclusions/Discussion The results meet the objective, because they show that this bionic eye device is very accurate and reliable. The tests on real human subjects showed the same. Therefore, the device is ideal for the blind or visually impaired, allowing them to complete daily activities, without assistance.</p>	
Summary Statement The purpose of my project is to create a bionic eye for the blind that is wearable, lightweight, inexpensive, reliable, and accurate.	
Help Received	