



CALIFORNIA STATE SCIENCE FAIR 2017 PROJECT SUMMARY

Name(s) Simrithaa L. Karunakaran	Project Number S1010
Project Title SafetyStep: A Novel Device Using IoT to Provide Safe Navigation for the Visually Impaired	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective of this project is to invent SafetyStep, which is to be a novel invention to provide safer, more independent, more mobile, and more accurate self navigation for the visually impaired with the ability to detect if the user can self navigate safely as well.</p> <p>Methods/Materials Main components (for the prototype used in the demonstration): 1 Arduino Uno (integration of all electrical components), 2 Ultrasonic Sensors (detect distance and direction of obstacles from user), 2 Vibration Motors (create various vibrations), 1 GSM/GPRS Shield (send text messages), and 1 Speaker (sound various alarms) Coded using Arduino language, which is a set of C/C++ functions. Made to be used with as many ultrasonic sensors and vibration motors as preferred by user and device can be placed anywhere on the body to detect objects in all levels. Final prototype had cost of about \$50 and per-unit materials cost will drastically decrease during mass production.</p> <p>Results Objective was accomplished by invention of SafetyStep. SafetyStep was made to use vibration motors to alert the user of the direction and distance of obstacles in the vicinity of the user, an alarm to alert the user of the distance of the obstacle, and text messages to alert the caretaker of whether the user is adequately processing the information SafetyStep is giving and if the user has the capability to even self navigate safely. Prototype tested 70 times using all possible test scenarios using different obstacles at different distances from the ultrasonic sensors. Final prototype received accuracy level of 95%</p> <p>Conclusions/Discussion According to the WHO, about 285 million people are visually impaired worldwide and about 90% of the world's visually impaired live in low-income settings. Objective of project met through invention of SafetyStep. SafetyStep is a novel, low cost, haptic (using vibrations), hands-free approach to increase mobility, safety, and independence during self-navigation for the visually impaired while also being high in accuracy and universally usable by people with specific accommodations and disabilities.</p>	
Summary Statement Novel, low cost, hands-free device to detect obstacles' distance and direction via vibrations and alarm sounds and identification of unsafe self navigation via text messages for exponentially safer self navigation for the visually impaired	
Help Received Parents provided monetary help for purchasing components of SafetyStep; All research, design, development, and testing of SafetyStep done by me	