



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Jessica A. Richeri	Project Number S0914
Project Title Autonomous Robotic Vehicle: Saving Lives, Preventing Accidents One at a Time	
Abstract Objectives/Goals My goal was to design and manufacture an autonomous car that improves safety on the road by preventing accidents, saving one life at a time. My second phase consisted on the creation of hardware which showed a 3D virtual mapping with the used of 2D sensors and a monocular camera. The three major modules that have been developed to feed the virtual mapping are: Marginal Protection, Line Detection and Road Guidance, and Obstacle Detection and Avoidance.	
Methods/Materials I took a remote controlled car, removed the transmitter and connected an array of infra-red sensors to a Phidgets interface kit. A Hokuyo LIDAR was connected to the car via a RS232 port. A Point Grey Firewire camera with a variable lens was used to capture the images and send to the Processing Cluster. All the hardware was connected to a Tablet PC, running XP Pro. A computer cluster is made up of four HP DL360 Servers. Windows Compute Cluster Server 2003 R2 was used to do the processing and calculate the Steering angle and Speed and send them to the remote car via wireless. The three main modules that I developed were Marginal Protection, Line Detection and Road Guidance, and Obstacle Detection and Avoidance. These modules were written on Microsoft Visual Studios 2008 C# language with the help of Image Processing libraries.	
Results The long and short distance sensors overlapped with each other so I had to install an opto-relay switching system. The amount of processing was directly proportional to the speed of the car and the fps of the images captured by the camera. I learned that 10 fps was the ideal speed to calculate the steering at 65 mph car speed. In order to reduce the false positives, I created a fusion from the infra-red and LIDAR sensors. The Marginal Protection System kept the autonomous car with in the lanes, at the same time, detect and avoid obstacles creating a 3D virtual map.	
Conclusions/Discussion Subsequent to adding more image processing hardware and upgrading the servers video cards, my car was able to travel seamlessly in the 3D virtual world created. The curvature of the street and the cars proximity had an effect on how the car will find its way, but the steering needed to be proactive, adjusting the direction of the car before it arrived to the curve. The system was able to use sensor and camera data to create a virtual map.	
Summary Statement My project consisted of desgining and implementing an autonomous car that creates a 3D virutal map with the use of 2D technology and follow lines and avoid obstacles.	
Help Received	