



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Chloe C. Kuo	Project Number 34494
Project Title An Emergency Autonomous Driving System to Improve Safety from Battery Fires in Electric Cars	
Objectives/Goals My project sought to test the feasibility of designing and building an emergency autonomous driving system to improve safety from a battery fire in an electric car. My hypothesis is that an emergency autonomous driving system can be designed, built, and tested in a model car which would successfully mimic the system a real electric car might use to improve safety in the case of a lithium-ion battery fire. In the case of a battery fire in a real electric car, my system would begin, where the car would automatically stop, detach its battery, and autonomously drive away from the burning battery.	
Abstract Methods/Materials I used the chassis of a radio-controlled off-road vehicle to test my model system, which I named #Ted#. To operate my autonomous driving system, I utilized an Arduino Uno microcontroller which commanded a servomotor, 2 range sensors, diodes, resistors, a transistor, and accompanying wires. I tested each of the subroutines of the entire system separately to ensure that each one functioned as designed and integrated them into one system and optimized the overall system to function as designed. To simulate a battery in a real electric car, I used a 5lb weight, which best mimicked a real lithium-ion battery.	
Results I successfully completed three tests, each simulating different situations of when a battery fire had started, and each successfully working properly for the purpose of this experiment. I was able to design, build, and test an autonomous driving system in a model car so my hypothesis is correct. In completing my project, I encountered many unexpected difficulties that necessitated inventive and creative solutions. I learned that such occurrences are typical of engineering projects like the one I pursued. I conducted three different tests on Ted. Each tested Ted's ability to autonomously drive (in an emergency situation) based on different obstacles placed in front and behind him. Each test proved to be successful. Conclusions/Discussion An emergency autonomous driving system should be seriously considered as an additional safety measure for future electric cars. Lithium-ion battery packs in future electric cars should be designed to allow rapid detachment in the case of fire.	
Summary Statement My project sought to test the feasibility of designing and building an emergency autonomous driving system to improve safety from a battery fire in an electric car.	
Help Received David Eldon, a UCSD graduate student in physics, provided technical advice on my project, taught me about electric circuits, and taught me how to program in Arduino.	