



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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| Name(s) Anna K. Simpson | Project Number S0915 |
| Project Title A Mobile Autonomous Chemical Detecting Robot | |
| <p style="text-align: center;">Abstract</p> <p>Objectives/Goals A robotic chemical detector, moving and responding to dangerous chemicals without human presence or control, could help save lives. My objective was to create an autonomous mobile chemical detecting robot. Building upon the basic sensor prototype I made last year, I had to increase sensitivity, make vapor movement autonomous, speed up response and integrate the sensor onto a mobile chassis. I hypothesized that I could improve the sensitivity by a factor of 10 using more complicated circuitry, address movement and speed with a fan, and produce a mobile robot to autonomously detect chemical in real time.</p> <p>Methods/Materials I added an op-amp, resistors and voltage regulators into the sensor circuit to increase sensitivity, limit drift, and improve signal stability. I also added a fan and ran hundreds of tests of baseline and chemical readings. Then I attached the sensor and fan to a mobile chassis and wrote control programs for it to move and detect autonomously. After the programming, I ran tests where the robot moved over some ethanol placed on the ground.</p> <p>Results Tests on the amplified circuit showed limited noise and range in the baseline, and a signal change more than 20 times the baseline when chemical was introduced, far more than was hypothesized. Even concentrations only of 5% ethanol changed the signal markedly. The fan caused almost immediate detection and was placed with the sensor on the mobile chassis. After creating the program, I had the autonomous mobile robot move over a spill of chemical. It consistently and accurately detected and responded to the presence of chemical in real time!</p> <p>Conclusions/Discussion My product is a mobile robot that can sense chemical spills on the ground below it autonomously and in real time. The program can be adapted to implement a variety of algorithms for searching and response, as needed for applications in industry, security and counter-terrorism.</p> | |
| Summary Statement My product is a mobile robot that can sense chemical spills on the ground below it autonomously and in real time. | |
| Help Received Used lab equipment and lab space at UC San Diego under Professor Michael Sailor | |