



**CALIFORNIA STATE SCIENCE FAIR  
2006 PROJECT SUMMARY**

<b>Name(s)</b> Anna K. Simpson	<b>Project Number</b> <b>J0727</b>
<b>Project Title</b> <b>Overcoming Background Variations in Line Following with Multiple Light Sensors</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> My objective was to find out if robots could follow lines better with more than one light sensor when the it is faced with an unknown or changing background lighting. I hypothesized that multiple light sensors would erase problems with background lighting that the single sensor cannot combat.</p> <p><b>Methods/Materials</b> I tested the sensors by adding them to a simple robot that I built, programming the constants to follow the line in my control lighting. I made the robot so that it could hold combinations of one, two, and three light sensors. Then, I had the robot follow the lines on 3 different courses in 6 different background lightings, while recording the percentage of the total distance that it covered and the time it took to do so. I did five trials with everything constant for each combination.</p> <p><b>Results</b> The single light sensor was unable to follow the line when it was really bright, really dark, or when the lighting changed during the test. Three light sensors did it all but when it was really dark and the lighting changed. Two light sensors were able to do it in one hundred percent of background lightings. On a straight line (one of my courses), the robot went at an average speed of 4.2 cm/s when equipped with one sensor, 1.5 cm/s when equipped with two light sensors, and 7.6 cm/s when equipped with three sensors.</p> <p><b>Conclusions/Discussion</b> The double light sensor is most accurate and the three light sensor is not as good as the double, through it was about four times as fast. I would have to utilize a more complicated programming language to get better speed with the two light sensors or more accuracy with the three. I found that two light sensors are slightly better than three so my hypothesis was supported.</p>	
<b>Summary Statement</b> Multiple light sensors make robots more accurate at line following when the background lighting is unknown or changing.	
<b>Help Received</b> My advisor and science teacher helped me with the preparation of my project; Mr. Robin Laird gave me some opportunities for research; Mother and Father helped me reseach and put my poster together and helped check my experimental conditions and change batteries;	