



**CALIFORNIA STATE SCIENCE FAIR
2009 PROJECT SUMMARY**

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Project Title To Go or Not to Go: That Is the Calculation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The objective is to develop a geometrical algorithm to estimate car travel distance to a traffic light using digital camera and inclinometer. The goal is to estimate the distance with <10% error, while the car is at a distance of >200 feet from the light. Our motivation is to prevent accidents when drivers approach an intersection with traffic light, and make the wrong decision to continue after it turns yellow.</p> <p>Methods/Materials Digital camera, Laptop, GPS, incline meter, distance meter, laser level, ImageJ software</p> <p>A digital camera and inclinometer was securely attached to tripod and placed in the car. At an arbitrary distance from the intersection: take photo of traffic light, and record road incline and GPS distance reading. As car moves towards the intersection, repeat the steps three times at different distances, and also record the GPS reading under the traffic light. Use ImageJ to read the image file, and measure the image length in pixels. The change in image length, as the car moves closer to the light, is proportional to the distance moved. Use triangle theorems to estimate distance to traffic light. Perform the experiments during day, night, and for different traffic light types.</p> <p>Results Overall we collected and analyzed 35 images from control experiments, 72 day-time images, and 56 night-time images from Cupertino road intersection experiments. We failed to meet our initial goal of <10% error because we got $CHI-2 = 14.8$ with this criteria. We could not analyze the night-time images at all, since the images had too much glare from the lights, so image length measurement was not repeatable.</p> <p>Conclusions/Discussion Our original goal was too ambitious for the equipment we were using and the sources of errors. However, by changing our goal to <15% error, we got $CHI-2 = 0.099$. Hence, we conclude that with the equipment we were using, we should have set a goal of <15% error. Using ImageJ software for traffic light recognition and measurement did not work successfully for all images.</p>	
Summary Statement To accurately estimate car travel distance to traffic light at an intersection, using a digital camera, inclinometer and geometrical algorithms.	
Help Received We would like to thank our science teacher, Mrs. Renee Fallon, for statistics help. Our Dad helped make sense of digital camera and the mathematics in our references.	