



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> <b>Benjamin C. Wu</b>	<b>Project Number</b> <b>J1222</b>
<b>Project Title</b> <b>A Color Distinguishing Robot</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective is to determine whether a robot constructed out of LEGO bricks can be made to distinguish between colors.</p> <p><b>Methods/Materials</b> A LEGO MINDSTORMS Robotics Invention System 1.5 kit was purchased. Using these pieces, a robot was constructed and programmed. The robot was tested in different lighting conditions (dim, normal, bright) and with different materials (LEGO bricks, paper). The accuracy of the robot's color recognition was also tested.</p> <p><b>Results</b> Since the robot was designed to perform optimally in normal lighting conditions with LEGO bricks, it performed best under those conditions. It did not perform well under other lighting conditions. The robot also had some slight problems with paper.</p> <p><b>Conclusions/Discussion</b> It was found that in both very bright and very dim environments, the robot could not distinguish the colors accurately. The ambient lighting conditions affected the amount of light reflecting off the colored objects, which in turn caused the sensor to misrecognize the observed colors. This is because the program uses data gathered in normal lighting conditions, and was not designed for different environments. Different materials also caused minor problems with the color recognition. It is speculated that the lower opacity of the paper and the higher reflectivity of the LEGO bricks caused these problems. In addition, it was found that it was impossible to distinguish between similar colors, such as white and yellow, because they reflect roughly the same amount of light. It is also impossible to be able to distinguish between all colors with accuracies of 100%. An increase in accuracy with one color is often paired with a decrease in accuracy in another.</p>	
<b>Summary Statement</b> A robot that could distinguish between colors was constructed out of LEGO bricks.	
<b>Help Received</b> Father helped with notebook	