



California Science Center  
**CALIFORNIA STATE SCIENCE FAIR**  
 2001 PROJECT SUMMARY

<b>Your Name</b> (List all student names if multiple authors.) <b>Christopher Jordan; Garron Ma</b>	<b>Science Fair Use Only</b>  <h1 style="margin: 0;">J0618</h1>
<b>Project Title</b> (Limit: 120 characters. Those beyond 120 will be ignored. See pg. 9) <b>Which Infrared Emitting Diode Pair Provides the Best Object Detection?</b>	<b>Division</b> <b>J Junior (6-8) J Senior (9-12)</b>
<b>Preferred Category</b> (See page 5 for descriptions.) <b>6 - Electricity &amp; Electronics</b>	
<b>Abstract</b> (Include Objective, Methods, Results, Conclusion. See samples on page 14.) Use no attachments. Only text inside these boxes will be used for category assignment or given to your judges.	
<p>The purpose of this project was to determine which IRED (Infrared emitting diode) angle is superior for object detection. To detect an object the IRPD (Lynxmotion Infrared Proximity Detector kit) repeatedly flashes each of its two IREDs and waits to detect any photons that bounce back from an object. Infrared IREDs are typically used because this allows the detector to be insensitive to shorter wavelengths (visible light), but sensitive in the range just above visible light, often around 880 nm. The project's hypothesis was that an IRED pair with a smaller emitting angle would do better for the purpose of object detection. Two assumptions were made when developing this hypothesis. First, all IREDs of the same product family emit the same number of photons but have different angles. Second, the photons are spread out equally over space. To test the hypothesis two black poster boards were obtained and white paint pens were used to draw a grid of one-inch squares on the boards. Next, a thirteen-inch tall, 1/2" round dowel was painted white and nailed to a base. A grid was drawn on the base. Finally, the dowel was moved across the grid in a systematic fashion and the software on the laptop computer indicated whether the IRPD could detect the object or not. Each grid location was marked either Left, Right, Both, or Neither. IREDs with a +9° angle pair, +15° angle pair, +20° angle pair, and a +30° angle pair were tested. Testing and data analysis confirmed that the hypothesis was correct! The +9° IRED pair did the best based on a figure of merit point system that rewarded accuracy and distance of detectability. Using this figure of merit point system the +9° IRED pair scored 885 points! The +15° pair received 615, the +20° pair received 574, and +30° pair scored only 413 points. The data was not 100% accurate, since it was difficult to align the IRED pairs to be exactly parallel, and each pair was probably aligned a little differently from all the other pairs. In addition, it was later ascertained that photons do not spread out equally over space. However, the lack of accuracy did not affect the general conclusions.</p>	
<b>Summary Statement</b> (In one sentence, state what your project is about.) The effect of infrared emitting diode emission angle on object detection in robotic vehicles.	
<b>Help Received in Doing Project</b> (e.g. Mother helped type report; Neighbor helped wire board; Used lab equipment at university X under the supervision of Dr. Y; Participant in NSF Young Scholars Program) See Display Regulation #8 on page 4. Dad helped troubleshoot electrical hardware.	