



CALIFORNIA STATE SCIENCE FAIR 2009 PROJECT SUMMARY

Name(s) Ritik Malhotra	Project Number S0909
Project Title Multi-Touch Table: An Infrared-Based Touch Interface Designed for Collaborative Data Manipulation	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Multi-touch sensing touch screens are rapidly revolutionizing the tech industry. With capabilities of sensing multiple touches at once, multi-touch screens are becoming useful for collaborative work and are becoming increasingly popular in corporate environments. But even with such advanced technology, affordable multi-touch products are far too small for the average consumer, while large-scale multi-touches cost too much, and cheap multi-touches have backlighting issues, making them unusable. This project is the construction of an infrared-based, large-scale multi-touch screen for an affordable price, while keeping the same functionality as a capacitance-based one.</p> <p>Methods/Materials The multi-touch table was constructed using an infrared-based detection system. An array of infrared light is shined into an acrylic glass sheet at a specific angle, causing the light to reflect inside the glass, bouncing up and down within it. Once a user touches the glass sheet, the light becomes "frustrated" and is reflected directly downwards at that spot. A webcam with its infrared filter removed, and connected to a laptop, is placed on the bottom of the table and is used to detect the infrared light at the spots where the user touches the glass, effectively sensing every point that the user touches.</p> <p>Results Multiple touch blobs were detected from multiple users touching the screen all at once, showing that its multi-touch capabilities were functional.</p> <p>Conclusions/Discussion The successful construction of my infrared-based multi-touch showed that it was possible to achieve the same effect that a modern-day, capacitance-based, multi-touch screen achieves, but at less than ten percent of the cost (capacitance: \$5,000+; infrared: \$500). Next, it proved that multi-touch screens would no longer have any size limitations as long as they adhered to the infrared-based detection principle. Lastly, it showed that CCFL backlights could be used to light up the touch screen without causing major interference within the touch sensing system. The multi-touch table could also run many applications. Small scale applications for the multi-touch include photo viewers, multiplayer games, musical synthesizers, and entertainment systems. Large scale applications of the multi-touch include using it for military operations, interactive business conferences, and government use.</p>	
Summary Statement This project is the design and construction of a multi-touch sensing touch screen using infrared light as its detection method.	
Help Received I want to thank my father and my uncle for helping me operate some of the tools during the construction of the project. I also want to send out a special thanks to Sudi Bhat, for providing me with the inspiration to participate in Science Fair this year.	