



**CALIFORNIA STATE SCIENCE FAIR  
2004 PROJECT SUMMARY**

<b>Name(s)</b> <b>Sonia Singhal</b>	<b>Project Number</b> <b>S0713</b>
<b>Project Title</b> <b>Computer Haptics: Giving Computers the Sense of Touch</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of this experiment was to replicate the sense of touch using a computer. <b>Methods/Materials</b> An apparatus was built that allowed a pointer to be moved in space. Two small motors connected to the arms supporting the pointer applied forces to the pointer. Two accelerometers measured the tilts of the arms, which a microcomputer used to calculate the pointer's position in space. The microcomputer also controlled the speed and direction of the motors via a motor controller.  Computer programs were written to simulate four virtual objects or "phantoms." The programs turned the motors on and off near the boundaries of the phantoms, thus resisting the motion of the pointer at those boundaries. This allowed the person moving the pointer to feel the virtual shapes in space. <b>Results</b> The computer programs were able to generate virtual objects whose shapes could be sensed by a person feeling in space with a pointer. Although the boundaries were spongy, the shapes could be readily identified by the user. <b>Conclusions/Discussion</b> The results of this experiment are useful for applications where the sense of touch is important. Examples include microsurgery, remote sensing, and aids for the blind.	
<b>Summary Statement</b> My project replicated the sense of touch using a computer.	
<b>Help Received</b> My father milled the plastic pieces for the apparatus and answered questions I had on the programs. My mother reviewed the poster.	