



Colorado Science and Engineering Fair

2025 Individual Project Abstract Form

Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.

Title of Project: Magic Mouse: A touchless, Theremin-based mouse to help people with hand limitations

Finalist's Name: Laurel Amber Kent

School and City: Eagleview Middle School, Colorado Springs, CO

Sponsor's Name: Dr. David R. "Chip" Kent IV

Category: Engineering

Division: Junior (grades 6 - 8)

Abstract (250 words or less):

My project is Magic Mouse, and its purpose is to design, program, and build a touchless mouse for people with hand limitations.

When I watched the movie Mars Attacks!, I heard a strange noise. When I researched what made the noise, I found out it was made by a Theremin. A Theremin is a musical instrument that you can control and play without having to physically touch it. My idea was to design and engineer a mouse based off of a Theremin. A touchless mouse would help people with hand limitations, like my friend's dad who has carpal tunnel syndrome.

Wrist pain is more common than people think. 10% of all people have wrist pain, and 50% of students have wrist pain. Wrist pain is also more common in women. A touchless mouse could help many people with hand limitations:

- 53.95% of people who are 75 or older have arthritis. Arthritis can make it hard to use a regular mouse, because the pain in your joints makes it hard to move them.
- 1-5% of people have carpal tunnel syndrome, which causes your hand to feel numb and tingle. Some studies suggest that using a mouse, and not the keyboard, causes carpal tunnel syndrome.
- In the Global War on Terror, high-energy explosives such as improvised explosive devices caused upper-extremity injuries. From 2001-2011, 41-52% of all combat wounds were to the upper extremities, and 302 veterans had their arms amputated.

Magic Mouse creates a touchless mouse as follows:

- The 4 distance sensors constantly send out ultrasonic waves.
- When the user hovers his or her hand over the distance sensors, the ultrasonic waves bounce off of the user's hand.
- The Raspberry Pi constantly pulls data from the distance sensors to see if any ultrasonic waves have bounced back.
- My software takes the information from the distance sensors and subtracts Y1 from Y2 and X1 from X2 to get the difference.
- My software tells the pyautogui library to move the X and Y coordinates proportionate to the difference on the screen.
- The pyautogui library tells the Raspberry Pi's operating system to move the cursor that much on the screen.

I implemented this project's software in Python using the pyautogui and GPIO0 modules.

I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.

Finalist's Signature:

Date:

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. **A signed copy of this form must be included in your notebook.**