



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: AI Guides, Vision-Impaired Act: Safety-Aware Actionable Guidance via Vision-Language Models

Finalist's Name: Amy Zhang

School and City: Lakewood High School, Lakewood

Sponsor's Name: Casey Walter

Category: Mathematics & Computer Sciences

Division: Senior (grades 9 - 12)

Abstract (250 words or less):

Independent living for vision-impaired individuals requires them to perform daily physical tasks on their own, such as reaching a chair to sit or grasping an apple to eat. However, many still rely on human assistance for these tasks, limiting their independence. For example, the state of Colorado collaborated with the Aira program, which provides a 24/7 call-in human service to assist vision-impaired individuals.

In this project, I developed a multi-agent vision-language-models (VLM)-powered action guidance system. This system builds upon the capabilities of VLMs by adding actionable guidance intelligence, providing the user with real-time motion guidance to guide the vision-impaired individuals to interact with the physical environment effectively. Each VLM agent is strategically assigned a role, including object spatial relation reasoning, safety checking, action planning, and interactive prompt generation, such that they are dedicated to fulfilling the designated tasks, enabling specialized performance and efficient collaboration to achieve the overall action guidance goal. This research bridges the knowledge gap in the VLM-based generic scene understanding and VLM-based actionable reasoning to support the down-streaming path planning and action guidance. It also enables users to follow its executable guidance to interact with the environment and thus achieve improved independence and quality of life that go beyond the capacity of existing assistive technologies.

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.**