



Colorado Science and Engineering Fair

2024 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: Improving Detection of Subterranean Objects Using Infrared Sensors

Finalist's Name: Ethan Bonnell

School and City: Centaurus High School, Lafayette

Sponsor's Name: Eric Mattys

Category: Engineering (ENGR)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Due to the fact that subterranean objects are not visible from aboveground, traditional methods of detecting them often fail to do so. Normally, this issue can be circumvented by using manned detection systems such as Ground-Penetrating Radar (GPR) sensors attached to carts. However, when the subterranean objects being scanned pose a danger to humans, such as in the case of landmines, detection has to be performed remotely. Several Unmanned Aerial Vehicle (UAV)-based subterranean object detection systems have been developed, utilizing GPR, infrared thermography, and other non-traditional methods of sensing. However, these detection systems rely on highly expensive sensors, which makes them less than ideal for widespread distribution and use. Since landmines are prevalent across large portions of the world, and minefield locations are often unknown, many landmine detection systems must be deployed in order to reduce landmine casualties. Additionally, previously developed detection systems often implement custom parts which cannot be purchased, further limiting these designs' potential for extensive use. Here, a relatively inexpensive, commercially available infrared thermography camera was determined to be reasonably effective at detecting close-to-surface subterranean objects with properties similar to those of landmines. This camera could be attached to a UAV with relative ease, and due to the overall convenience of this detection system, it would be viable for scanning potential minefields to determine if they are risks to human safety.

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:

Ethan Bonnell

Date:

2/27/2024

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.