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: An early tornado warning system

Finalist's Name: Anirudh Rao

School and City: STEM School Highlands Ranch, Highlands Ranch

Sponsor's Name: Bharathi Rao

Category: Earth & Enviornmental Sciences (EAEV)

Division: Junior (6th - 8th grades)

Abstract (250 words or less):

Every year, approximately 1000 tornadoes hit the United States, causing around 1500 injuries and claiming lives. Alarmingly, 75% of these tornadoes in the world occur in the central region of the USA. The financial impact for each tornado is an average of $500,000 in damages, totaling losses of $500 million annually.

Due to climate change, the tornado alley is now moving eastwards getting closer to densely populated areas. The early tornado season of 2023 was an example where tornadoes touched down east-wards of the alley.

Presently, tornado warnings provide a mere 13 minutes of lead time on average, making it insufficient for adequate preparation. Recognizing this critical issue, my project seeks to harness infrasound detection technology, supported by other environmental indicators historically associated with tornado formation, to extend warning times.

With a network of autonomous drones equipped with sensitive infrasound detectors, pressure, temperature, and altitude sensors, the solution aims to provide continuous monitoring and early detection capabilities. These drones, capable of self-charging and deployment from base stations, continuously scan the surroundings, transmitting data for analysis.

Several test flights verified the working of the prototype including data collection, calculation, and warnings. The solution can potentially increase the warning time for tornadoes up to 40 minutes.

Further testing with weather stations during the tornado season is needed to confirm the accuracy of the solution and calibrate with doppler radar results. In future, the solution can potentially also compare with existing data models using data science techniques, to increase accuracy of prediction.

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 o 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.