



CALIFORNIA STATE SCIENCE FAIR 2013 PROJECT SUMMARY

Name(s) Rishabh Jain	Project Number S1412
Project Title The Early Detection of Wildfires through the Use of GOES Satellite Imagery, Edge Analysis, and Spectral-Based Hashing	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Wildfires threaten thousands of people each occurrence including fire-fighters and citizens; furthermore, these wildfires are usually caused through natural means such as heat waves or lightning strikes, resulting in the wildfire spreading before it is detected and reported. Wildfires are extremely dangerous to report and as a result they are usually monitored and detected from space. Although this type of detection from space is practical, a large data set is presented, leading to the common usage of the MODIS, which does not provide intense coverage of one area. Therefore, in this project, the GOES is used as it provides the intense coverage needed to detect, classify, and analyze wildfires; however, the large data set must be searched and created effectively as to reduce computational power and data storage requirements necessary.</p> <p>Methods/Materials In this project, a novel wildfire detection algorithm from space was developed, using edge analysis of the wildfire hot spots as well as spectral-based hashing with suffix arrays as a means of classification and early detection of wildfires. By first retrieving a temperature mapping from the GOES and identifying hotspots from temperature irregularities, these outlines can then easily be stored in a persistent database. Then, the dataset is searched by identifying correlated sequences and through the usage of the novel suffix array algorithm. Deviation analysis is conducted on each wildfire through time, allowing for the classification and analysis of wildfires from space.</p> <p>Results The flagged hot spots were compared to known hot spots as provided by the NOAA, the system correctly identified the hot spots. Furthermore, the algorithm identified the core of the wildfire as a new correlation of pixels was created through the usage of deviation analysis over time, allowing for a variance system of importance per hotspot to be created. Moreover, the algorithm is measured for run-time and space requirements and its parts are found to be under quadratic run-time and to have linear space requirements</p> <p>Conclusions/Discussion The algorithm presented is shown to be a powerful method for the early detection of wildfires from space and is also shown to have monumental applicability to other fields such as cancer research, Alzheimer's research, and security systems.</p>	
Summary Statement Creating a novel algorithm that is as effective and more robust in determining wildfires from space than current implemented algorithms and has wide applications in diverse fields.	
Help Received Father allowed me to understand advanced mathematical conceptions; Chris Spenner aided in the process of editing and refining my project.	