# CALIFORNIA STATE SCIENCE FAIR
# 2014 PROJECT SUMMARY

**Name(s)**
Jongho Park

**Project Number**
34968

**Project Title**
## The Automatic Detection of Comets through Image Processing LASCO C2 of the Solar and Heliospheric Observatory

**Abstract**

**Objectives/Goals**
Since the Solar and Heliospheric Observatory (SOHO) started its mission in 1996, using the coronagraphs from the Large Angle and Spectrometric Coronagraph (LASCO) C2 and C3, many amateur astronomers found comets by comparing the movement of potential comets to the movement of other celestial objects by eye. This project is aimed to develop a program and algorithm to automatically detect comets, which appear in the image of LASCO C2 of SOHO.

**Methods/Materials**
First, I would brainstorm and code a program in MATLAB to extract celestial objects in the image set and then distinguish comets from other objects, such as stars and cosmic rays. Next, I found data of known comets and input the images of the known comet in order to test the prototype. Also, to determine certain constraint variables, the data of known comets were gathered and statistically analyzed The function of the program was redesigned through major and minor changes during coding. When all errors were fixed, to test accuracy, 25 stratified random samples of comet containing images were selected through the years 2011-2013 with known comet orbits (x and y coordinates).

**Results**
While minimizing the threshold value yielded the comet, when it exists in the images, it greatly lowered the accuracy and efficiency due to false results and long calculation time. In order to increase accuracy, the comet-detecting program, or function, needed a greater number of input images, while lowering the threshold value. This approach maximized accuracy, when there were seven image parameters and threshold value equaled 0.06, to 46.67%, which contains the information of a comet among output orbit data by 46.67%.

**Conclusions/Discussion**
The program developed could yield a maximum accuracy of 46.67%, which means among 100 of the coordinate outputs, 47 of them would be comets. Although this program may not extract comets only, the algorithm significantly reduces the observations that would take place without the program and produce a list of potential comets. For further research, the accuracy can be enhanced by adding the condition of comparing RGB values for similar brightness.

**Summary Statement**
This project is aimed to develop a program to automatically detect comets, and create a larger database of comets, leading to more sophisticated research of comets, and algorithm that may be applied to other fields of astronomy.

**Help Received**
I would like to thank Dr. James Li and Mr. Knight for their help for me to start and enter science fair and discussions.