

OSC SI Comet Hunters

*Evan Bretl, Cassie Park,
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Start the Project



MATLAB

Project for the comet hunting software was developed using MATLAB.



Image Processing

Algorithm used to detect the comet's nucleus and its tail.



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How were the comets actually found?

Comets were found by amateur astronomers using their telescopes.

What the computer does is it takes the images from the telescope and processes them to find the comets.

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“My Data”

Shows the raw data collected by the telescope.

Challenges

Developing the algorithm to detect the comet's nucleus and its tail.

Special Thanks

To the amateur astronomers who provided the data.

Visualizer

Shows the processed data and the detected comets.

Goal Completed

The goal of the project was to develop a software that can detect comets automatically.



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About Us

Josh "The Intern" Clark and Brian Guilfoos

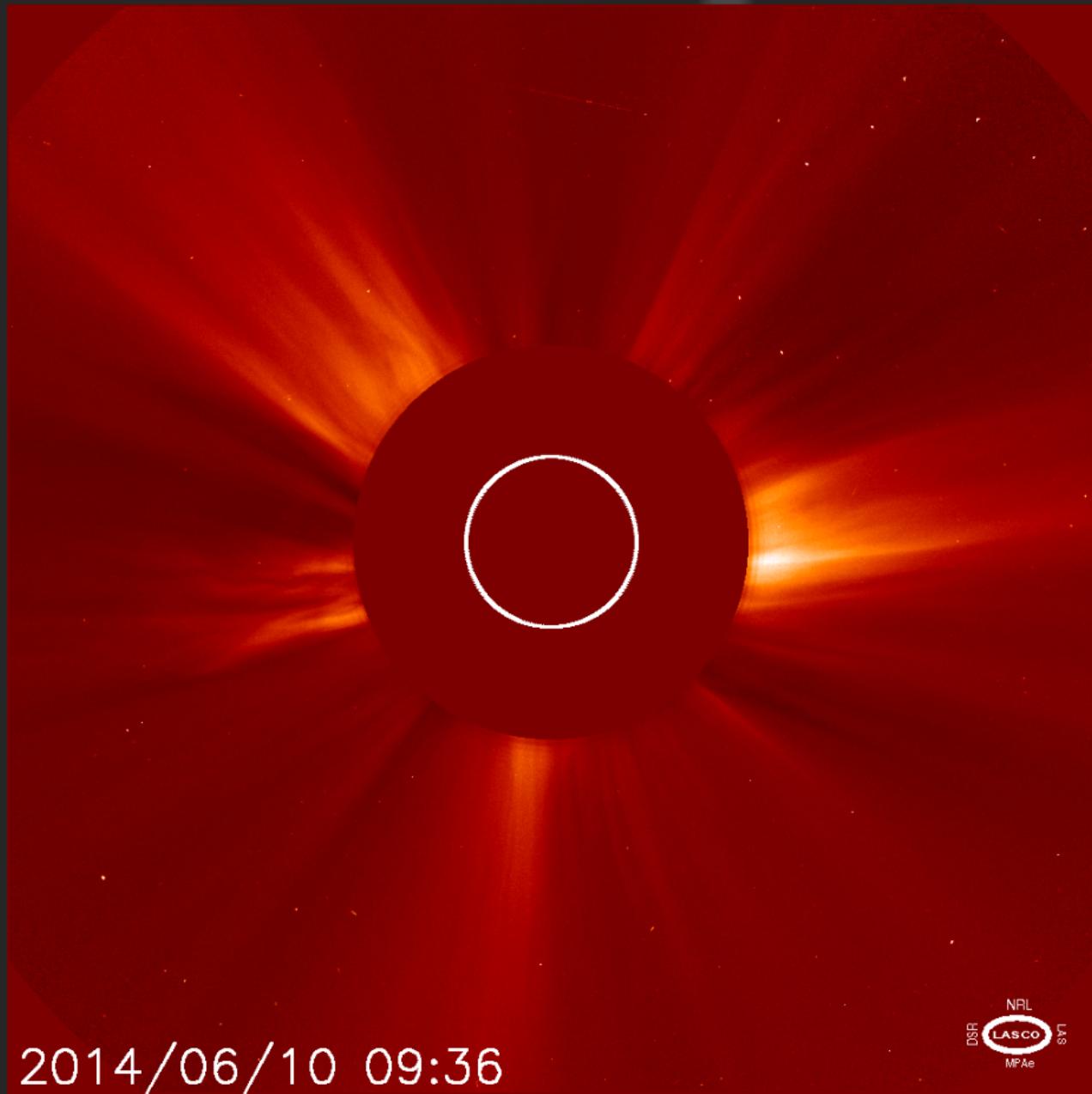


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About the Project

Our Goal: to find comets

- Using images from the SOHO spacecraft and LASCO instrument
 - Old images to test code
 - Come in every 24 minutes
 - New images to find new comets
 - Come in every 12 minutes



2014/06/10 09:36



MATLAB

What we used it for

- Process the images
- Filter by intensities and trajectories of suspected comets
- Visualize comets

Image Processing

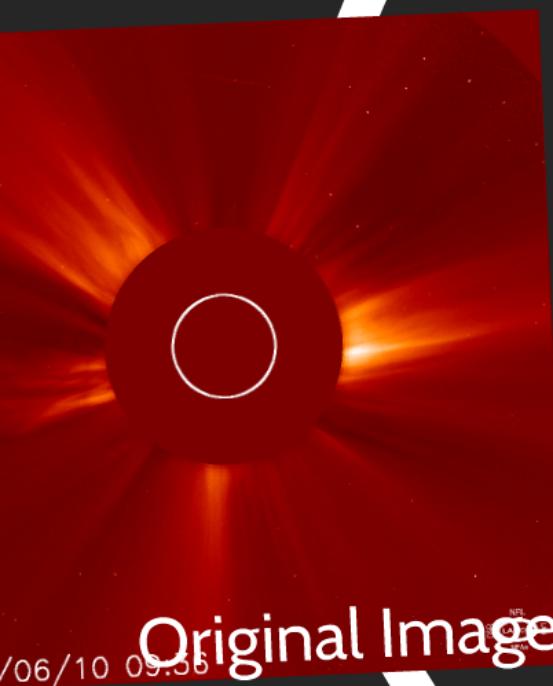
Why is this important?

- Makes the comets more identifiable
 - Isolates small white points (stars, planets, comets, etc.) in a black and white image

Image Processing

The process

- Highlight edges
- Dilate highlighted edges
- Fill holes
- Create/Insert mask
- Erode white points
- Shrink white points to one pixel



Final Product

```
-function [O, I, G] = processImage(image)

O = imread(image);
I = O;
I = edge(I, 'sobel', 0.03);
I = imdilate (I, strel('disk', 3, 4));
I = imfill(I, 'holes');
mask = imread('Mask.gif');
mask = double(mask);
I = double(I);
I = I.*mask;
I = logical(I);
I = bwulterode(I);
I = bwmorph(I, 'shrink', Inf);
I = double(I);
temp = double(O);
G = temp .* I;
I = logical(I);
```

Filtering Through the Images

- Proximity
 - Narrows the possible area of comet travel
- Trajectory
 - Calculates the direction of the comet
- Intensity
 - Finds the size of the white point

"Big Data"

438,976,000 possible paths through the images

Relation to Supercomputing

How were the comets actually found?

Comparison between series of images

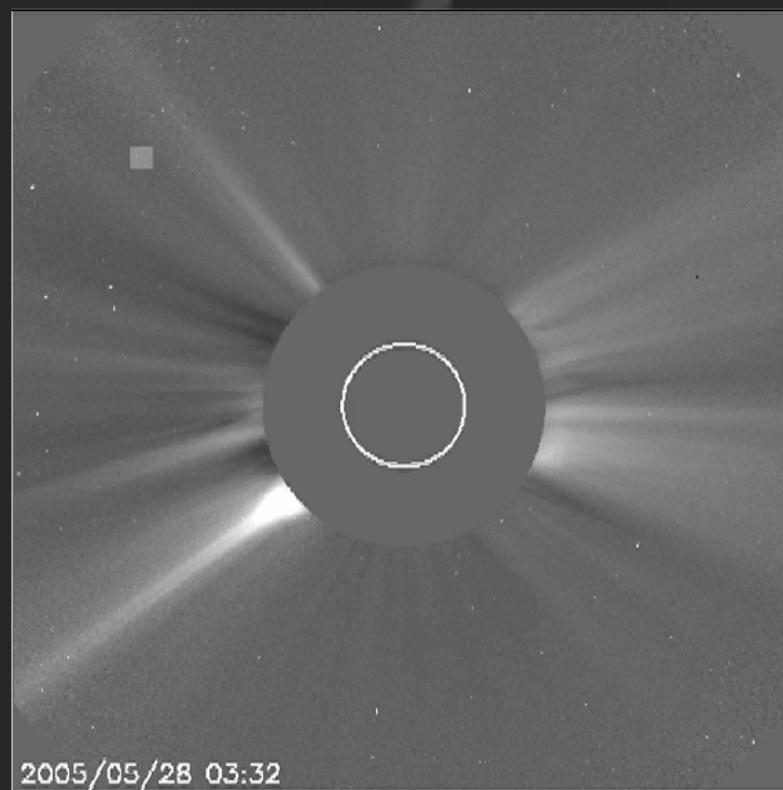
- Calculated the proximity, trajectory, and intensity of each white point in a series of images
- Set a limit of possible change in trajectory and intensity of a comet
- Searched within the set proximity
- Found matches of white points within the tested images

Visualization

Making the Movie

- Highlight the comet
- Draw a line on the path of the comet
- Play the images consecutively

Goal Completed





Prezi

2005/05/28 03:32

Challenges

- Inexperience with MATLAB
- Varying past programming experience
- Breaking up the work
 - Efficiency

What We Learned

- Programming experience
- Small group collaboration
 - Communication
- Problem-solving
- Time management



Questions?

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Special Thanks

- Brian Guilfoos, *Project Lead*
- Alan Chalker, *Summer Institute Director*
- Gregg Kummer, *Summer Institute Instructor*
- Jenny Lang, *Summer Institute Instructor*
- Josh "The Intern" Clark, *The Intern*