



A Search For New Planets



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Science, Discovery, and the Universe
Computer Science

Introduction

My capstone was to observe exoplanet transits. A transit is when a planet orbiting another star passes in front of its star from our view on Earth, blocking a small portion of the star's light. This change in the target star's brightness is detected by measuring the brightness of the star over time and subsequently graphing it to obtain a light curve.

Equipment

Telescope: 7" Astro-Physics Refractor

-Lens Dia: 7" (177.8 mm)

-Focal Length: 65" (1654 mm)

CCD: SBIG ST-10 XME

-Array Size: 2184 x 1472 pixels

-Array FoV: 32.0 x 21.5 arcmin

-Pixel Size: 6.8 x 6.8 microns

-Pixel FoV: 0.9 x 0.9 arcsec

Computer: Dell Desktop PC

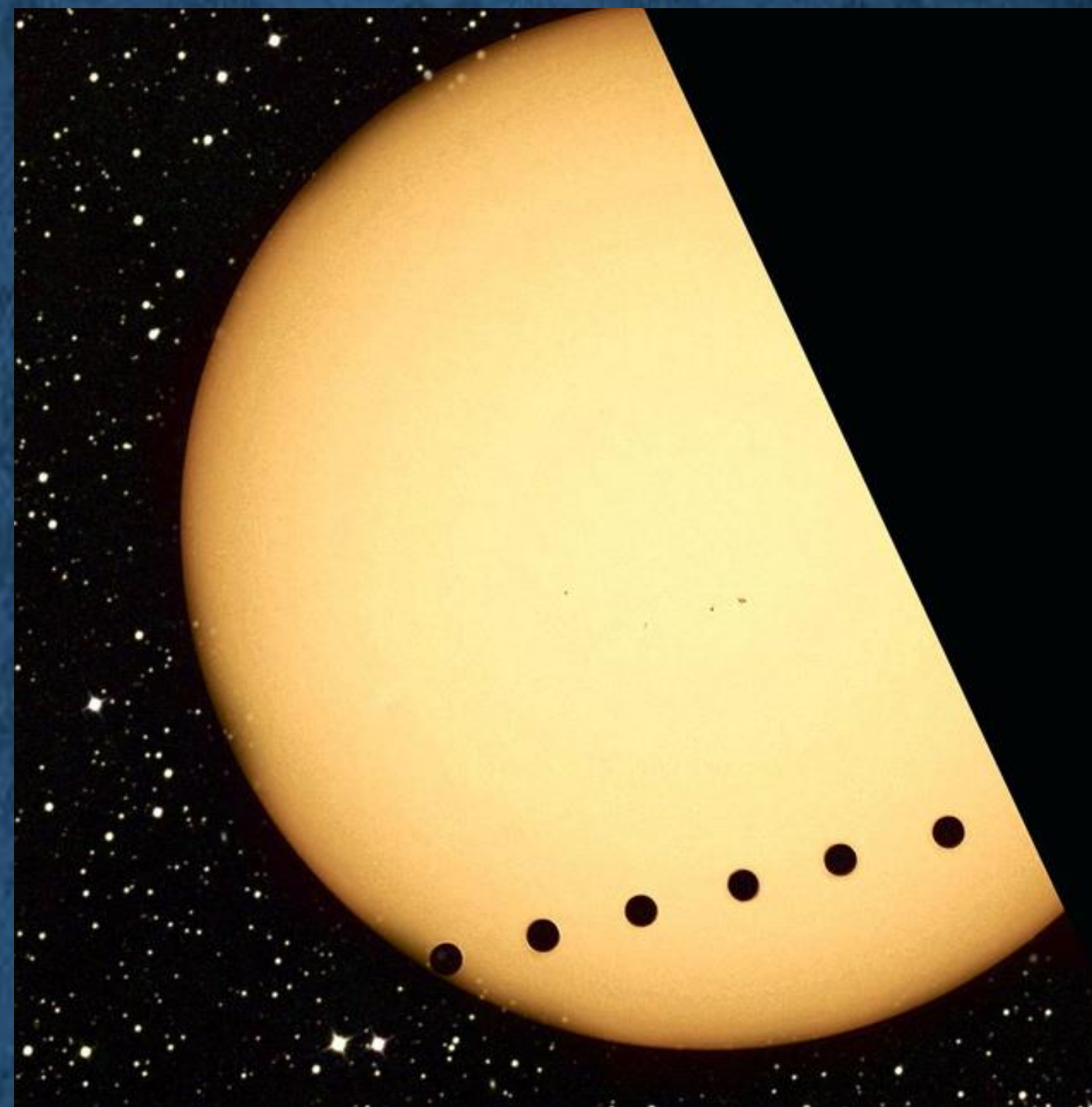
Software:

-Camera Control: Maxim DL

-Analysis: AstroImageJ 3.0.1

Data Collection

- 1) Pick a target
 - 1) Ensure visibility from the Observatory
 - 2) Obtain coordinates
 - 3) Obtain finder chart
- 2) Go to observatory (early)
- 3) Set up telescope
 - 1) Sync control computer's time to NIST
 - 2) Hook up control computer to telescope
 - 3) Set cameras to cool (usually to -10 C)
- 4) Wait for the cameras to cool and darkness to fall
- 5) Aim the telescopes
 - 1) Sync telescope to a known star
 - 2) Set to cords of target
 - 3) Check images from telescope against finder chart
- 6) Take a ton of images
 - 1) Light Frames – Data
 - 2) Calibration Frames
 - 1) Dark Frames
 - 2) Bias Frames
 - 3) Flat Fields



Artist Rendition of a Transit

From <https://wellbredinsolence.wordpress.com/2013/07/04/exoplanet-transits-and-star-shunters>



7" Astro-Physics Refractor

Picture taken by Matthew Livas



HAT-P-13 b from var2.astro.cz

My Data

Unfortunately, I did not collect any data pertaining to exoplanets. I signed up for telescope time at the UMD Observatory on a few nights to try and collect data on a few targets. Each time, the weather was bad (cloudy, raining, etc.), or the telescope was set up, and aimed but I was unable to confirm that I was observing the correct star.

Data's Significance

I attempted to confirm the existence of a few already known exoplanets. This would have not added to the overall scientific knowledge, it would have been great practice for my true intention, to confirm suspected exoplanets. I unfortunately was unable to accomplish either of these goals.

Conclusion

I was unable to observe and collect data on exoplanet transits due to the weather and an inability to confirm if I was observing my intended target.

Reflection

Through my work at the UMD Observatory, I gained a new appreciation of how difficult observational astronomy can be. There is a lot of research and planning done before any data is collected. So many factors must be taken into account: target visibility, telescope set-up and aiming time, is the weather going to cooperate, just to name a few. The real work begins only after the data is collected. Wrestling with the analysis software to produce usable information from the collected data and then relaying this information are the true challenges.

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