3D Printed Filar Micrometer

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“Double stars are the tinted jewels and waltzing couples of the night sky”

-James Mullaney
Double Stars

• Double stars have an observable orbit
• The mass of the double stars can be calculated from this orbit
• The mass of a star is the primary influence on how its life progresses.
• Mullaney states it is the only direct method of calculating stellar mass
Filar Micrometers

• The closest double star pairs require a visual measurement technique
• Used as primary double star measuring tool from 18th to 20th century
• Professional astronomers are neglecting the study of double stars
• Amateur astronomers can gather professional data with the right tools
GOAL

3D print a filar micrometer that could be used by amateur astronomers to measure double stars.
Using the Filar Micrometer
Methodology

- Researched amateur designs in *Sky & Telescope*
- Design process was iterative with four distinct prints
- Calibrated using Couteau’s artificial double star
Artificial Double Star

[Diagram showing two flashlights labeled 'Flashlight 1' and 'Flashlight 2', and a cross labeled 'Golf tee and bearing ball'. A line marked 'To the telescope' points downwards.]
Results

• The collective calibration value is $1.55 \times 10^{-4}$ inches per arcsecond.
• The calculated percent error of the simulated 24 Coronae Bernices measurements is 16.88%.
Results

- The final cost includes:
  - Final print
  - Vernier micrometer
  - Nichrome wire

- Final cost comes to less than $250
- Cost of professionally built filar micrometer is more than $2500
Conclusions/Project reflection

- Successful filar micrometer at amateur level achieved.
Thank You
References


Questions?

Contact me at Emily.Rull777@gmail.com