CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

James A. Lu

Project Number

35883

Project Title

The Effect of Magnification Ability of a Telescope on Position Angle and Average Separation of Double Stars

Abstract

Objectives/Goals

The objective was to determine if an amateur, store-bought, Zhumell Z8 telescope could collect accurate astrometric measurements to update National double star orbit database, as compared to the accuracy of a professional telescope.

Methods/Materials

A store-bought, Zhumell Z8, 0.20 meter objective mirror-size telescope and a professional, Estrada, 0.56 meter telescope was used to collect separation and position angle astrometric orbit data on the same double star, Mintaka. A Celestron astrometric eyepiece was installed on the telescopes during data collection to overlay a calibrated scale on the double star, and separation in arcseconds was first measured by counting the tick marks on the ruler scale between the two stars. Using the same eyepiece, the slow movement of the double star drifting to the outer protractor scale was used to record position angle in degrees. Position angle and separation measurements were taken 12 times for each telescope. Both telescope data were compared to published Mintaka observation data.

Results

For the store-bought, Zhumell Z8, 0.20 meter telescope, the average position angle for the double star Mintaka was 000.33 degrees and the average separation was 52.79 arcseconds. For the professional 0.56 meter telescope, the average position angle was 359.33 degrees and the average separation was 56.87 arcseconds. The published data, or ground truth, contained a position angle of 000.00 degree and a separation of 52.80 arcseconds.

Conclusions/Discussion

The store-bought Zhumell Z8 telescope was capable of performing astrometry to a very precise level based on the project data. After comparing collected data to published source, it was concluded that the store-bought, 0.20 meter telescope measurement of 000.33 degrees position angle and 52.79 arcseconds separation were as accurate as the professional 0.56 meter telescope in position angle and more accurate in separation due to speckle interference for higher magnification, professional, 0.56 meter telescope. Data supported inference that an amateur, store-bought telescope may be used in lieu of a professional telescope to collect precise, double star orbit data to update National database.

Summary Statement

With only a few thousand of over 100,000 known visual double star orbits plotted, project data supported the use of amateur, store-bought telescopes to collect accurate astrometric data to update National double star database.

Help Received

Amateur astronomers Mr. Reed Estrada and Mr. Chris Estrada, Central Coast Astronomical Society, provided the professional, 0.56 meter, transportable, reflector telescope; as well as guidance on double star observation procedures and techniques. Mr. Mike Antrim provided overall project guidance.