Measurements of the Double Star STFA 10AB

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Abstract: Observations of the double star STFA 10AB were made with an 8-inch Celestron Schmidt-Cassegrain telescope equipped with a 12.5mm Celestron Micro Guide astrometric eyepiece, and a stop watch. The average drift time was determined to be 9.66 arc seconds/division. The average separation was determined to be 333.7 arc seconds. The average position angle was determined to be 347.2 degrees. The last epoch (2002) listed inside the Washington Double Star Catalog (WDS) was used as a reference. The separation is listed as 336.0 arc seconds, and the position angle as 348.0 degrees. The separation and position angle remained consistent and checked with the accepted values, within acceptable percentage error.

Introduction

The double star STFA 10AB is listed inside the WDS at right ascension 04 hr 28 min 07 sec, and declination +15° 52′. Inside the constellation Taurus the magnitude of the primary star is listed as 3.4 and the secondary star as 3.7 (Mason *et al.*, 2010). An 8-inch Celestron Schmidt Cassegrain telescope from the Central Coast Astronomical Society and a 12.5mm Celestron Micro Guide astrometric eyepiece provided by Celestron were used.

The goals for our project were to: (1) observe, analyze, and report; and (2) provide an educational experience culminating in a published paper.

Observations

Observations were made on October 30, 2011 (B2011.08). A linear scale from 0 to 60 was used to determine the scale constant. Ten independent drift measurements were made. A stopwatch that reads 1/100s was used to record the average time the primary star drifted freely from 0 to 60. The scale constant was determined by the formula,

Figure 1: The authors from left to right: Alex Maldonado, Kyle Lee, Anthony Rogers, and Mark Brewer.

$$Z = \frac{15.0411(T_{avg})\cos(dec)}{D}$$

where Z equals the scale constant, 15.0411 equals Earth's rotation rate, T_{avg} is equal to the average

drift time, cos(*dec*) equals the cosine of declination, and *D* equals the total displacement on the linear scale.

Ten independent measurements were made to determine the separation by aligning the primary and secondary stars along the linear scale. The stars were positioned at different positions along the linear scale to lower bias. The separation was determined to be 333.7 arc seconds.

Ten independent measurements were made to determine the position angle by aligning both stars on the linear scale with the primary star on the central 30 division mark. Turning the drive motor off allowed the stars to drift freely to the outer protractor. The drive motors were turned back on once the primary star reached the outer protractor. The eyepiece was rotated 180° every run to reduce bias (Frey 2008). The average position angle was determined to be 347.2 degrees.

Conclusion

The accepted values listed in the Washington Double Star Catalog (WDS) and our values compared favorably. The absolute difference between the observed value and most recent value for separation is 0.3 arc seconds, a percentage of error of 1.1%. The absolute difference between the observed value and recent value for position angle is 0.8°, a percentage of error of 0.2%. The minimal sources of error can be attributed to causes such a movement of the telescope due to wind or acceptable errors in human perception. A percentage error no larger than 5.0% is considered precise and accurate results (Tanguay 1998).

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