CCD Astrometry of Select Stars in the Washington Double Star Catalog

Ashwini Iyer[1], Izzy Gross[1], Rachel Freed[1], Chris Spenner[1], Jolyon Johnson[2], Russell Genet[3, 4, 5]

1. The Harker School, San Jose, California
2. University of Washington, Seattle
3. Cuesta College, San Luis Obispo, California
4. California Polytechnic State University, San Luis Obispo
5. Concordia University, Irvine, California

Abstract Students at the Harker School collected data on four double stars selected from the Washington Double Star Catalog. Their measured separations and position angles were compared to past observations. No significant changes had occurred.

Introduction

A double star, as defined in observational astronomy, is a pair of stars that seem to be close to each other when seen through an optical telescope. This can occur for two reasons: the stars are either binary stars or optical doubles. Binary stars are gravitationally bound together, while optical doubles are stars that by chance are aligned in our line-of-sight. Stars showing similar properties such as proper motion, trigonometric parallaxes, and radial velocities are the best candidates to be physically bound. However, they cannot be proven binaries until they have been observed long enough for their separation and position angle to show an elliptical path. The separation is the angular distance between the stars and the position angle is the direction by which the stars are separated bearing from the brighter to the fainter component relative to celestial north (Argyle 2010). In this study, students at the Harker School selected four candidate binary stars (LDS 1679, LDS 1715, LDS 1778, and STF 1455 A, BC) and provided measurements of their position angles and separations. These measurements were compared to the last measurements reported in the Washington Double Star Catalog (WDS).

Methods

The double stars were observed with a Paramount ME, apogee U47 camera, Orion Star Shooter Autoguider, Optec TCF-5 focuser, and Optec LRGB with photometric filter wheel (Figure 1). The observatory roof can be opened or closed remotely using AstroMC. The roof control is connected to ClarityII weather software. If Clarity II detects a weather issue, an alert is sent to the user. FocusMax4 was used for focusing and connects to the Apogee U47 via SkyX. SkyX was used to control the telescope, camera, filter wheel, and autoguider.

Figure 1: The observing equipment including a Paramount ME and Apogee U47.

Results

Table 1 shows the separation and position angle for each double star measured in the study. A comparison is given to the most recent (last) measure reported in the WDS. The number of observations prior to the present study is indicated.

Double Star ID	Year of Last Observation	# Obs.	Separation (arc seconds)		Position Angle (degrees)	
			Last	Present	Last	Present
LDS 1679	2003	3	142.7	142.67	107	106.4
LDS 1715	2000	2	80.3	81.11	320	321.5
LDS 1778	2004	3	26.7	26.34	302	300.6
STF 1455 A, BC	2012	18	33.8	34.23	251	249.4

Table 1: The observed separations and position angles of the target double stars compared to their last reported values.

Discussion

The observational results of the present study are similar to the most recent measurements reported in the WDS. This may tentatively indicate the accuracy of the reported separations and positions angles. Since there are so few historical measurements of LDS 1679, LDS 1715, and LDS 1778, our measurements may be used by future astronomers to characterize these systems should they prove to be binary in nature.

Conclusion

The students at the Harker School successfully contributed observations of four target double stars. Future studies of these stars may contribute to their characterization as physically bound or merely optical in nature. Over time, the relative motions of the primary and secondary stars will determine if an orbit can be estimated.

Acknowledgments

We are thankful for all the help and guidance Mr. Spenner has provided the students, always willing to discuss and answer questions outside of the classroom. We are also grateful to Mr. Smith for helping us gather data at the observatory. This work made use of the Washington Double Star Catalog.

Reference

Argyle, Robert W. 2010. Double Stars. In *Small Telescopes and Astronomical Research*. Eds. Russell M. Genet, Jolyon M. Johnson, and Vera Wallen. Santa Margarita, CA: Collins Foundation Press.