New Possible Binary in Cepheus

Gergely Talaber[1], Tamas Ladanyi[2]

[1] Amateur astronomer, Bakonykuti, Hungary; gergely.talaber@gmail.com
[2] Leader of the Hungarian Astronomical Association Double Star Section; tom.ladanyi@gmail.com

Abstract

This paper reports a new possible double star system in the constellation Cepheus that was found by Gergely Talaber. The two component's attributes (parallax, apparent magnitude, proper motion, etc.) were checked in Gaia DR2 and DR3. No historical data was found neither in the WDS, nor in the WDSS about these stars. A short analysis of the images and Gaia DR2/DR3 data shows possible gravitational bound between the two components.

1. Introduction

During the observation of several double stars in Cepheus, a new unknown pair was noticed. I searched an already known WDS object in the specific coordinates without success. The distance of the components from Earth and the common proper motion of the two stars suggested the detailed analysis.

2. Equipment and Methods

The equipment used for the observation was an 8" Meade LX90 (203/2000 mm) telescope with no filters attached. The imaging was done by a Canon 1000D digital camera on ISO 1600, 10 images were taken with 10 seconds exposure time from Bakonykuti, Hungary during the night of the JD 2022.5941 (5th of august 2022). The coordinates of the images were defined by using the astrometry.net software package, while the measurements were done using AstroimageJ 5.1.

3. Data

The designation of the two stars in the system are Gaia DR3 2272237780637931776 and Gaia DR3 2272237780637932672. The parallaxes of the two stars are not exactly the same, however calculating the range of the possible distances based on the parallax error shows 5% overlap at the distance between 801.16 and 801.53 parsecs, which indicates, that the distance between the two stars is calculated from 6970.03 to 6973.20 AU.

Calculations of the proper motions (Harshaw 2016.) shows that the system belongs to the Common Proper Motion pairs (pm resultant is 1.73%).

Table 1. Component coordinates and magnitude

Components	RA	DEC	Mag V
Gaia DR3 2272237780637931776	323.388996	70.6802116	12.4768422
Gaia DR3 2272237780637932672	323.395998	70.6794984	13.0634928

The table above shows the coordinates measured during the observation session.

Table 2. Component data retrieved from Gaia DR3

Designation	RA	DEC	Parallax	PM RA	PM DEC	Mag G	Teff
Gaia DR3 2272237780637931776	323.389	70.68	1.2632	3.652	1.459	13.11	5750.02
Gaia DR3 2272237780637932672	323.396	70.679	1.2319	3.591	1.489	13.64	5821.04

The table shows the Gaia DR3 data of the components for epoch 2016.

Table 3. Component measurements

Theta	Rho	Delta mag
107.1115832	8.726129386	0.587

Table shows the measured separation and position angle of the two stars.

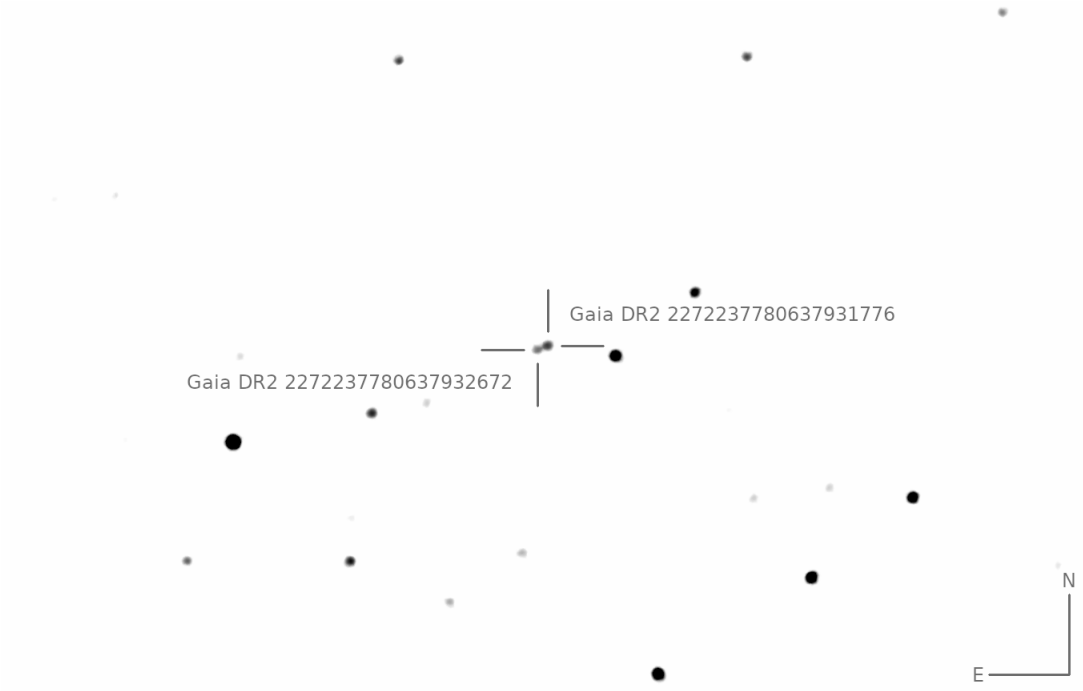

Figure 1. Image taken with the 8" SC telescope about the components.

4. Discussion

Based on the measurements and the data from Gaia DR3 (parallax, proper motion and radial velocity), the pairs of the system can bound physically, however the distance between them calculated exceeds the maximum calculated distance (3878.56 AU), which is commonly accepted as an indicator for the maximum distance of gravitational bound (Nouh and Sharaf 2012). The parallax error allows the overlap of the distance ranges of the two components, although it can't be the final verdict as conclusive evidence for the nature of this star system.

5. Conclusions

Based on the available data, the physical connection between the components of this double is possible. Continuous tracking should be done in the future to collect more data and also later Gaia data releases will help to clarify the nature of the pair.

6. Acknowledgements

This research has made use of the Washington Double Star Catalog maintained at the U.S. Naval Observatory

This work has made use of data from the European Space Agency (ESA) mission Gaia (https://www.cosmos.esa.int/gaia), processed by the Gaia Data Processing and Analysis Consortium (DPAC, https://www.cosmos.esa.int/web/gaia/dpac/consortium). Funding for the DPAC has been provided by national institutions, in particular the institutions participating in the Gaia Multilateral Agreement.

References

Harshaw, R. (2016). CCD Measurements of 141 Proper Motion Stars: The Autumn 2015 Observing Program at the Brilliant Sky Observatory, Part 3. Journal of Double Star Observations, 12(4) Retrieved from http://www.jdso.org/volume12/number4/Harshaw_394_399.pdf

Harshaw, R. (2018). Gaia DR2 and the Washington Double Star Catalog: A tale of two databases. Journal of Double Star Observations, 14(4). Retrieved from http://www.jdso.org/volume14/number4/Harshaw_734_740.pdf

M. I. Nouh & M. A. Sharaf (2012). On the Maximum Separation of Visual Binaries. Journal of Astrophysics and Astronomy, Volume 33, Issue 4, pp.375-386