A New Visual Double Star in Gemini

Abdul Ahad

Bedfordshire, United Kingdom
aa_spaceagent@yahoo.co.uk

Abstract: This paper highlights a new common proper motion double star in Gemini, currently not included in the WDS catalog. The components show virtually identical photometric and spectral properties and share similar proper motions, with a close separation of 10.53 arcseconds. This suggests the pairing is more likely to be binary rather than optical.

This new pair was identified while evaluating the double star pairs POU1030, KUI23 and BU1241 from the Washington Double Star Catalog [1] in the vicinity of the galactic open cluster M35 in Gemini (Figure 1).

The Pourteau double star POU1030 (WDS 06090+2416) was in particular analyzed to some level of detail, with no conclusive proof as to whether this pair is in fact a physical member of the open cluster or merely a foreground alignment with no true association to M35, which lies at a distance of around 3,000 ly.

Observations and Analysis

The new pair identified in this paper is situated 1° 22′ south of M35 in a rich starfield. An observation was made by the author using a 4.75-inch refractor, and a sketch of the field was produced at a magnification of x159 (Figure 2) utilizing a Super Plossl 6.3mm eyepiece.

The primary has the designation HD252129 and the companion BD+22° 1186p, and they have V magnitude 9.87 and 9.97, respectively. Differencing the coordinates between each star yielded the latest measurements for epoch 2000.0:

Position Angle (θ): 284.0° (2000.0)

Separation (ρ): 10.53" (2000.0)

These measurements were further confirmed and found to be in agreement with astrometry performed on high resolution J-band imagery taken from the 2MASS database for epoch 1997-11-15.

The PPMXL catalog [2] highlighted the components to be sharing common proper motions, as shown in Table 1.

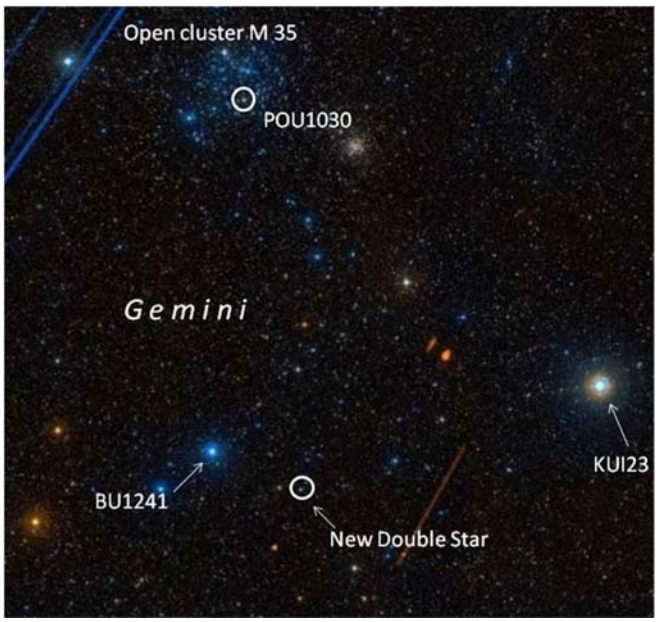

Figure 1: Three studied double stars in the neighborhood of M35 and the identified new pair.

These tiny annual proper motions suggest the pair is likely to reside at a great distance, and the two stars have shown no relative movement between the POSS1 and POSS2 surveys. By the Aitken criterion, the angular separation limit for this pair was computed to be 9.26" [3]. The observed angular separation of 10.53", however, falls marginally outside this limit by just 1″. The pair may nevertheless still be considered physical

A New Visual Double Star in Gemini

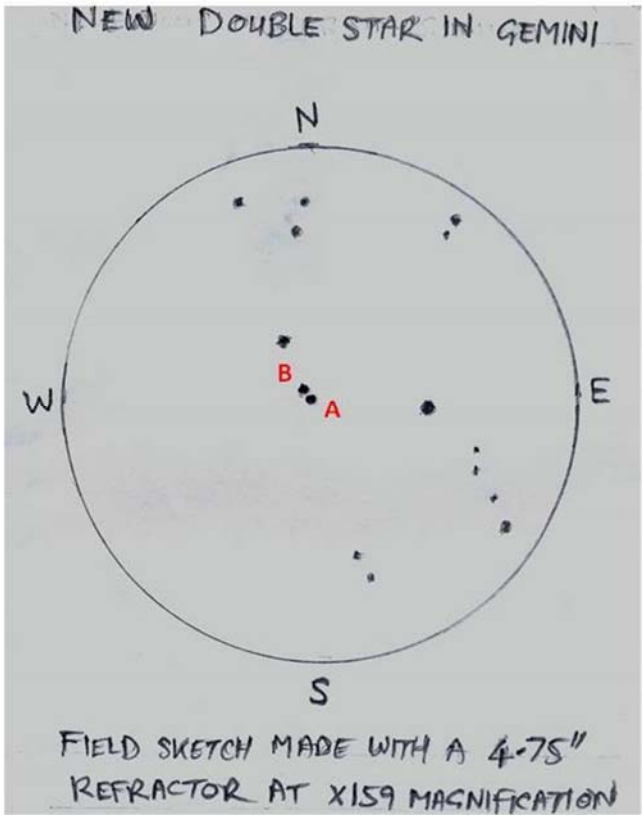

Figure 2. A sketch of the telescopic field surrounding the proposed new double star made by the author at 23:30 UT on October 28, 2013. The faintest stars are of magnitude 12.

on other analytical grounds. As highlighted in (Rica 2006), the Aitken criteria serves as a useful tool for making general deductions of binarity over a large sample of visual double star pairs, though it does not allow one to reach a satisfactory conclusion on every single double star system on an individual basis. The nearby binary system Groombridge 34 is a classic example of a pair in which the components are separated by twice the angular distance required to satisfy Aitken's criterion, yet rigorous observations accumulated over many decades of study have confirmed this to be a bona-fide binary system, with a consensus orbital period of some 2,600 years.

From the 2MASS Catalog [4], we provide the J- and K-band magnitudes for the component stars of this Gemini pair shown in Table 2.

These 2MASS (J – K) color indices would categorize the pair into two white stars of spectral class A7 [5]. They compare with the (J – K) color indices of other similar well-known stars as follows: the prominent summer star Altair (α Aquilae) and the third magnitude θ^2 Tauri (a member of the winter Hyades

Table 1: Proper Motion of the Components

	Proper Motion in RA	Proper Motion in Dec
A-component	-0.3 mas/year	-3.4 mas/year
B-component	-1.0 mas/year	-4.0 mas/year

Table 2: J and K magnitudes and Color Indices

	J-magnitude	K-magnitude	Color Index (J-K)
A-component	8.502	8.316	+0.186
B-component	8.616	8.423	+0.193

star cluster) are both stars of spectral class A7. Altair is a main sequence A7 V star whose (J – K) color index is known to be +0.21, whereas θ^2 Tauri is a giant A7 III star whose (J – K) color index is +0.11. Using these two stars as comparative 'candles,' we can infer that the stars in this Gemini pair are probably more likely to be A7-class main sequence stars, rather than A7-class giants.

Consequently, it seems reasonable to suppose they would be of absolute magnitudes in the region of +2, yielding a spectral distance of the pair of about 1300 ly (400 pc) from the Solar System.

It is also interesting to note that both Altair and θ^2 Tauri are Delta Scuti-type variables, with small amplitudes, and this type of brightness variation may well prove to be mirrored in either component of this Gemini double.

Conclusions

Given the fixed nature of this pair, with no appreciable movement between POSS 1 and POSS2 surveys, the similar proper motions, and the match of observed photometric characteristics to physical properties, it seems this pair is more likely to be binary rather than optical. The close angular separation, which virtually satisfies the Aitken criterion, also argues in favour of physically related components.

Acknowledgments

This research has made use of the SIMBAD database and VizieR databases operated at the Centre de Données Astronomiques, Strasbourg, France and the Washington Double Star Catalog maintained at the US Naval Observatory, Flagstaff, Arizona.

References

[1] Mason, B. D., Wycoff, G. L., and Hartkopf, W. I., *Washington Double Star Catalog* (http://as.usno.navy.mil/ad/wds/wdsnewref.txt).

[2] *PPMXL Catalog*, Roeser, et al., 2010.

[3] Romero, Francisco Rica, "R. G. Aitken's Criteria to Detect Physical Pairs", *JDSO,* **2**, 36-41, 2006.

[4] The Two Micron All-Sky Catalog of Point Sources, Cutri, et al., 2003.

[5] Ahad, A., "A New Common Proper Motion Double Star in Cetus", *JDSO*, **8**, 332-334, 2012.