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UBVRI Photometry of the Possible Binary Open Star Cluster NGC 6755/NGC 6756

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Abstract.

We present a CCD UBVRI photometry of the possible binary open star cluster NGC 6755/NGC 6756. Our aim is to confirm or disapprove their binarity comparing theirs age difference. For NGC 6755 we found $\log(\text{age})$ = 8.19 (155 $\pm$ 8 Myr) and for NGC 6756 $\log(\text{age})$ = 8.35 (224 $\pm$ 8 Myr). As this is a big age range and we can not confirm their binarity based on age determination. For a more conclusive result, we need wides field CCD photometry for investigation the tidal link between the clusters.

1 Introduction

A binary open star cluster is an object consisting of two open clusters, that form together from one and the same Giant Molecular Cloud. Amongst over 1600 open clusters known in our Galaxy, the only one well ascertained binary cluster is NGC 869/NGC 884 (known also as $h + \chi$ Persei). Subramaniam *et al.* [1] suggested a catalogue of 18 probable binary open star clusters, they considered for a good selection criterion: center-to-center separation of $\leq$20 pc; age difference between components either $\leq$ 10 Myr or their ages agree well within the uncertainties of their age determination. Our aim is to determine more precisely the reddening, distances and ages for the closely projected open clusters NGC 6755/NGC 6756, and confirm or disapprove their binarity.

2 Observation and Reductions

The clusters were observed on July 18, 1998, at the Rozhen National Astronomical Observatory of Bulgaria with the 2-m Ritchey-Chretien telescope equiped with 1024×1024 Photometrics CCD camera (CCD chip SITe, SI003AB with 24 μm pixel size that corresponds to 0.31 arcsec on the sky, a gain factor of 4.93 e/ADU, readout noise 5.1 e/px) and standard Johnson-Cousins filters. In the Table 1 we present the observing log.

Table 1. Exposure time [sec.]

Filter	U	B	V	R	I
NGC 6755	200	50	50	50	50
NGC 6756	300	75	50	50	50

The standard IRAF routines were used to reduce the data. Photometry was carried out with DAOPHOT II. Instrumental magnitudes were transformed to standard magnitudes using standard fields around cluster M92. We applied the following transformation relations:

$$
\begin{aligned}
u &= U + 4.185 - 0.247(U - B) + 0.811X \\
b &= B + 2.038 - 0.065(B - V) + 0.343X \\
v &= V + 1.545 + 0.119(B - V) + 0.190X \\
r &= R + 1.964 + 0.092(V - R) + 0.094X \\
i &= I + 2.552 - 0.043(R - I) + 0.050X
\end{aligned}
$$

were X is the airmass, capital letters represent standard magnitudes and color, and lower-case letters denote instrumental magnitudes. Figure 1 shows luminosity functions for both clusters.

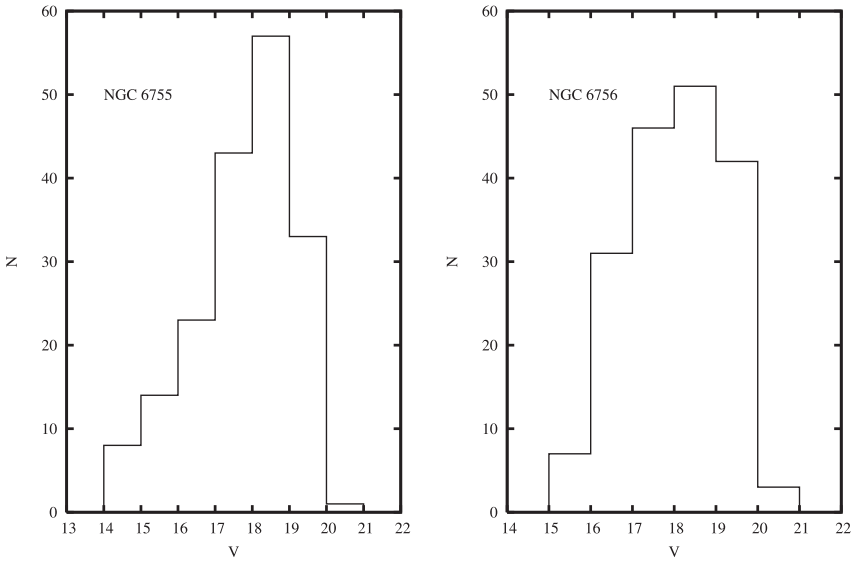

Figure 1. Luminosity functions.

3 Results and Discussion

In the Figure 2 we show color-color diagrams and reddening determinations for both clusters, the solid line is Schaerer *et al.* [2] ZAMS of stars for luminosity class V, dots denote cluster members before de-reddening, crosses denote cluster members after de-reddening. For NGC 6755 we assume color excess E_{B-V} = 0.87 $\pm$ 0.07 and E_{B-V} = 0.98 $\pm$ 0.07 for NGC 6756. We confirmed larger reddening in the direction of NGC 6756.

Figure 3 present age determinations, we use the isochrone from Schaerer *et al.* [2] with solar metallicity ($z = 0.02$). For NGC 6755 we found $\log(\text{age})$ = 8.19 (155 $\pm$ 8 Myr) and for NGC 6756 $\log(\text{age})$ = 8.35 (224 $\pm$ 8 Myr). The results of the age determinations for NGC 6755/NGC 6756 show a big age range, and we can not confirm their binarity based on age determination. We need wides field CCD photometry for a more conclusive result about the tidal link between the clusters.

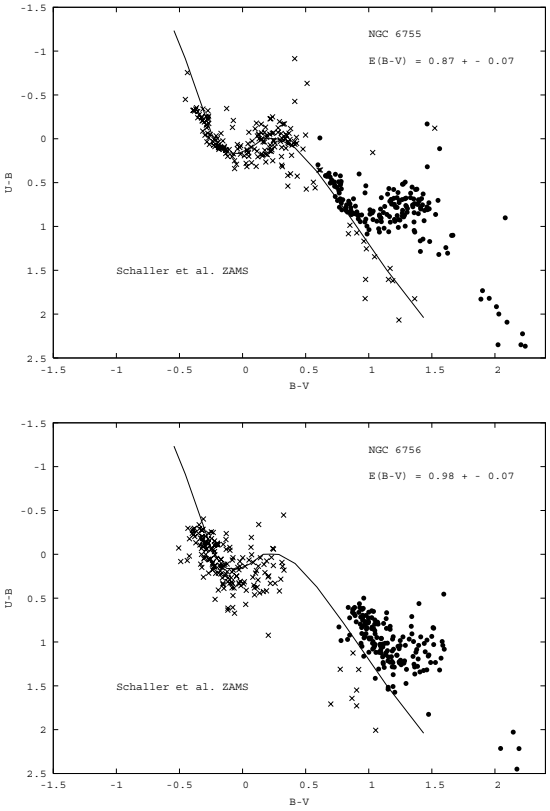

Figure 2. Color-color diagrams and reddening determinations.

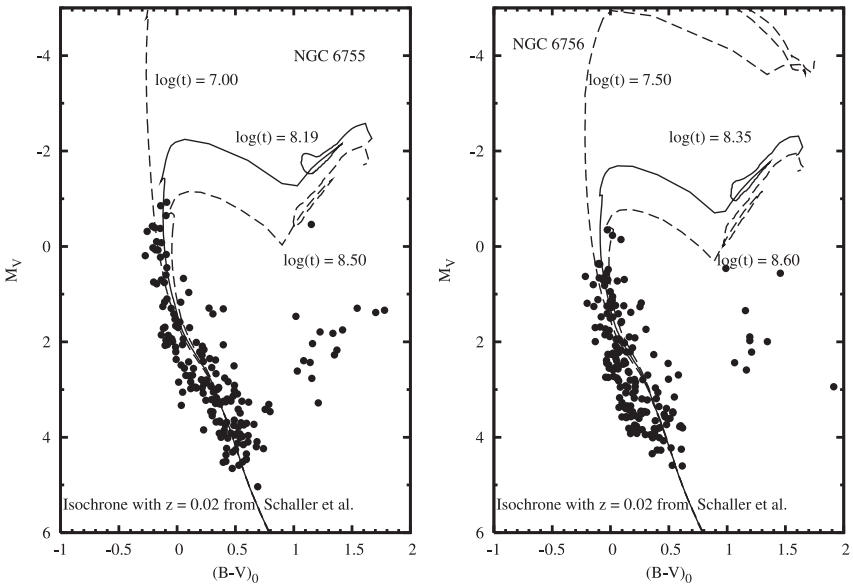

Figure 3. Age determinations.

References

[1] A. Subramaniam *et al.* (1995) *Astronomy and Astrophysics* **302** 86.
[2] D. Schaerer *et al.* (1993) *Astronomy and Astrophysics Supplement Series* **98** 523.