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Strømgren Photometry of Wide Visual Double Stars with G–Type Primaries, Most of Which Have Common Origin Components[1]

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ABSTRACT: We have performed *uvby* aperture photometry of wide visual double stars with G–type primaries. We chose our pairs in order to have minimum angular separation of their components 10″ and mainly less than 20″. It is shown that both components have similar photometric parameters. We infer that most of these double stars have components of *common origin*.

1. INTRODUCTION

Common origin components are often present in wide visual double stars (Abt 1988). We found a lot of them in our recent photometric studies as well (Sinachopoulos 1989, 1990, 1991). They are present even in the sample of Lindroos (1983, 1985), who studied photometrically wide double stars with B–type primaries. We suppose that there must be fewer in the sample of Oblak (1978, 1980, 1987), who studied wider double stars mainly for the HIPPARCOS mission.

Double stars with common origin components are astrophysically very interesting objects, since they have been formed together and therefore have the same age, metallicity, distance from the Sun, and their spectra show the same interstellar reddening. Their common astrophysical parameters enable a check of theories of stellar evolution. They can provide a key for understanding stellar formation mechanisms, and they provide, together with the physical binaries, an excellent tool for determining the main sequence locus and its width.

For this reason, we observed wide visual double stars with G–type primaries and small magnitude difference between the components in order to have adequate data for pairs which we suspected to have common origin components.

2. OBSERVATIONS & DATA

We used the 50-cm Strømgren Automatic Telescope at La Silla for the measurements of the present work. Seven nights were allocated to our programme in July 1991, but only two of them were photometric. For this reason, only the components of 66 double stars could be observed. With the exception of 11 pairs, which have been observed only once, we measured our targets on both nights in order to check them for variability.

The mean accuracy of our results is 0.008 mags for V, 0.004 for $(b-y)$, 0.006 for m_1, and 0.012 for c_1.

During the observations, we gave hightest priority to pairs with small magnitudes difference between their components. Thus, the mean magnitude differ-

[1]based on observations made at ESO, La Silla, Chile

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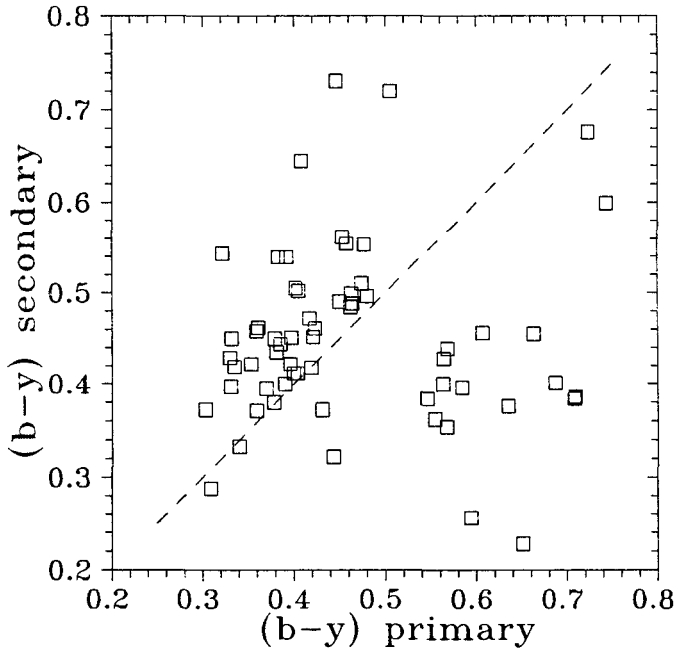

FIGURE 1. $(b-y)$ values of the components

ence of the observed components is $\Delta m = 0.8 \pm 0.6$ mags, the minimum 0.0, and the maximum 2.8 mags. We thus expected to select several double stars having secondaries with spectral types close to those of the primaries.

3. DISCUSSION

The results fulfilled the above expectations. The $(b-y)$ index is a temperature indicator of stellar atmospheres. G0 V stars have $(b-y) = 0.37 \pm 0.01$, and for K0 V $(b-y) = 0.48 \pm 0.02$ mags (Olsen 1984). For the same spectral types these values increase for giants and supergiants (Gray 1991).

In Figure 1, we present the $(b-y)$ values of the primaries *versus* the values of the secondaries. The mean $(b-y)$ value for both components observed is 0.47 $\pm$ 0.13 mags, but 50 (about 40%) of them are in the range 0.37 to 0.44 mags. Due to our selection of the double stars of our sample, $(b-y)$ differences of the components of the same double star may at most be up to a few hundredths of magnitude for the physical binaires or common origin components. In fact, 32 out of 62 pairs in our sample have $0^m.00 \leq \Delta(b-y) \leq 0^m.15$ and 27 out 62 have $0^m.0 \leq \Delta(b-y) \leq 0^m.1$. Since their angular separation is larger than $10''$, the probability that they are gravitationally bound is very low. Thus,they must be considered as double stars having components of common origin.

In addition, we remark that the so often criticized spectral types listed in WDS turned out to be better than often claimed.

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