

A Finding List for $\Delta\mu$ Binaries derived from a Comparison of HIPPARCOS Proper Motions with Long-term Averaged Data

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Abstract

The comparison of quasi-instantaneously measured HIPPARCOS proper motions with long-term averaged proper motions, derived from ground-based data, allows the identification of many stellar objects as $\Delta\mu$ binaries (Wielen et al., 1999, A&A 346, 675). We have used this method to find $\Delta\mu$ binaries among the fundamental stars, among the GC stars, and among the Tycho-2 stars. A finding list for about 4000 $\Delta\mu$ binaries is given under the URL <http://www.ari.uni-heidelberg.de/dmubin> in a machine-readable format. This information on the probable duplicity of the listed objects can be used for planning specific observing programs, for improving our knowledge of binary statistics, or for avoiding the use of these binaries in some astrophysical calibrations or as astrometric reference stars.

1. Astrometric catalogues used

In order to identify $\Delta\mu$ binaries (Wielen et al. 1999a) we compare the HIPPARCOS proper motions (ESA 1997), which are quasi-instantaneously measured within about three years, with long-term averaged, mean proper motions, which are derived by using ground-based data from a much longer observational period (often a century or more). If the difference $\Delta\mu$ between the short-term and the long-term proper motion is statistically significant, the object is probably a binary or a multiple system. The statistical significance of $\Delta\mu$ is measured by the test parameter $F_{\Delta\mu}$. If the errors of the proper-motion components were independent of the directions, $F_{\Delta\mu}$ would be equal to $\Delta\mu/(\text{mean error of } \Delta\mu)$. We take into account the non-isotropy of the errors of $\Delta\mu$ and the correlations between the components of $\Delta\mu$. A value of $F_{\Delta\mu} > 3.44$ corresponds to the same error probability as the familiar two-sided 3σ criterion, and is therefore used by us for identifying $\Delta\mu$ binaries.

The long-term averaged proper motions are partially taken from available astrometric catalogues; partially they are derived from the mean positions given in the ground-based catalogues and the positions in the HIPPARCOS Catalogue (we call this proper motion μ_0). The ground-based catalogues are corrected for systematic errors by comparing them with the HIPPARCOS Catalogue.

For determining various values of $\Delta\mu$ with respect to HIPPARCOS, we have used the following astrometric catalogues: FK5 (Fricke et al. 1988, 1991), RSup

(Schwan et al. 1993), GC (Boss et al. 1937), and TYCHO-2 (Hoeg et al. 2000). More details will be given in other papers. For the basic FK5 stars, Part I of the FK6 (Wielen et al. 1999b) gives already many additional informations (see also URL: <http://www.ari.uni-heidelberg.de/fk6>).

2. Finding list of $\Delta\mu$ binaries

A finding list for about 4000 $\Delta\mu$ binaries is given in the Internet under URL

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in a machine-readable format. The list gives identification numbers, F values, and other informations on these $\Delta\mu$ binaries. For many of these objects, the probable duplicity was hitherto unknown. The highest fraction of $\Delta\mu$ binaries occurs among the basic fundamental stars, because their proper motions are most accurately measured. Among the fainter stars, the fraction of identified $\Delta\mu$ binaries is smaller, due to the larger measuring errors. The highest sensitivity of our $\Delta\mu$ method for detecting binaries is reached for nearby stars.

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