17th NDAC report from Lund Observatory

WP8000: Double stars (Söderhjelm, Lindegren)

The observation and reduction of double stars with appreciably curved orbital motion over 2.5 years have been studied ($074 = C$). Observations were simulated from realistic sets of orbital parameters, magnitudes, and mass ratios, but reduced according to a 'linear' model, allowing independent proper motions for the two components but a common parallax. As expected, the actual astrometric errors of this solution are small as long as the 'curvature' is less than some 10–30 mas. On the other hand, the relatively few expected cases with large curvature are likely to be disclosed by a large $\chi^2$ value for the linear fit. Qualitatively similar results are found for astrometric binaries ($\rho < 0.1''$). On the whole, binary orbital motion during the short lifetime of HIPPARCOS seems to be a rather minor problem.

Simulations of binaries in the separation range 0.6–2.4" ($073 = C$) show increased astrometric errors for $\rho \sim 1.2''$ (one grid period) at low and moderate ecliptic latitudes ($|\beta| < 45^\circ$).

Current experiments concern $\delta$-a. triple and multiple stars. Provided that good prior information exists on the number of components and their relative positions (to $\sim 0.1''$), one usually obtains good solutions at least for systems with 3, 4, and 5 components.

The simulation program now includes the calculation of $\Delta\chi^2$ according to $075 = C$, and preliminary results show good correlation between various test statistics based on the distribution of the $\Delta\chi^2$ and the goodness-of-fit of the single-star solutions. This confirms the usefulness of $\Delta\chi^2$ for discovering new binaries and selecting the programme stars to be subjected to the double star analysis. A simple histogram representation of $\Delta\chi^2$ has been proposed for use in the real processing at RGO (075).

The data and format for output from the IDT Preprocessing and Location Estimator to the Double Star analysis have been specified ($076 = C$). This includes a specification of the algorithms to be used for compressing frame data to rectified signal parameters averaged over a FOV crossing.

Miscellaneous (Lindegren)

A software package ('SIMSET') for simulating input data for the Set Solution has been developed and delivered to CUO ($077 = C$). Data for a whole set (5 great circles) were generated at LO for test purposes and has been transferred to CUO in the tape format specified for the RGO/DSRI interface.

Working papers

C Söderhjelm 1986 June 11: HIPPARCOS binaries: Error increase at 1 grid-period
(C NDAC/LO/073)

C Söderhjelm 1986 June 18: HIPPARCOS reductions for multiple stars, III
(C NDAC/LO/074)

C Lindegren 1986 Aug 06: Estimation of $\Delta\chi^2$ from the Fourier parameter and information matrix
(C NDAC/LO/075)

C Lindegren 1986 Aug 13: Specification of output from the IDT Preprocessing and Location Estimator as required for the Double Star analysis
(C NDAC/LO/076)

C Lindegren 1986 Aug 25: "SIMSET": Simulation of input data for the Set Solution
(C NDAC/LO/077)