STRUVE – SPACE ASTROMETRY AND PHOTOMETRY PROJECT

A.E. ILIN, A.G. BUTKEVICH, M.S. CHUBEY, D.I. GORSHANOV
I.I. KANAYEV, T.R. KIRIAN, I.M. KOPYLOV, V.N. YERSHOV
Pulkovo Observatory, Russian Academy of Sciences, St.Petersburg 196140, Russia

The Space Astrometry and Photometry Project Struve is being designed at the Pulkovo Observatory in cooperation with other Russian space institutes. It is expected to be launched before 2010 with a duration of mission of at least 36 months.

The main objectives are to extend at milliarcsecond accuracy the Hipparcos satellite reference system to fainter objects including quasars and to get a second epoch for Hipparcos stars. The project Struve, along with the recently suggested project DIVA, will fill the intermediate place between Hipparcos and microarcsecond astrometry. Unlike DIVA, we propose far more extensive astrometric and photometric surveys.

We expect an Output Catalogue of 20 million stars (density of about 500 stars per square degree). A sky survey will be complete down to $V = 14$ (about 15 million stars), and selected objects down to $V = 19.5$ will be observed within a special program. The proper motions of the Hipparcos stars will be determined with an accuracy of about 0.1 mas/yr. The mean accuracy of star positions in the output catalogue is expected to be 0.6 mas which could be achieved by proper design of the satellite (symmetry, smooth rotation etc.), optics and the micrometer. A properly designed micrometer (with CCD arrays, special processors for image processing and the compression of the data flux to the ground station) will give the possibility of observing all objects of the sky down to a definite limiting magnitude.

ON THE POSSIBILITY OF IDENTIFICATION OF THE MOVING CELESTIAL OBJECTS OBSERVED WITH THE SPACE ASTROMETRIC TELESCOPE

O.P. BYKOV
Pulkovo Astronomical Observatory, Russia

In connection with the creation of the scientific grounds of the Russian Project named 'Struve' Space Astrometric System, the main principles of classification and identification of any celestial moving object observed with this System were formulated and basic algorithms were elaborated. These algorithms are invariable for a short or long observational arc, for a known or unknown heavenly body and for an artificial or natural celestial object.

For classification of observed celestial bodies the angular velocities of motion are used. These values are calculated from the statistical treatment of the 5 nearest spherical celestial body positions with a time interval between them near 7 seconds.

For an identification of well known sky objects ordinary procedure may be used by means of traditional ephemeris calculations. For an identification of unknown natural celestial bodies a special algorithm was developed. It uses a calculated angular velocity of moving object from one scan to another close scan of observations. Then, having several accurate positions of fixed object during 5-10 hours per day, we can determine an initial elliptical object's orbit by the Apparent Motion Parameters Method created at Pulkovo Observatory. It deals with a position of object, its angular velocity and acceleration, position's angle and a curvature of trajectory on a short observational arc. These last four quantities are named the Apparent Motion Parameters.

In spite of a preliminary character of the AMP-method orbits we can identify an observed object through a large interval of time, for example over 2-4 months after orbit determination. In this problem the observed and calculated angular velocities of the object's motion are very useful. They are new and important ephemeris parameters at the epoch of Space Telescope astrometric positional observations. Examples of simulations of orbit determinations will be presented.

J. Andersen (ed.), Highlights of Astronomy, Volume 11A, 585.