New integrated software package for minor planets

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Abstract

Yearly, starting in 1991, the ITA prepares software package STAMP which is a computer version of the corresponding volume of the EMP. Apart from reproducing tables of EMP, STAMP makes it possible to solve a number of problems connected with planning observations and processing their results, such as interpolation of ephemerides, identification of minor planet observations, statistical analysis of the distributions of elements and so on. As the package uses computed in advance data from EMP, which are storing in computer memory, it provides rather efficient means for solving problems connected with successive examination of data for great number of planets ('the group operations'). The apparent shortcommings of the package are restricted interval of the standard near-opposition ephemeris and its limited formal precision (5 arcsec). A certain inconvenience arises when the moments of time are close to the boundary between two consecutive years.

One more package, 'Ceres', intended for minor planet ephemeris calculation has been also deigned in ITA. Its computation possibilities depends on a built-in integrator RADAU by Everhart. The package enables ephemerides to be computed on the time interval 1950-2020 with full accounting for perturbations. But the package is detinated for computation of ephemerides for individual planets and does not provide a means of executing the group operations.

At present, a new integrated software package is under development in ITA (provisional title AMPLE - All Minor Planet Long-term Ephemerides) which is, in some sense, intermediate in method of operations between STAMP and Ceres and should combine their merits to some extent. AMPLE computes positions of planet on certain interval by the formulae of elliptic motion, but using sets of osculating elements obtained in afvance for a number of, generally speaking, nonuniformly distributed moments of time covering the whole interval. The spacing between moments of time, that is between knots of the net of osculating elements, is determined in the course of its creation from the condtion of conserving the preassigned accuracy of minor planet positions. It is supposed that such a net will be computed for numbered as well as for those unnumbered planets which have sufficiently reliable orbits. The net covers standard time span of 400 days and can be expanded as needed. Apart from ephemeris calculations AMPLE will give the chance to include the unnumbered planets in statistical analysis along with numbered ones.

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