Algorithms of the numerical simulation of the motion of large planets' satellites.

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A brief summary of results obtained by the authors on the process of development and application of algorithms of the numerical simulation of the motion of natural and artificial satellites of large planets and the Earth is presented. The using of the algorithms based on Kustaanheimo-Stiefel (KS) equations is substantiated.

It is shown by theoretical and practical outcomes that stabilizing effect of the KS-transformation may be considerable if investigating objects move near its central body having powerful zonal gravitational field. In particular speed of calculation of the space positions of inner satellites of planets increases in four times.

Principles of constructing Encke-type differential equations in KS-variables based on Keplerian intermediate solution are expounded. Results of application of these Encke-type equations in problems of numerical simulation of long-term orbital evolution of some satellites are considered. Results of numerical experiment points at the essential advantage of the Encke-type equations in comparison with another ones. The using of equations in variations of KS-variables improves accuracy of numerical integration almost by one order for the Earth's artificial satellites and by two order for the natural satellites.

New intermediate solution of differential equations of the perturbing motion of near equatorial satellite has been constructed in KS-space. The solution has been written in form of harmonic oscillator which frequency is calculated taking into account the influence of the second zonal harmonics of gravitational field of the central planet. Encke-type algorithms constructed on the basis of the new solution had been approved in problems of dynamics of set of natural satellites. Analysis of the results of numerical experiments shows that the using of new intermediate orbit for forecasting of the motion allows to improve accuracy of numerical integration almost by two order.