18th IAA SYMPOSIUM ON VISIONS AND STRATEGIES FOR THE FUTURE (D4)
Innovative Concepts and Technologies (1)

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DYNAMIC PROPERTIES OF SMALL CELESTIAL BODY AND THEIR SENSIBILITY TO THE APPROXIMATION OF THE BODY SURFACE

Abstract

Mission to a small celestial body implies a rigorous analysis of spacecraft dynamics in vicinity of such body, which in turn requires an assessment of its gravitational field. Construction of a model for gravitational field of a comet or asteroid is quite a difficult problem due to complex geometry of such bodies and uncertainties in their composition. Meanwhile, acquisition of data regarding the surfaces of small celestial bodies makes it possible to improve the triangulation grids approximating these surfaces, in particular, to increase their order, determined by the number of vertices, edges and faces. Refinement of the surface approximation allows one to refine the inertial characteristics of the body, such as the moments of inertia, that is, the components of the Euler-Poinsot tensor, of various orders. For a number of known small celestial bodies for which there are several triangulation grids of different order of accuracy, in particular, for the asteroids (433) Eros, (21) Lutetia, and also for the comet (67) Churyumov-Gerasimenko, the components of the tensors of Euler-Poinsot up to fourth order are calculated and compared. Also, using such approximations, the locations of libration points are found and their comparative analysis is carried out.