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METHOD OF OPTIMIZATION OF THE SERVICING SPACE-BASED SYSTEM ORBITS AND  
DETACHED UNITS MANEUVERES PARAMETERS IN THE PROBLEM OF ON-ORBIT-SERVICING  
OF THE GIVEN MULTI-SATELLITE SPACE INFRASTRUCTURE

**Abstract**

Over the last years many organizations in different countries have been involved in development of various technical aspects of on-orbit satellite servicing, which to a great extent predetermines the characteristics of next-generation space systems. One of the main problems to be considered for developing next-generation space systems basing on on-orbit-servicing concept is developing the special methods for optimization of orbital structure of the servicing space-based system equipped with detached units meant for providing on-orbit-servicing of the given multi-satellite infrastructure, as well as simultaneous optimization of the unit maneuvers parameters during the on-orbit-servicing process. The problem mentioned is considered in the present paper. The method suggested combines the questions of servicing system orbit optimization and detached units maneuvers optimization. The optimization of orbital structure of the servicing system is based on using so-called nodally-synchronized circular and elliptic orbits (without relative nodal regression). This kind of orbits for the satellites of the servicing system provides minimum angular shift between servicing satellite's and arbitrary chosen serviced satellite's nodes, which leads to minimization of the average Delta-V (fuel) for orbital maneuver of the unit detached from the servicing satellite and transferring to its destination - the fixed serviced satellite. The special optimization of the concrete unit maneuver is implemented by the criterion of minimum Delta-V (fuel) with constraint on the maneuver duration. Main features of the method are illustrated by the numerical results presented. Particularly it is shown that the method suggested provides rational design of the servicing space-based system orbits with optimal on-orbit-servicing maneuvers of the detached units.