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ON A METHOD OF CONTROLLING THE ANGLE OF ENTRY IN THE ATMOSPHERE

Abstract

The angle of entry in the atmosphere, as a rule, is the most important parameter of the orbit of the spacecraft during the descent in the Earth's atmosphere, as It depends essentially on the parameters path in the atmosphere: overload, thermodynamic heating, diffusion, and others. The angle of entry depends on the magnitude of the deorbit burn and its direction.

Implementation errors of the deorbit burn, and as a result, the program entry angle can occur for various reasons: the imperfection of actuators and their mathematical models, errors in the task orientation and navigation, and others. Therefore, an important task is to correct the angle of the input required for the implementation of the program path descent.

Given that the entry angle is one of the most important parameter in the descent in the Earth's atmosphere, the issue of bringing the angle of entry in the Earth's atmosphere to a predetermined value. The problem is resolved by controlling the flight path based on the regulation of the aerodynamic forces by changing the angle of heel. The restrictions that take into account the physical feasibility of control and its stability are considered. With the use of approach based on the decomposition model motion of the spacecraft and the theory of identification, using the method of precise placement of the poles applied to affine system synthesized algorithm for solving the boundary value problem and obtained the analytical solution of the problem of correcting the angle of entry in the Earth's atmosphere. In the numerical examples shown that 3-5 iterations sufficient to reduce the angle deviation from the programmed value input to zero and thus it is possible to perform realtime combined synthesis control the angle of entry in the Earth's atmosphere.