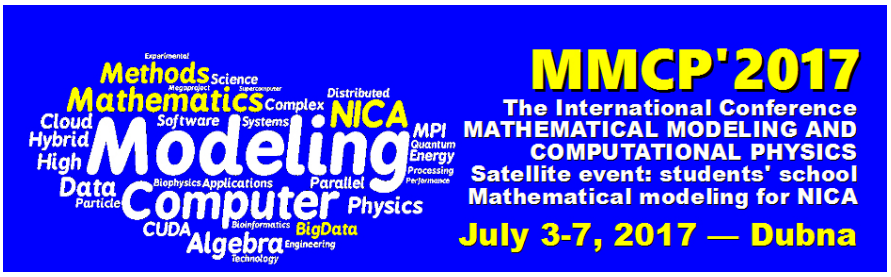

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Symbolic-numerical modeling of the influence of damping moments on satellite dynamics

Thursday, July 6, 2017 2:45 PM (15 minutes)

The dynamics of a satellite in a circular orbit under the influence of gravitational and active damping torques, which are depend on the projections of the angular velocity of the satellite is investigated [1]. Such active damping torques are proportional to the projections of angular velocities onto the axes of the satellite body coordinate system and can be provided by using the angular velocity sensor. Computer algebra methods for determination of all equilibrium orientations of the satellite in the orbital coordinate system with given damping torque and given principal central moments of inertia are used. The equilibrium orientations are determined by real roots of the system of nonlinear algebraic equations. An algorithm for construction of the Groebner basis for solving the problem was applied.
The conditions of the equilibria existence depending on three damping parameters were obtained by the analysis of real roots of algebraic equations from the constructed Groebner basis.
The conditions of asymptotic stability of the satellite's equilibria were determined as a result of the analysis of linearized equations of motion using Routh-Hurwitz criterion. The integration of the differential equations of satellite attitude motion has been done numerically. The transition decay processes of spatial oscillations of the satellite at different damping parameters have been studied.

Short biography note

[1] V. A Sarychev, Problems of orientation of satellites, Itogi Nauki i Tekhniki, Ser. "Space Research", Vol. 11. Moscow: VINITI, 1978

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