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QUASI-OPTIMAL DECELERATION OF ROTATIONS OF A GYROSTAT WITH INTERNAL DEGREE OF FREEDOM IN A RESISTIVE MEDIUM

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Abstract. The problem of the time-dependent quasi-optimal deceleration of dynamically symmetric rigid body rotations under a small control torque in the ellipsoidal domain with close unequal values of the ellipsoid's semiaxes is studied. It is assumed that the body contains a spherical cavity filled with a highly viscous fluid (assuming small Reynolds numbers). The body is assumed to have a moving mass connected to it via elastic coupling with quadratic dissipation. The moving mass is modeling the loosely attached elements in a space vehicle, which can significantly affect the vehicle's motion relative to its center of mass during a long period of time. In addition, the body is acted upon by a small medium resistance torque. The problem is solved asymptotically, based on the procedure of averaging the precession-type motion over the phase. The qualitative properties of quasi-optimal motion are analyzed and the corresponding graphs are presented.

Key words: Deceleration, fluid, mass, resisting medium, averaging.

1. INTRODUCTION

The desirable development in the field of research describing the problem of dynamics and control of rigid bodies moving about a fixed point would imply that the bodies were not absolutely rigid but rather close to ideal models. The need for the analysis of the influence of various deviations from the ideal states is caused by

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