

PERTURBED MOTIONS OF A RIGID BODY UNDER THE ACTION OF UNSTEADY TORQUES

Perturbed motion of a rigid body, close to the Lagrange case, under the action of restoring and perturbation torques that are slowly varying in time is investigated in the work. The motion in Lagrange's case can be regarded as a generating motion of a rigid body, which takes into account the main torques acting on the body. The perturbed motions of a rigid body, close to the Lagrange case, were considered with the help of the averaging method in [1, 2]. We describe an averaging procedure for slow variables of a perturbed motion of a rigid body, close to the Lagrange case. Conditions for the possibility of averaging the equations of motion with respect to the nutation phase angle are presented and averaging procedure for slow variables of a perturbed motion of a rigid body in the first approximation is described. The averaged system of equations is obtained and qualitative analysis of motion is conducted.

As an example of the developed procedure, we investigate a perturbed motion, close to Lagrange's case, taking into account the torques acting on a rigid body from the external medium. The averaged system is integrated numerically for various initial conditions and parameters of the problem. The graphs of the solutions were built. A new class of rotational motions of a dynamically symmetric rigid body about a fixed point has been investigated with unsteady restoring and perturbation torques being taken into account.

1. Chernousko F., Akulenko L., Leshchenko D. Evolution of motions of a rigid body about its center of mass (Springer, 2017).
2. Akulenko L., Zinkevich Ya., Kozachenko T., Leshchenko D. The evolution of motions of a rigid body close to the Lagrange case under the action of an unsteady torque, *J. Appl. Math. Mech.*, **82** (2017), 79–84.