На рис. 2 приведен график движения КА на временном промежутке порядка 2 лет с управлением, полученным при решении оптимизационной задачи со смешанным функционалом. начальные данные такие же как и для первого графика.

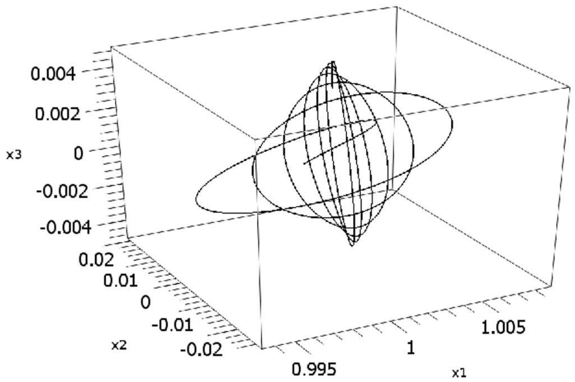

Рис. 2.

Графики построены в рамках модели круговой ограниченной задачи трех тел во вращающейся системе координат.

Работа выполнена при поддержке гранта СПбГУ 9.37.345.2015.

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ON THE INTERCEPTION CELESTIAL BODY PROBLEM IN THE NEAR-EARTH SPACE WITH USING THE COLLINEAR LIBRATION POINTS

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Consider the motion of an celestial body like asteroid under the gravitational attractions of two primaries masses: the Earth and the Sun. The study of the motion of such celestial bodes is known as restricted three body problem. Furthermore, if we assume that primaries are moving in circle around their center of mass then we get the model of the circular restricted three body problem. Under this model, the equations of control motion of a celestial body in a rotating reference frame $Ox_1x_2x_3$ using Hill's problem for solar potential can be represented in the form

$$\dot{x}_1 = x_2 + y_1, \quad \dot{y}_1 = -\frac{3x_1}{\|\mathbf{x}\|^3} + 2x_1 + y_2 + u_1,$$

$$\dot{x}_2 = -x_1 + y_2, \quad \dot{y}_2 = -\frac{3x_2}{\|\mathbf{x}\|^3} - x_2 - y_1 + u_2,$$

$$\dot{x}_3 = y_3, \quad \dot{y}_3 = -\frac{3x_3}{\|\mathbf{x}\|^3} - x_3 + u_3,$$

where $\mathbf{x} = \langle \mathbf{x_1}; \mathbf{x_2}; \mathbf{x_3} \rangle$ is coordinate vector of the celestial body, $\mathbf{y} = \langle \mathbf{y_1}; \mathbf{y_2}; \mathbf{y_3} \rangle$ is an impulse vector, and $\mathbf{u} = \langle \mathbf{u_1}; \mathbf{u_2}; \mathbf{u_3} \rangle$ is the acceleration vector [1]. The center of mass of the Earth coincides with the origin of the coordinate system, while the Ox_1 axis is directed along the axis connecting the centers of mass of the Earth and the Sun. $\|\cdot\|$ is the Euclidean norm of a vector. The libration points L_1 and L_2 in the rotating coordinate system are stationary and have coordinates $\mathbf{x}^* = \langle \mathbf{1}; \mathbf{0}; \mathbf{0} \rangle$, $\mathbf{y}^* = \langle \mathbf{0}; \mathbf{1}; \mathbf{0} \rangle$ and $\mathbf{x}^{**} = \langle -\mathbf{1}; \mathbf{0}; \mathbf{0} \rangle$, $\mathbf{y}^{**} = \langle \mathbf{0}; -\mathbf{1}; \mathbf{0} \rangle$, respectively.

It is known that the libration points L_1 and L_2 are unstable. Hence, the question of retention of the celestial bodies motion in the neighborhood of these points is relevant. In some cases, instability may be a positive factor that helps reduce energy costs while maneuvering [2]. To intercept maneuvers in near-Earth space in [3] the developed scheme maneuvering is described. This scheme involves the selection and calculation of the orbit of expectations, and the construction of the active part of the trajectory.

For example, to solve the comet and asteroid hazard problem explores the idea of impact on a potentially dangerous object to alter its trajectory and thus prevent the threat of collision. To achieve this goal in [4] proposed to use gravity assist in near-Earth space. It uses properties of unstable trajectory collision. In this study, the use of another type of instability is proposed, namely, the instability property of the collinear libration points [3].

The study presents the results of research and numerical construction of the set of trajectories to intercept potentially dangerous objects in the near-Earth space.

Aknowledgement. The author acknowledge Saint-Petersburg State University for a research grant 9.37.345.2015

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ON THE STABILITY OF PERIODIC POINTS OF THE THREE-DIMENSIONAL DIFFEOMORPHISMS

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Smooth C^r-diffeomorphisms of the three-dimensional space with a hyperbolic fixed point at the origin are considered, where $r \geqslant 1$ (case $r = \infty$ is included). The existence of non-transversal homoclinic point is assumed; i.e. intersection of the stable and unstable manifolds contains a point, referred to as a homoclinic point, and this point is a point of tangency of these manifolds.