

# Stability of basis property of a type of problems with nonlocal perturbation of boundary conditions

Bayandy Bostanov<sup>1</sup>, E.S. Temirbekov<sup>2</sup> Matin Dauren<sup>1</sup>

<sup>1</sup> *Faculty of mechanics and mathematics, L.N. Gumilyov Eurasian National University, Astana, Kazakhstan*

<sup>2</sup> *U.A.Dzholdasbekov IMMash, Almaty, Kazakhstan*

*bostanov bayandy@mail.ru, temirbekove@mail.ru, d.matin@mail.ru*

## Abstract:

We consider the problem of determining the position of the conjugate points of a combined trajectory, ensuring the conditions of tangency, continuity, and equality of the radius of curvature. When the arcs of a circular and elliptical trajectory are conjugated at the junction where there is a common tangent, a jump in the centrifugal force occurs due to the inequality of the radii of curvature, which will lead to a shock / 1-2 /.

In order to avoid a jump in curvature, the method of inserting a second-order smoothing curve (the transition cone) is applied. There are known methods of continuous, smooth connection of trajectories, which include contours, splines. With such conjugations, the conditions of tangency and continuity of two arcs of curves are satisfied, but the equality condition for the radii of curvature of these curves at the junction point is not satisfied. A mathematical condition for unstressed conjugation of trajectories was defined. Setting the starting point of the connection and using the condition of smoothness (second-order smoothness), one can determine the end point of the transition curve. The process is proposed to be modeled by a rocking mechanism, which allows to visually, quickly and effectively determine the position of the finish point on the circle. Using the method of determining the position of the conjugate points based on the kinematics of the rocking mechanism, it is possible to smoothly join conical arcs satisfying the conditions of continuity, tangency and equality of curvature and to create on their basis new models of treadmills (trajectories) from conical arcs that allow eliminating unwanted impact effects.

**2010 Mathematics Subject Classification:** 35J05, 35J08, 35J25

## REFERENCES

- [1] Temirbekov E.S., Bostanov B.O.: Analiticheskoye opredeleniye plavnogo perekhoda konturov detaley odezhdy. Izvestiya vysshikh uchebnykh zavedeniy. Technology of the textile industry. 365, 160–165 (2016)
- [2] Bostanov, B.O., Temirbekov, E.S., Dudkin, M.V.: Planetarnyy vibrovobuditel' s ellipticheskoy dorozhkoy. Proceedings of the All-Russian Scientific and Technical Conference

"The Role of Mechanics in Creating Effective Materials, Constructions and Machines of the 21st Century", pp.66–70. SibADI, Omsk (2006)

- [3] Shpigelman, M.: Ellipsy, paraboly i giperboly v sovmeshchennykh polyarno-dekartovykh koordinatakh., M., 2006.-460 p.
- [4] Fox A.,Pratt M.: Vychislitel'naya geometriya, Application in design and production: Per. with the English .- M .: Mir, 1982.-304 p.