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On rotational solutions for elliptically excited pendulum. (English) Zbl 1242.70023
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Summary: The author considers the planar rotational motion of the mathematical pendulum with its pivot oscillating both vertically and horizontally, so the trajectory of the pivot is an ellipse close to a circle. The analysis is based on the exact rotational solutions in the case of circular pivot trajectory and zero gravity. The conditions for existence and stability of such solutions are derived. Assuming that the amplitudes of excitations are not small while the pivot trajectory has small ellipticity the approximate solutions are found both for high and small linear dampings. Comparison between approximate and numerical solutions is made for different values of the damping parameter.

MSC:

70F20 Holonomic systems related to the dynamics of a system of particles

Cited in **3** Documents

Full Text: [DOI](#) [arXiv](#)

References:

- [1] Lenci, S.; Pavlovskaja, E.; Rega, G.; Wiercigroch, M., *J. sound vibration*, 310, 243, (2008)
- [2] Xu, X.; Wiercigroch, M., *Nonlinear dyn.*, 47, 311, (2007)
- [3] Bogolyubov, N.N.; Mitropol'skii, Yu.A., *Asymptotic methods in the theory of nonlinear oscillations*, (1961), Gordon and Breach New York · [Zbl 0151.12201](#)
- [4] Seyranian, A.P.; Yabuno, H.; Tsumoto, K., *Dokl. phys.*, 50, 9, 467, (2005)
- [5] Horton, B.; Sieber, J.; Thompson, J.M.T.; Wiercigroch, M., *Dynamics of the elliptically excited pendulum*, (11 March 2008)
- [6] Blekhman, I.I., *Izv. AN SSSR, OTN*, 8, 79, (1954), (in Russian)
- [7] Blekhman, I.I., *Vibrations in engineering. A handbook. vol. 2. vibrations of nonlinear mechanical systems*, (1979), Mashinostroenie Moscow, (in Russian)
- [8] Blekhman, I.I., *Vibrational mechanics. nonlinear dynamic effects, general approach, applications*, (2000), World Scientific Singapore, 509 pp
- [9] Akulenko, L.D., *J. appl. math. mech.*, 65, 5, 817, (2001)
- [10] Trueba, J.L.; Baltanás, J.P.; Sanjuán, M.A.F., *Chaos solitons fractals*, 15, 911, (2003)
- [11] Fidlin, A.; Thomsen, J.J., *Int. J. non-linear mech.*, 43, 7, 569, (2008)
- [12] Belyakov, A.O.; Seyranian, A.P., *Dokl. phys.*, 55, 2, 99, (2010)
- [13] Nayfeh, A.H., *Perturbation methods*, (1973), Wiley-Interscience New York, 425 pp · [Zbl 0375.35005](#)
- [14] Volosov, V.M.; Morgunov, B.I., *Averaging method in the theory of nonlinear oscillatory systems*, (1971), MSU Moscow · [Zbl 0232.70021](#)
- [15] Belyakov, A.O.; Seyranian, A.P.; Luongo, A., *Physica D*, 238, 1589, (2009)

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