STEADY MOTIONS OF THE ONE-WHEELED ROBOT WITH ASYMMETRICALLY DISPOSED FLYWHEEL

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A one-wheeled robot-gyrostat are modeled by a heavy round disk with a balanced rotating flywheel. Disk rolls without sliding on a motionless horizontal absolutely rough plane. The disk and the flywheel dynamic symmetry polar axes make a constant any size angle β with each other. For robot-gyrostat as a nonholonomic system the steady motions family is found, their existence conditions and stability are obtained. Analytical, numerical, graphic research is realized by means of package Mathematica7 and presented in the form of computer animations, plots, parametrized by the flywheel angular momentum, initial motion conditions and the angle β.

Unlike a symmetric case $\beta = 0$ [1-3] the represented in work Chaplygin's form motion equations depend on a disk spin angle. Routhian analogue and the changed potential energy of the system are built. Steady motions are obtained and their stability is investigated. The physical realizability of the motion equations solutions is checked up on a sign of a vertical reaction in a disk with a horizontal plane contact point.

References

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