Modelling and numerical simulation of an ellipsoidal rigid body moving on horizontal surface

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Abstract: The paper is devoted to mathematical modelling and numerical investigations of dynamics of a full ellipsoid of revolution in contact with plane and horizontal base. This system is a special case of the Celtic stone (in the sense of mathematical modelling) and possesses the commonly known property: if set in fast rotational motion about shorter semi-axis, undergoes transition to rotational motion about longer semi-axis (the body undergoes rotation about horizontal axis and the mass centre rises up). It is assumed that it is a system with elliptic frictional contact with variable eccentricity and fully developed sliding. The aim of this work is to test effectiveness of the developed approximate models of friction force and moment, based on generalizations of Padé approximants and coupled with rolling resistance, by the comparison of the simulation results with those obtained by the use of models with exact integral expressions for friction force and torque components.

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