

Motion and Stability of an Elastic Heavy Top

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Motion and stability of an elastic top with stress-free surface and a fixed point moving in a gravitational field is considered. The investigation is based on a direct approach in the energy momentum method split into two steps. The deformation of the top due to the gravitation and an arbitrary rotation is considered first and after that – the motion of the deformed top as a rigid one. This separation is possible since the elastic deformation is assumed static during the motion which leads to a relative equilibrium state of the top. It is stable if the top is in a stable state with respect to both of them – the deformation and the motion. The Koiter's definition for nonlinear stability with respect to the deformation and the usual Lagrange definition for stability of the motion of the deformed top as a rigid one are adopted. Relative equilibrium states are determined and criteria for stability are proved. The obtained results are applied for the case of a sleeping heavy top when the top is an elastic circular cylinder.

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