NONLINEAR DYNAMICS OF A UNIFORM SELF-GRAVITATING ELLIPSOID

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Equations are derived, which describe in a simplified way the newtonian dynamics of a selfgravitating ellipsoidal body. For the equation of state at which a spherical star is unstable, it is obtained, that contraction to a singularity happens only in a pure spherical collapse, and deviations from the spherical symmetry stop the contraction by the stabilising action of nonlinear nonspherical oscillations. A real collapse happens after damping of the oscillations due to energy losses, shock wave formation or viscosity. Detailed analysis of the nonlinear oscillations of a spheroid is performed using a Poincaré map construction. Regions of regular and chaotic oscillations are localized on this map.