On the rotation of a triaxial rigid body. Fourier series expansions

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We propose here a new approach to the rotation of a triaxial rigid body under a gravitational field. There is no assumption on the axes of inertia.

It is well known that elliptic functions appear in the solution of the Euler equations in the free rotation of a triaxial rigid body. Let us assume that the gravitational field is a perturbation (which is true in most of the celestial bodies). Our approach consists of using the solution of the unperturbed part (that contains elliptic functions) to expand the perturbation in a Fourier series, which coefficients are polynomials of the Jacobian nome. These series converge very fast, and thus, with only few terms a good approximation is obtained. Once the expansion is obtained, it is possible to apply to it a Lie-transformation. Several application to artificial and natural bodies have been carried out.