

On Normalization and Symmetrization of Hamiltonian Systems

V.Ph.Zhuravlev, A.G. Petrov
Institute for Problems in Mechanics
Russian Academy of Sciences
Moscow, Russia

Abstract

A normal form of a Hamiltonian system near an equilibrium point has two main properties: a) Taylor expansion of the normal form has the simplest form (It includes the so called resonant terms only); b) its linear part commutes with a nonlinear one. Property a) is a definition of a normal form. It is used for the normalization procedure. Property b) is used to build asymptotic solutions, to analyze stability etc. So, it is used to achieve the main goals. However, these goals can be reached directly, by using property b) only, without the Taylor expansion usage. There are a number of examples, where a symmetrized form of Hamiltonian is sought for: a plane restricted problem of three bodies in a resonance; a problem on a rocking spring; a spherical pendulum with a space vibrating point etc.

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