Nonlinear Sciences > Exactly Solvable and Integrable Systems

Differential Galois theory and Integrability

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This paper is an overview of our works which are related to investigations of the integrability of natural Hamiltonian systems with homogeneous potentials and Newton's equations with homogeneous velocity independent forces. The two types of integrability obstructions for these systems are presented. The first, local ones, are related to the analysis of the differential Galois group of variational equations along a non-equilibrium particular solution. The second, global ones, are obtained from the simultaneous analysis of variational equations related to all particular solutions belonging to a certain class. The marriage of these two types of the integrability obstructions enables to realise the classification programme of all integrable homogeneous systems. The main steps of the integrability analysis for systems with two and more degrees of freedom as well as new integrable systems are shown.

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