Geometric Integration of Hamiltonian Systems by Solvable Structures

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Solvable structures provide a geometric method for integrating involutive distributions on manifolds. In this talk, we investigate solvable structures associated with the distribution generated by a completely integrable Hamiltonian vector field X_H on a $2n$-dimensional symplectic manifold M.
We prove that X_H admits a family of solvable structures formed by $2n$ Hamiltonian vector fields on the extended phase space $\mathbb{R} \times M$. The integration of the corresponding Pfaffian forms leads to the action-angle variables of the system and to explicit solutions of Hamilton's equations. In this way, the proposed framework yields a geometric reinterpretation of Liouville integrability and provides a new approach to the construction of action-angle variables.
The general theory is illustrated by the rational Calogero–Moser system and the open Toda lattice.