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Integrable Magnetic Flows on Spheres and Nonholonomic Mechanics

Abstract:

We introduce and study the Chaplygin systems with gyroscopic forces. We put a special emphasis on the important subclass of such systems with magnetic forces. In a reduction, we construct Hamiltonian magnetic systems on spheres S^n . We prove the integrability of the latter systems for $n = 2, 3, 4$, and 5 . We conjecture the integrability of those systems for all n . This is based on joint work with Borislav Gajić and Bozidar Jovanovic and the following papers:

- [1] Dragović, V., Gajić, B., Jovanović, B., Demchenko's nonholonomic case of a gyroscopic ball rolling without sliding over a sphere after his 1923 Belgrade doctoral thesis, Theor. Appl. Mech. (2020)
- [2] Dragović, V., Gajić, B., Jovanović, B., Gyroscopic Chaplygin systems and integrable magnetic flows on spheres, J. Nonlinear Sci. (2023)
- [3] Dragović V., Gajić, B., Jovanović, B., Integrability of homogeneous exact magnetic flows on spheres, arXiv: 2504.20515