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Manuel de León, David Martín de Diego, Miguel Vaquero

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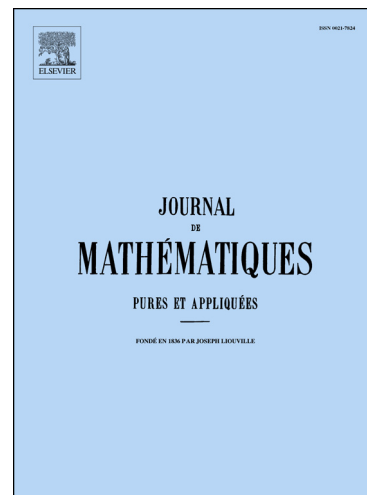
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Hamilton-Jacobi theory, Symmetries and Coisotropic Reduction

Manuel de León¹, David Martín de Diego², Miguel Vaquero³

*Instituto de Ciencias Matemáticas, ICMAT,
c\ Nicolás Cabrera, nº 13-15, Campus Cantoblanco, UAM,
28049 Madrid, Spain*

Abstract

Reduction theory has played a major role in the study of Hamiltonian systems. Whilst the Hamilton-Jacobi theory is one of the main tools to integrate the dynamics of certain Hamiltonian problems and a topic of research on its own. Moreover, the construction of several symplectic integrators relies on approximations of a complete solution of the Hamilton-Jacobi equation. The natural question that we address in this paper is how these two topics (reduction and Hamilton-Jacobi theory) fit together. We obtain a reduction and reconstruction procedure for the Hamilton-Jacobi equation with symmetries, even in a generalized sense to be clarified below. Several applications and relations to other reduction of the Hamilton-Jacobi theory are shown in the last section of the paper. It is remarkable that as by-product we obtain a generalization of the Ge-Marsden reduction procedure ([18]) and the results in [17]. Quite surprisingly, the classical ansätze available in the literature to solve the Hamilton-Jacobi equation (see [2, 19]) are also particular instances of our framework.

Keywords: Hamilton-Jacobi theory, reduction, symmetries, Lagrangian submanifolds.

¹mdeleon@icmat.es

²david.martin@icmat.es

³miguel.vaquero@icmat.es

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