The link between Lagrange–Poincaré and Poisson–Poincaré reduction

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Abstract

First-order covariant Lagrangian field theories are described on fiber bundles and their first jet spaces. When a Lie group G acts freely, properly, preserving the fibers of the bundle and the Lagrangian density is G-invariant, a G-principal connection can be used to split the quotient of the first jet space to study a reduced version of the problem. This procedure is called Lagrange–Poincaré reduction [2].

In a similar fashion, the covariant bracket formulation of Hamiltonian field theories can be reduced using the presence of a symmetry to split a polysymplectic space. In this talk we show this so called Poisson–Poincaré reduction procedure as introduced in [1] and relate it with Lagrange–Poincaré reduction via a Legendre transformation.

References

[1] M. A. Berbel and M. Castrillón López. Poisson–Poincaré reduction for field theories. *J. Phys. A*, 191(104879):1–23, 2023.

[2] D. C. P. Ellis, F. Gay-Balmaz, D. D. Holm, and T. S. Ratiu. Lagrange-Poincaré field equations. *J. Geom. Phys.*, 61(11):2120–2146, 2011.