

REDUCTION (BY STAGES) OF LAGRANGE-POINCARÉ BUNDLES.

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ABSTRACT. In classical mechanics, systems are often described by a Lagrangian defined on the tangent bundle TQ of a physical space given by a manifold Q . Symmetries of the system, encoded by the action of a Lie group G , are used to reduce the Lagrangian to the quotient bundle TQ/G . The reduced Lagrangian completely describes the original system, but it is defined on a vector bundle which may not be a tangent bundle, in fact, each affine connection on $Q \rightarrow Q/G$ provides the identification $TQ/G \cong T(Q/G) \oplus \tilde{\mathfrak{g}}$, where $\tilde{\mathfrak{g}}$ is the adjoint bundle. Thus, reduction by stages (the process of reducing repeatedly by several groups) needs a formulation of Lagrangian mechanics in a wider category than tangent bundles: Lagrange-Poincaré bundles. This talk reviews the formalism of Lagrange-Poincaré bundles and presents a joint work with Marco Castrillón López that answers affirmatively a question posed in [1]: The reduction procedure can be done in Lagrange-Poincaré bundles which do not necessarily come from reducing a tangent bundle.

Keywords: Lagrangian reduction, reduction by stages, Lagrange-Poincaré bundles.

REFERENCES

- [1] H. Cendra, J.E. Marsden, T.S. Ratiu, *Lagrangian reduction by stages*, Mem. Amer. Math. Soc. **152** (2001), no. 722.