The Lie-Palais Theorem

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Abstract.
In this talk we present a more general version of the well-know Lie-Palais Theorem. The Lie-Palais Theorem, which is related to the fundamentals of Sophus Lie's theory, gives an answer to the following question: are the actions of Lie algebras consequences of the actions of Lie groups? This theorem was originally proved by Sophus Lie in a local context and later by Richard Palais, who proved the result as a global result. Specifically, Palais proved that the infinitesimal action θ of a finite dimension Lie algebra $\mathfrak{g}$ in a differentiable manifold M comes from a smooth action of a Lie group on M, if all vector fiels $\theta(X)$ are complete in M (see [2]).

As the years passed, this theorem was developed in lots of versions and applied in the most diverse situations. In our version, in the context presented in [3], we relax the hypothesis that all vector fields $\theta(X)$ are complete in M. There exists a proof (see [1]) for a result similar to the one we prove here, but they are different and produced in totally independent ways.

References

[1] Hilgert J., Neeb K-H. Structure and Geometry of Lie Groups. SpringerMonogr. Math. Heidelberg: Springer 2012.

[2] Palais, R. S. A global formulation of the Lie theory of transportation groups. Mem. Amer. Math. Soc. 22, 1957.

[3] San Martin L.A.B. Grupos de Lie. Editora Unicamp, 2016.