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Structure theory of naturally reductive spaces

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Abstract: This talk is about naturally reductive spaces. A (locally) naturally reductive space is a Riemannian manifold together with a metric connection with parallel curvature and parallel skew torsion. When the torsion is zero, then the space is locally symmetric.

Naturally reductive spaces are, as the name alludes to, the most natural class of Riemannian homogeneous spaces. For example naturally reductive connections have the same geodesics as the Levi-Civita connection.

The aim of this talk is to present a general construction of naturally reductive spaces. This generalizes the naturally reductive structures on 2-step nilpotent Lie groups by Gordon. This construction is also closely related to the double extension of a quadratic Lie algebra by Medina and Revoy. Furthermore, I will show that this construction in fact exhausts all naturally reductive spaces. Thus it induces a general formula for any naturally reductive space which can for example be used to classify naturally reductive spaces.

