Gancarcewicz, J.; **Rahmani, N.**

Horizontal lift of linear connections to vector bundles associated with the principal bundle of linear frames. (English) Zbl 0793.53017

Szenthe, J. (ed.) et al., Differential geometry and its applications. Proceedings of a colloquium, held in Eger, Hungary, August 20-25, 1989, organized by the János Bolyai Mathematical Society. Amsterdam: North-Holland Publishing Company. Colloq. Math. Soc. János Bolyai. 56, 273-284 (1992).

Let ∇ be a linear connection on M and $\pi : E \to M$ a vector bundle associated with the principal bundle of the linear frame LM. Let S and $S' : M \to E$ be sections of E; S^V and S'^V their vertical lifts to E. It is proved that there exists exactly one linear connection $\widetilde{\nabla}$ on E (called the horizontal lift of ∇) such that (i) $\widetilde{\nabla}_{X^H} Y^H = (\nabla_X Y)^H$, (ii) $\widetilde{\nabla}_{X^H} S^V = (\nabla_X S)^V$, (iii) $\widetilde{\nabla}_{S^V} X^H = 0$, (iv) $\widetilde{\nabla}_{S^V} S'^V = 0$, where $X, Y \in \mathfrak{X}(M)$ and X^H stands for the horizontal lift of X. This is a generalization of two theorems of *K. Yano* and *S. Ishihara* [J. Math. Mech. 16, 1015-1029 (1967; Zbl 0152.204)] and of *K. Yano* and *E. M. Patterson* [J. Math. Soc. Japan 19, 185-198 (1967; Zbl 0171.207)]. Also torsion and curvature tensors of $\widetilde{\nabla}$ are studied.

For the entire collection see [Zbl 0764.00002].

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MSC:

53B05 Linear and affine connections

Keywords:

linear connection; horizontal lift; torsion; curvature