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On F-connections and associated non-linear connections

Dedicated to Professor Dr. W. Barthel,
wishing a quick recovery of his health

By

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In 1963, W. Barthel [1] developed an elegant theory of holonomy groups of homogeneous non-linear connections. He defined a homogeneous non-linear connection on a differentiable manifold M as a special distribution on the tangent bundle $T(M)$.

As is well-known (for example, see [9]), a *linear* connection on M, however, can be defined as a connection in the bundle of linear frames $L(M)$ over M, and then its holonomy group is a subgroup of $GL(n, R)$ acting on $L(M)$.

The purpose of the present paper is to give a concept of an F-connection, a collection of special distributions on $L(M)$, and to show that *any homogeneous non-linear connection in $T(M)$ is associated with an F-connection.* For this purpose, a concept of Finsler connections will be quite useful. The first section is devoted to summarize basic concepts of Finsler connections, which have been described in a series of our papers [2], ···, [8]. In the second section, some properties of homogeneous Finsler connections will be derived. Then, the main result will be given in Theorem 6 of the third section.