# New results on the holonomy groups of Finsler manifolds

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The holonomy group of a Riemannian or Finslerian manifold is the group generated by parallel translations along loops. Riemannian holonomy groups have been extensively studied and by now, their complete classification is known. On the other hand, on Finslerian holonomy, our knowledge is much more limited. From the few known explicit examples, it is clear that Finslerian holonomy can be very different from Riemannian holonomy. For instance, there are examples where the Finslerian holonomy groups are finite-dimensional and examples where they are infinite-dimensional. Our goal is to clarify the situation. We prove that the set of Finsler metrics on an $n$-dimensional manifold ($n \geq 2$) contains an open and everywhere dense subset of Finsler metrics with infinite-dimensional holonomy groups. We give a sufficient condition in terms of infinitesimal holonomy algebra, to be the holonomy maximal (diffeomorphic to the connected component of the diffeomorphism group of the $n-1$-dimensional sphere in the simply connected case). We prove that the holonomy group of a spherically symmetric projective Finsler metrics of constant curvature is maximal. In particular, the holonomy groups of the $n$-dimensional standard Funk metric and the Bryant–Shen metrics are isomorphic to $\mathcal{D}\mathit{iff}_o(\mathbb{S}^{n-1})$. These results are the firsts to explicitly describe the holonomy group of $n$-dimensional Finsler manifolds in the non-Berwaldian case (i.e. when the canonical connection is non-linear).