

Metrics that realize all Lorentzian holonomy algebras

Anton Galaev

The holonomy algebra of an indecomposable $(n+2)$ -dimensional Lorentzian manifold M is a weakly-irreducible subalgebra of the Lorentzian algebra $\mathfrak{so}(1, n+1)$. The only possible irreducible holonomy algebra is $\mathfrak{so}(1, n+1)$. L. Berard Bergery and A. Ikemakhen divided weakly-irreducible not irreducible subalgebras $\mathfrak{g} \subset \mathfrak{so}(1, n+1)$ into 4 types and associated with each such subalgebra \mathfrak{g} a subalgebra $\mathfrak{h} \subset \mathfrak{so}(n)$. T. Leistner proved that the subalgebra $\mathfrak{h} \subset \mathfrak{so}(n)$ associated to a holonomy algebra is the holonomy algebra of a Riemannian manifold. Before there were known metrics that realize all weakly-irreducible not irreducible algebras of type 1 and 2 with any associated holonomy algebra of a Riemannian manifold. I construct such metrics for all algebras of type 3 and 4.

This completes the classification of holonomy algebras for Lorentzian manifolds.