Galaev, A. S.
Holonomy groups of Lorentzian manifolds. (English. Russian original) Zbl 1332.53065
Russ. Math. Surv. 70, No. 2, 249-298 (2015); translation from Usp. Mat. Nauk 70, No. 2, 55-108 (2015).

This is a survey paper which collects results on the classification of connected holonomy groups of Lorentzian manifolds.

The focus is placed on the results obtained by L. Bérard Bergery and A. Ikemakhen in 1993 [Proc. Symp. Pure Math. 54, 27–40 (1993; Zbl 0807.53014)]. They classified all possible weakly irreducible subalgebras of pseudo-orthonormal Lie algebras, all of them being candidates to be holonomy algebras of Lorentzian manifolds.

The author in [Int. J. Geom. Methods Mod. Phys. 3, No. 5–6, 1025–1045 (2006; Zbl 1112.53039)] gave explicit Lorentzian metrics having the candidates above as holonomy algebras. So he completed the classification of the Lorentzian holonomy algebras. In this paper a more simple realization of these algebras as holonomy algebras of Lorentzian manifolds is given.

Applications and consequences of the classification mentioned above are included in this work.

Reviewer: Viviana del Barco (Rosario)

MSC:

53C29 Issues of holonomy in differential geometry
53C50 Global differential geometry of Lorentz manifolds, manifolds with indefinite metrics
53B30 Local differential geometry of Lorentz metrics, indefinite metrics
53-02 Research exposition (monographs, survey articles) pertaining to differential geometry

Keywords:
Lorentzian manifold; holonomy group; holonomy algebra; Walker manifold; Einstein equation; recurrent spinor field; conformally flat manifold; 2-symmetric Lorentzian manifold

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