Kasparian, Azniv; **Ungar, Abraham A.**
Lie gyrovector spaces. (English) Zbl 1071.83001
J. Geom. Symmetry Phys. 1, 3-53 (2004).

In this paper, an arbitrary section σ of the canonical projection of a group G onto the cosets modulo a subgroup H is associated with a binary operation on the cosets G/H. Next the authors provide sufficient conditions for obtaining a left loop, a left gyrogroup or a gyrocommutative gyrogroup in such a way. The non-positively curved sections in Lie groups allow a scalar multiplication, which turns them into quasi left Lie gyrovector spaces (Proposition 7). It is shown that the left invariant metrics on homogeneous spaces turn out to be compatible with the gyro-structure. For instance, their geodesics are gyro-lines; the associated distance to the origin is a gyro-homogeneous norm, satisfying gyro-triangle inequality; etc. The work establishes criteria for homogeneous space to bear a left Lie gyrovector space or a Lie gyrovector space structure. Corollary 33 characterizes the Cartan gyrovector spaces and finally works out explicitly the example of the upper half-plane.

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MSC:

83A05 Special relativity
53C30 Differential geometry of homogeneous manifolds
53B30 Local differential geometry of Lorentz metrics, indefinite metrics

Keywords:

gyrogroup; left gyrovector space; left loop; left Lie gyrovector space

Full Text: Link