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Abstract

Hom-Lie triple systems endowed with a symmetric invariant nondegenerate bilinear form are called quadratic Hom-Lie triple systems. In this work, we introduce the notion of double extension of Hom-Lie triple systems so that we can give an inductive description of quadratic Hom-Lie triple systems.

Key words: Representation, quadratic Lie triple systems, Hom-Lie triple systems, central extension, double extension.

MSC: 17A40, 17B05.

Introduction

Using the Bianchi identities, K. Nomizu [23] characterized, by some identities involving the torsion and the curvature, reductive homogeneous spaces with some canonical connection. K. Yamaguti [26] gave an algebraic interpretation of these identities by considering the torsion and curvature tensors of Nomizus canonical connection as a bilinear and a trilinear algebraic operations satisfying some axioms, and thus defined what he called a general Lie triple system. A Lie triple system as it is considered in his paper is a finite-dimensional linear space \mathbf{L} together with a trilinear map $[-, -, -] : \mathbf{L} \times \mathbf{L} \times \mathbf{L} \rightarrow \mathbf{L}$ which satisfies the following identities:

$$\begin{aligned} [x, x, z] &= 0 \\ [x, y, z] + [y, z, x] + [z, x, y] &= 0 \\ [u, v, [x, y, z]] &= [[u, v, x], y, z] + [x, [u, v, y], z] + [x, y, [u, v, z]], \forall x, y, z, u, v \in \mathbf{L}. \end{aligned}$$

If \mathbf{L} is equipped with a symmetric nondegenerate bilinear form B which satisfies $B([x, y, z], u) = B(z, [y, x, u])$ for all $x, y, z \in \mathbf{L}$, we say that \mathbf{L} is quadratic.

In physics, quadratic Lie triple systems appear in many different contexts. Let us mention a few of them. Lie triple systems can be used to construct solutions of the Yang-Baxter equation which appears in many subjects from statistical mechanics, exactly solvable two-dimensional field theory, the quantum

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