

Accepted Manuscript

On split regular Hom-Lie superalgebras

Helena Albuquerque, Elisabete Barreiro, A.J. Calderón, José M. Sánchez

PII: S0393-0440(18)30041-X

DOI: <https://doi.org/10.1016/j.geomphys.2018.01.025>

Reference: GEOPHY 3146

To appear in: *Journal of Geometry and Physics*

Received date: 26 April 2017

Revised date: 6 September 2017

Accepted date: 27 January 2018

Please cite this article as: H. Albuquerque, E. Barreiro, A.J. Calderón, J.M. Sánchez, On split regular Hom-Lie superalgebras, *Journal of Geometry and Physics* (2018), <https://doi.org/10.1016/j.geomphys.2018.01.025>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



ON SPLIT REGULAR HOM-LIE SUPERALGEBRAS

HELENA ALBUQUERQUE, ELISABETE BARREIRO, A.J. CALDERÓN, AND JOSÉ M. SÁNCHEZ

ABSTRACT. We introduce the class of split regular Hom-Lie superalgebras as the natural extension of the one of split Hom-Lie algebras and Lie superalgebras, and study its structure by showing that an arbitrary split regular Hom-Lie superalgebra \mathfrak{L} is of the form $\mathfrak{L} = U + \sum_j I_j$ with U a linear subspace of a maximal abelian graded subalgebra H and any I_j a well described (split) ideal of \mathfrak{L} satisfying $[I_j, I_k] = 0$ if $j \neq k$. Under certain conditions, the simplicity of \mathfrak{L} is characterized and it is shown that \mathfrak{L} is the direct sum of the family of its simple ideals.

Keywords: Hom-Lie superalgebra, Root, Root space, Structure theory.

2000 MSC: 17A60, 17A70, 17B22.

1. INTRODUCTION AND FIRST DEFINITIONS

The motivation to study Hom-Lie structures are related to physics and to deformations of Lie algebras (see for instance [1, 3, 13, 14, 19, 21, 22]). A Hom-Lie superalgebra is a \mathbb{Z}_2 -graded space with a bracket for which the super Jacobi identity is twisted by a homomorphism. This class was introduced by Ammar and Makhoul in [1], where they have shown that the supercommutator bracket defined using the multiplication in a Hom-associative superalgebra leads naturally to a Hom-Lie superalgebra. Hom-Lie superalgebras are generalizations of Lie superalgebras, Lie algebras as well as Hom-Lie algebras, and also they are a particular case of Γ -graded quasi-Lie algebras introduced by Larsson and Silvestrov in [15], who also have shown its relation with discrete and deformed vector fields and differential calculus. We also note that an analogous notion has been considered in other categories like Hom-associative algebras, Hom-alternative algebras, Hom-Leibniz algebras, etc. (see [1, 12, 16, 17, 18, 20, 23]).

In the present paper we introduce the class of split regular Hom-Lie superalgebras as the natural extension of the one of split regular Hom-Lie algebras (see [2]) and study its structure presenting them as a direct sum of adequate ideals. We also characterize a simple split regular split Hom-Lie superalgebra which together a relation of equivalence defined in its root system allow us to obtain a final expression as direct sum of simple ideals. Here it is interesting to mention the recent references [9, 10, 11, 24] where different classes of split Hom-algebras are also studied from the viewpoint of their inner structures.

We briefly describe the content of this paper. In Section 2 we develop connection of roots techniques which becomes the main tool in our study. In Section 3 we apply all of the machinery introduced in the previous section to show that a split regular Hom-Lie

The first, second and fourth authors acknowledge financial assistance by the Centre for Mathematics of the University of Coimbra – UID/MAT/00324/2013, funded by the Portuguese Government through FCT/MEC and co-funded by the European Regional Development Fund through the Partnership Agreement PT2020. Third and fourth authors are supported by the PCI of the UCA ‘Teoría de Lie y Teoría de Espacios de Banach’, by the PAI with project numbers FQM298, FQM7156 and by the project of the Spanish Ministerio de Educación y Ciencia MTM2013-41208P. The fourth author acknowledges the Fundação para a Ciência e a Tecnologia for the grant with reference SFRH/BPD/101675/2014.

Download English Version:

<https://daneshyari.com/en/article/8255555>

Download Persian Version:

<https://daneshyari.com/article/8255555>

[Daneshyari.com](https://daneshyari.com)