NEW WAYS OF DEFINING FILIFORM LIE ALGEBRAS

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Extended Abstract

As it is already known, filiform Lie algebras, which are a subset of nilpotent Lie algebras, were defined by Vergne in 1966.

At present, the traditional way of defining complex Lie algebras in general, and complex filiform Lie algebras in particular, consists in giving all the non-null brackets between elements of a basis of the algebra.

Then, the main goal of this paper is to show two new ways of defining complex filiform Lie algebras, in which the number of non-null brackets needed is reduced. To do this, we use the invariants i and j of complex filiform Lie algebras, previously defined by some of the authors of this paper in earlier papers. In fact, we prove that a complex filiform Lie algebra of dimension n is completely defined with respect to an adapted basis $\{e_1, e_2, \ldots, e_n\}$ if either only the brackets $[e_h, e_n] \quad (i \leq h < n)$ or only the brackets $[e_k, e_{k+1}] \quad (j \leq k < n)$ are known, where i and j are the invariants previosly mentioned.

We also give in this paper an algorithmic procedure which allows to compute all the non-null brackets appearing in traditional definition starting of the only ones appearing in ours. This algorithm involves lots of computations, which can be made by using any symbolic computation package.