Structure Theorem of 9-dimensional Quasi-Filiform Lie Algebras *

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February 13, 2004

Abstract

The classification of Nilpotent Lie Algebras (NLA) remains an open and complex problem. So far, the classification for dimension less or equal to seven [5], [4] is the only one which is completely known. A selection of interesting families of NLA could be a way to obtain the classification. If the dimension of a NLA $\mathfrak{g}$ is $dim(\mathfrak{g}) = n$, then, we call the NLA with nilindex $n-1$(the maximal nilindex) and $n-2$, Filiform Lie Algebras (FLA) and Quasifiliform Lie Algebras (QFLA), respectively. The classification of FLA is known up to dimension eleven [3], but the classification of QFLA is only known up to dimension eight [1] . This work presents the structure theorem for 9-dimensional QFLA. This is the previous step to obtain a complete classification. We demonstrate that the laws of a 9 dimensional QFLA family can be expressed as a family of 17 parameters with restrictions among the parameters. There are 15 polynomial degree 2 equations. Waterloo Maple's Maple 6 has been used for the elaboration of the necessary computational algorithms.

References

[1] L.M. Camacho, J.R. Gómez, R.M. Navarro, *Effective Computation of Quasi-Filiform Lie algebras*, submitted to Acta Mathamatica Sinica.

[2] J.R. Gómez, F.J. Echarte *Classification of Complex Filiform Nilpotent Lie algebras of dimension 9*, Rend. Sem. Fac. Sci. Univ. Cagkiari 61 (1), 21-29, 1991.

[3] J.R. Gómez, A. Jiménez-Merchán, Y. Khakimdjanov *Low-dimensional Filiform Lie algebras*, Journal of Pure and Applied Algebra, 130, 133-158, 1998.

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[4] Goze, M. and Khakimdjanov, Y. *Nilpotent Lie algebras*, Mathematics and its Applications, 361, Kluwer Academic Publishers, Dordrecht, Boston, London, 1996.

[5] V. Morosov *Classificaation of nilpotent Lie algebras of sixth order.*, Izv. Vyssh. Uchebn. Zaved. Mat. 4(5), 161-171, 1958.