Lie-central derivations, Lie-centroids and Lie-stem Leibniz algebras

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Abstract. In this paper, we introduce the notion of a Lie-derivation. This concept generalizes derivations for non-Lie Leibniz algebras. We study these Lie-derivations in the case where their image is contained in the Lie-center, and call them Lie-central derivations. We provide a characterization of Lie-stem Leibniz algebras by their Lie-central derivations, and prove several properties of the Lie algebra of Lie-central derivations for Lie-nilpotent Leibniz algebras of class 2. We also introduce ID_*-Lie-derivations. An ID_*-Lie-derivation of a Leibniz algebra $\mathfrak{g}$ is a Lie-derivation of $\mathfrak{g}$ in which the image is contained in the second term of the lower Lie-central series of $\mathfrak{g}$, and which vanishes on Lie-central elements. We provide an upper bound for the dimension of the Lie algebra $\mathsf{ID}_*^{\mathsf{Lie}}(\mathfrak{g})$ of ID_*-Lie-derivation of $\mathfrak{g}$, and prove that the sets $\mathsf{ID}_*^{\mathsf{Lie}}(\mathfrak{g})$ and $\mathsf{ID}_*^{\mathsf{Lie}}(\mathfrak{q})$ are isomorphic for any two Lie-isoclinic Leibniz algebras $\mathfrak{g}$ and $\mathfrak{q}$.

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