The category of strong homotopy Lie Rinehart pairs

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Abstract.

The first example of a strong homotopy Lie algebroid was the BV-BRST complex. In modern language, it appears when homotopy transfer is applied to a resolution of a Lie Rinehart pair by a semi-free dgc algebra and a graded projective dg module. However, a homotopy theory in which this phenomena embeds does not yet exist: in the current homotopical algebra for Lie Rinehart pairs developed by J. Nuiten in [1], the base is fixed, hence the formalism does not address its semi-free resolution. Defining weak equivalences of strong homotopy Lie Rinehart pairs $(A, M) \to (B, N)$ as ∞-comorphisms in which maps $B \to A$ and $M \to A \otimes_B N$ are both quasi-isomorphisms, we show that the full subcategory of pairs (A, M) with A a semi-free dgc algebra and M a cofibrant A-module is a category of fibrant objects [2]. Apart from the above historical application, the formalism is expected to provide the correct notion of a cotangent complex of a general Lie Rinehart pair, enabling the study of shifted symplectic structures (introduced by Pym and Safranov for Lie algebroids over a smooth base [3]), derived Lagrangian intersections etc.

References

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