Sabinin algebras

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Sabinin algebras play the same role in the non-associative Lie theory as Lie algebras in the classical Lie theory. Geometrically, a Sabinin algebra can be interpreted as the structure on the tangent space to a manifold with a flat affine connection; it consists of an infinite number of operations which may be thought of as the covariant derivatives of the torsion tensor of the connection.

Similarly to Lie algebras, Sabinin algebras have universal enveloping algebras (in this case they are non-associative) and can be integrated. While in general the integration procedure produces only a formal non-associative product, there are interesting particular cases (such as Malcev algebras or nilpotent Sabinin algebras) when a Sabinin algebra integrates to a unique simply connected globally defined loop.

In a certain sense, Sabinin algebras are a relative version of Lie algebras and the techniques of the theory fall into the scope of the classical Lie theory. I will give an overview of the theory of Sabinin algebras and non-associative Lie theory in general. The following topics will be addressed

(1) Sabinin algebras and flat affine connections.

(2) Non-associative Hopf algebras and the integration.

(3) Particular cases: Malcev and Bol algebras, Lie triple systems, nilpotent Sabinin algebras.

(4) Applications to discrete loops.