Smooth loops

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A loop is a rather general algebraic structure that has an identity element and division, but is not necessarily associative, and thus generalizes the notion of a group. A smooth loop is a manifold that is also a loop with smooth multiplication and division operations, and is hence a direct generalization of a Lie group. A key example of a non-associative smooth loop is the 7-dimensional sphere regarded as the loop of octonions of unit length. Given a smooth loop, the tangent space at identity then inherits an algebra structure that generalizes a Lie algebra structure. In this talk we will first overview the key properties of loops and their "pseudoautomorphisms" in general, and will then specialize to smooth loops, their associated tangent algebras, and will show the key differences and similarities with Lie theory.