Connections for general group actions

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Abstract

A partial connection associated to a group action on a manifold is an assignment of a complement to the tangent space to the group orbit at each point that is 'as smooth and as equivariant as possible'. Partial connections possess many of the essential features of connections on principal bundles, but can be defined not only on manifolds with nonfree actions, but on manifolds with multiple orbit types. In our treatment of partial connections, we make use of two analogs of the connection form: one is a Lie algebra-valued form, which is singular at singular points (i.e. points at which the isotropy jumps), while the other is a smooth form taking values in the dual of the Lie algebra. Partial connection forms can be combined with Lie group numerical schemes to obtain schemes for the solution of IVPs on manifolds with general group actions.

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