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Regular infinite dimensional Lie groups

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Abstract. Regular Lie groups are infinite dimensional Lie groups with the property that smooth curves in the Lie algebra integrate to smooth curves in the group in a smooth way (an 'evolution operator' exists). Up to now all known smooth Lie groups are regular. We show in this paper that regular Lie groups allow us to push surprisingly far the geometry of principal bundles: parallel transport exists and flat connections integrate to horizontal foliations as in finite dimensions. As consequences we obtain that Lie algebra homomorphisms intergrate to Lie group homomorphisms, if the source group is simply connected and the image group is regular.
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