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### **Riemann-Hilbert problems in loop spaces**

Two recent generalizations of the classical Riemann-Hilbert transmission problem in the context of loop spaces will be discussed. The first one is concerned with piecewise holomorphic vector-functions with values in a complex representation space of a compact Lie group  $G$ . Such problems are naturally described in terms of the grassmannian model of the loop group  $LG$ . In particular, a version of Fredholm theory for such problems can be formulated in terms of Fredholm pairs of subspaces and Kato grassmannians, which develops previous results of the authors concerning the geometry of Fredholm pairs and Kato grassmannians.

The second generalization is concerned with piecewise pseudoholomorphic functions taking values in a certain space of immersed loops in a three-dimensional riemannian manifold introduced by J.-L.Brylinski and L.Lempert. It will be shown that solutions to such problems can be constructed by solving Cauchy problem for a certain nonlinear partial differential equation on the underlying manifold. A geometric method for solving latter problem will be described and a few explicit examples of solutions will be given.