

Solutions of the set theoretical Yang-Baxter equation over Grassmann algebras

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Abstract

I will present certain birational maps that are solutions of the parametric entwining Yang-Baxter equation. These maps are obtained via refactorisation problems of certain matrices that are elements of a loop group. These matrices very naturally arise in soliton theory as Darboux matrices. I will also present various dynamical properties of the derived maps, such as existence of invariants and associated symplectic or Poisson structures, and I will prove their complete integrability in the Liouville sense, where possible. Then I will describe the generalisation of such maps over Grassmann algebras using refactorisation of products of supermatrices, i.e. Darboux matrices with bosonic and fermionic entries. I will use the analogue of the characteristic polynomial, which in this noncommutative setting is the characteristic function, to define an analogue of a spectral curve. The latter can be used to obtain invariants of these maps involving Grassmann variables. New higher dimensional commutative maps can be obtained by fixing the order of the Grassmann algebra $\Gamma(n)$ and I will discuss integrability properties of these derived commutative maps.