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Hidden Yangians in 2D Massive Current Algebras

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Abstract. We define non-local conserved currents in massive current algebras in two dimensions. Our approach is algebraic and non-perturbative. The non-local currents give a quantum field realization of the Yangians. We show how the non-cocommutativity of the Yangians is related to the non-locality of the currents. We discuss the implications of the existence of non-local conserved charges on the S-matrices.

1. Introduction

Conformal field theories describe two dimensional critical systems but (if there is no cross-over) scaling limits near criticality are described by massive theories. The ultraviolet fixed points of the massive theories are the critical CFT's we started with. Recently part of the algebraic CFT framework [1, 2] has been pushed to the massive theories. This has mainly consisted in the identification of integrable perturbations of conformal field theories and of their S-matrices [3], in the comparison of these perturbations with known integrable models and their restrictions [4–7], in the lift of CFT moduli diagrams to the moduli space of integrable models [8], etc.....

Moreover non-local conserved currents have been recognized as being hidden in massive integrable perturbations of CFT's [8–10]. On-shell they lead to algebraic equations which determine the factorizable S-matrices. There are two kinds of non-local conserved currents: i) Either the associated conserved charges have fractional Lorentz spins like in the (fractional supersymmetric) sine-Gordon models [8]. In these cases the factorizable S-matrices are trigonometric solutions of the quantum Yang-Baxter equations. ii) Or the non-local conserved charges have zero spin. In these cases the factorizable S-matrices are rational solutions of the Yang-Baxter equations.

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