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Locality of Conformal Fields in Two Dimensions: Exchange Algebra on the Light-Cone

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Abstract. We discuss the exchange algebra of light-cone operators as the fundamental structure of two-dimensional conformal quantum field theory. It is necessary in order to account for the locality properties of Wightman functions of conformal fields. We discuss the consistency requirements of this new type of algebra, and obtain a classification containing the well known "minimal models".

1. Introduction

Belavin, Polyakov, Zamolodchikov [1] have classified conformal quantum field theories in two dimensions, which contain only a finite number of "primary" fields. They introduced an algorithm, based on Ward identities associated with the Euclidean conformal invariance, in order to calculate correlations as solutions to certain differential equations.

Let us concentrate on a peculiar feature of these n-point functions. They have the factorized structure of a bilinear form in so-called conformal block functions depending on the coordinates of one light-cone only. It appears as a little miracle that these blocks can be combined in such a manner, that the full n-point function satisfies the requirements of locality. The reason lies in remarkable functional properties of the conformal block functions.

The aim of the present study is to identify the relevant operator algebra which lies at the origin of these properties [2]. The operators involved in this "exchange algebra" are intertwining light-cone operators interpolating between different representation sectors of the Virasoro algebra. The study of the intertwining operators should be most important for the understanding of the highly nontrivial interrelations among the Rocha-Caridi characters [3] of different Virasoro Verma modules. These interrelations are essential for the existence of modular invariant partition functions [4]. The existence of interpolating fields is no completely new issue. Actually they have been discussed in the old days of conformal invariance in