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Branching Rules for Conformal Embeddings

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Abstract: We give explicit formulas for the branching rules of the conformal embeddings $su(n(n+1)/2)_1 \supset su(n)_{n+2}$, $su(n(n-1)/2)_1 \supset su(n)_{n-2}$, $sp(n)_1 \supset so(n)_4 \oplus su(2)_n$, and $so(m+n)_1 \supset so(m)_1 \oplus so(n)_1$ with m and n odd.

Introduction

The theory of affine Lie algebras has found very useful applications in Theoretical Physics. Our work is related to the models found in Conformal Field Theory.

In [K-P] a set of functions called string functions were introduced to describe the branching rules of an integrable highest weight representation of an affine Lie algebra $\hat{g}$ with respect to its homogeneous Heisenberg subalgebra $\hat{h}$. There it was observed that those functions were modular functions with respect to a congruence subgroup of $Sl_2(Z)$. In [K-W], the problem of describing the branching rules for an arbitrary pair $\hat{g} \supset \hat{p}$ was considered, proving modular properties and finding the asymptotic behaviour of most of them.

A special case of pairs $\hat{g} \supset \hat{p}$ comes from the so-called coset construction, [G-K-O], given an irreducible highest weight representation $L(\Lambda)$ of $\hat{g}$ one constructs the Sugawara operators $T_m^{\hat{g}}$ that give a representation of the Virasoro algebra on $L(\Lambda)$, similarly for the restriction to $\hat{p}$ one obtains a representation of the Virasoro algebra by operators $T_m^{\hat{p}}$. Taking the difference of the Virasoro operators, a new representation of the Virasoro algebra is obtained and it commutes with $\hat{p}$. Thus we get the decomposition:

$$L(\Lambda) = \bigoplus_{\lambda} U(\Lambda, \lambda) \otimes L(\lambda) .$$

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