HIROSHIMA MATH. J.
16 (1986), 413–416

Irreducible decompositions of spinor representations of the Virasoro algebra

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(Received September 11, 1985)

0. Introduction

In our previous joint work [10], we discussed the structure of Fock representations of the Virasoro algebra. In this note, we treat the Fermion version and show that the physical states corresponding to suitable Maya diagrams give the irreducible decomposition of the spinor representations of the Virasoro algebra.

The author is grateful to Professor T. Miwa for his kind interest and suggestions on the translation invariant property of our operators.

1. Spinor representations of the Virasoro algebra

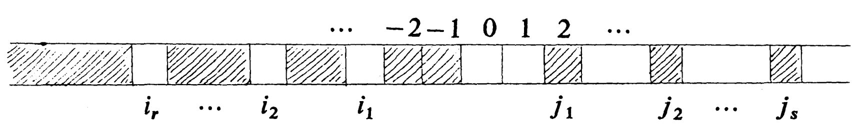
Let A be a Clifford algebra generated by 1 and $\{\psi_n, \psi_n^*\}_{n\in\mathbf{Z}}$ satisfying the following anti-commuting relations:

$$\psi_m\psi_n + \psi_n\psi_m = 0, \quad \psi_m^*\psi_n^* + \psi_n^*\psi_m^* = 0,$$
$$\psi_m\psi_n^* + \psi_n^*\psi_m = \delta_{m,n}.$$

Let B be the left ideal in A generated by $\{\psi_n\}_{n<0} \cup \{\psi_n^*\}_{n\geq 0}$ and we set $V=A/B$. Each element in V is written as a linear combination of

$$f_{i_r,\dots,i_1;j_1,\dots,j_s} = \psi_{i_r}^*\cdots\psi_{i_1}^*\psi_{j_1}\cdots\psi_{j_s}$$

$(i_r<\cdots<i_1<0\leqq j_1<\cdots<j_s)$, which is assigned to a Maya diagram



The degree and the charge of a monomial $f=f_{i_r,\dots,i_1;j_1,\dots,j_s}$ are defined by

$$\deg f = -(i_1+\cdots+i_r) + (j_1+\cdots+j_s)$$

and

$$\chi(f) = s - r$$