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The Structure Of $N = 16$ Supergravity in Two Dimensions

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Abstract. We extend the previously constructed linear system for $N = 16$ supergravity in two dimensions by including the unphysical gravitino degrees of freedom. This theory has a residual $N = 16$ "superconformal" invariance that can be bosonized to local E_9 transformations. The modifications to the linear system described here suggest a further extension to an infinite hierarchy of fields and associated gauge transformations related to E_9.

1. Introduction

It has long been known that when one dimensionally reduces a supergravity theory, the resulting theory often has a symmetry under a large, non-compact group [1]. This symmetry acts non-linearly, but it can be linearized by the introduction of a local gauge symmetry with respect to the maxiaml compact subgroup, H, of G [2]. To accomplish this one introduces unphysical fields that can be gauged away by using the local H-invariance; the original physical theory is thus recovered by passing to a gauge slice. One particularly interesting aspect of this occurs when the supergravity theory is reduced to two dimensions. There one finds that G becomes an affine Lie group, G^∞, and H becomes an infinite dimensional subgroup, H^∞ [3–5]. The field equations of a supergravity theory reduced to two dimensions are, for the bosons, those of a non-linear σ-model based on a coset G/H. The equations of motion of the fermions are also non-linear as a consequence of the four-fermi terms intrinsic to higher dimensional supergravity theories, and the nonlinear couplings to the scalars. In spite of this apparent difficulty, some, and possibly all, such models are completely integrable by virtue of the large, affine Lie group symmetry, G^∞. This was shown for maximal supergravity in [5], and in this paper we will briefly describe a number of models that can be obtained by consistent truncation.

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