INDECOMPOSABLE FINITE-DIMENSIONAL REPRESENTATIONS OF A CLASS OF LIE ALGEBRAS AND LIE SUPERALGEBRAS

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Indecomposable finite-dimensional representations of the Poincaré group was first studied in a systematic way by S. Paneitz. Only representations with one source were considered, though by duality, one representation with 2 sources was implicitly present. The idea of nilpotency was mentioned indirectly, but another method was chosen there. Here, we utilize nilpotency to its fullest extent to obtain, theoretically, a complete description of the indecomposable representations. The method applies to both a class of ordinary Lie algebras and to a similar class of Lie superalgebras. The defining representation of the Poincaré group inside $SU(2,2)$ is indecomposable. It was studied by the present author prior to the articles by Paneitz related to special aspects of Dirac operators and positive energy representations of the conformal group. We exemplify the general set-up:

1) All indecomposable representations of the Poincaré group with a single, 1-dimensional source are determined.

2) An infinite-dimensional family of inequivalent representations already in dimension 12 is constructed. Earlier, the 24-dimensional representations were thought to be the lowest possible.

3) A subclass of ideals of the enveloping algebra of the super Poincaré algebra is given.