

Representations of an Algebra of the Gell-Mann-Dashen Type

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Abstract. Let G^∞ denote the infinite-dimensional Lie algebra given by commutation relations $[a_m^\alpha, a_n^\beta] = c_{\gamma}^{\alpha\beta} a_{m+n}^\gamma$ ($m, n = 0, 1, \dots$), where $c_{\gamma}^{\alpha\beta}$ are structure constants of the arbitrary centerless Lie algebra. The paper is devoted to the construction of a certain class of skewsymmetric irreducible representations (so called F-representations) of the algebra G^∞ .

I. Introduction

Let G be an arbitrary r -dimensional real, centerless Lie algebra with commutation relations

$$[a^\alpha, a^\beta] = c_{\gamma}^{\alpha\beta} a^\gamma \quad (1)$$

($\alpha, \beta, \gamma = 1, \dots, r$). We now take the vector space G^∞ with basis a_m^α ($m = 0, 1, \dots, a_0^\alpha \equiv a^\alpha$) formed by all finite linear combinations of a_m^α and define the following commutation relations among a_m^α

$$[a_m^\alpha, a_n^\beta] = c_{\gamma}^{\alpha\beta} a_{m+n}^\gamma. \quad (2)$$

These relations respect JACOBI identities so that G^∞ forms an infinite-dimensional Lie algebra-infinite-dimensional extension of G .

Algebras extended in this way or in a similar way have a physical application [1, 2] and the question of their representations arises.

In the paper [3] finite-dimensional representations of the more general Gell-Mann-Dashen "current algebra" are constructed. It may be useful to know more general representations of such algebras.

The presented paper is devoted to the study of the class of irreducible representations by skewsymmetric operators of the algebra G^∞ which are, in some way, the direct generalization of the finite-dimensional skewsymmetric representations of G^∞ (these representations are contained in this class, of course).

The paper is part of a larger work in which representations of a certain infinite-dimensional Lie algebra $A(P, SU_3)$ having application in elementary particle physics [4, 5] are constructed.