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q-Oscillator Realizations of the Quantum Superalgebras $sl_q(m, n)$ and $osp_q(m, 2n)$

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Abstract. Realizations of the quantum superalgebras corresponding to the $A(m, n)$, $B(m, n)$, $C(n+1)$, and $D(m, n)$ series are given in terms of the creation and annihilation operators of q-deformed Bose and Fermi oscillators.

1. Introduction

Let $\mathcal{G}$ be a (simple) Lie algebra. The quantum Lie algebra [1–5] $\mathcal{G}_q$ is a deformation of the universal envelopping algebra of $\mathcal{G}$ which is endowed with a Hopf algebra structure [6]. This mathematical object is currently drawing a lot of attention, in part because of its connections with integrable systems and conformal field theories. The quantum algebra $\mathcal{G}_q$ can be characterized by giving its generators together with defining relations based on the Cartan matrix of $\mathcal{G}$.

The Weyl and Clifford algebras also admit quantum deformations [7] with q-analogues of the Bose, and respectively, Fermi oscillator operators as generators [7–10]. These quantized algebras have been used to construct oscillator realizations of the quantum algebras that correspond to all classical Lie algebras [7]. Here, we provide similar representations of the quantum Lie superalgebras associated to the unitary and the orthosymplectic series. Algebra homomorphisms from the quantized envelopping algebras of type $A(m, n)$, $B(m, n)$, $C(n+1)$, and $D(m, n)$ into the quantum Weyl superalgebra will be presented by expressing the generators of the quantum superalgebras as linears and bilinears in the creation and annihilation operators of q-bosons and q-fermions.

In Sect. 2 we review some results on the classification of contragredient Lie superalgebras. A general description of the quantum Lie superalgebras is given in

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