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2. Contractions of Lie Groups and Quantum Groups (CLGQG)

Contraction of the Finite Oscillator

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The finite oscillator model has the dynamical algebra u(2), consisting of position, momentum and mode number, with a finite number of values. We examine the contraction of this model to the ordinary quantum oscillator as the number and density of points increases. This is done on the level of the algebra, of the wavefunctions, and of the fractional Fourier-Kravchuk transform.

Continuum Canonical Transforms as Inductive Limits of Discrete Canonical Transforms

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Phase space: the motion group E(2) is a "contraction" of SO(3). A refinement for configuration space: the $L^2(R)$ representation of the Heisenberg-Weyl motion group EHW(2) (described by the fractional Fourier transform and the Heisenberg-Weyl translates) is an *inductive* (to be explained) limit of finite-dimensional representations of U(2). How might we "discretize" the other affine canonical transforms on $L^2(R)$? How might we "discretize" toroidal configuration spaces? What continuum scenario might be "discretized" by $SL(2, Z/p^n)$? These questions (arising in quantum physics, optics, signal analysis) can be clarified by casting them as questions about inductive limits of representations.

Lie Algebra Contractions and Separation of Variables on n-Sphere. Interbases Expansions

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Lie algebra contractions from $o(n+1)$ to $e(n)$ are used to obtain asymptotic limits of interbases expansions between bases corresponding to different subgroup chains for the group $O(n+1)$. The contractions lead to interbases expansions for different subgroup chains of the Euclidean group $E(n)$. They provide asymptotic formulae for quantities such as Wigner rotation matrices, Clebsch-Gordan coefficients and Racah coefficients.

Contractions of Quantum Groups and Quantum Vector Spaces

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Contractions of quantum orthogonal groups are studied unlike of Wigner–Inonu in a pure algebraic way with the help of Pimenov algebra $\mathbf{D}(\iota)$. Namely, the groups under consideration are regarded as an algebra of noncommutative functions but with nilpotent commutative generators. Possible contractions are essentially depended on the choice of primitive elements of Hopf algebra structure of quantum orthogonal group. All such choices are considered for quantum group $SO_q(N)$ and all allowed contractions in Cayley-Klein scheme are obtained. The quantum vector spaces corresponding to the appropriate contracted quantum group are described explicitly both in cartesian and symplectic generators. Quantum deformations of 1+3 kinematical spaces and groups are regarded as an illustration of the general theory.

Contractions of Superalgebras Osp(M/2N)

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We describe how dual numbers technique can be applied to the study of superalgebra contractions. A wide class of Cayley-Klein superalgebras are obtained by this method.