Orthogonal Polynomials of Discrete Variables and Lie Algebras of Matrices of Complex Size

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Classical orthogonal polynomials like sines, cosines and more sophisticated Chebychev and Hahn’s polynomials, as well as their q-analogs (whatever this is), have so numerous applications that even schoolchildren know about some of them. These applications make the study of the properties of these polynomials vital. In the talk which REQUIRES NO PRELIMINARY KNOWLEDGE, except how to differentiate a polynomial and what the trace of the matrix is, I will show a uniform way to introduce all the classical orthogonal polynomials. In particular, I will show how to get Chebychev and Hahn’s polynomials in terms of the traces of nxn matrices. Particularly interesting is the case when n is a complex number!

This method allows one to obtain multidimensional orthogonal polynomials in a most natural way.

(Observe also that generalizations of Lie algebra of matrices of complex size provide us with a natural generalization of Kortevg-deVries hierarchy and appear as symmetry algebras in unconventional Supergravity Models of the Grand Unification Theory which allow particles of spin greater than 2.)