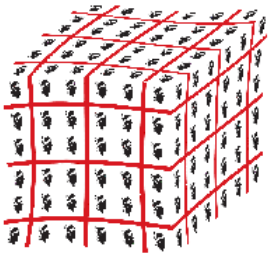

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A study of the complex action problem in a simple model for dynamical compactification in superstring theory using the factorization method.

Thursday, 17 June 2010 14:30 (20 minutes)

Monte Carlo simulations of matrix models could play an important role in understanding string theories in a similar fashion that lattice QCD has contributed to the understanding of the non-perturbative regime of quantum field theories. The IKKT or IIB matrix model has been proposed as a non–perturbative definition of superstring theory. The model provides a mechanism for the dynamical generation of spacetime, which suggests that also the dimensionality of spacetime can arise dynamically by breaking the SO(10) rotational invariance of the model in the 10-dimensional defining space.

We study the complex action problem in a matrix model which has been proposed as a toy model for the study of the dynamical compactification of spacetime dimensions scenario of the IIB matrix model of superstrings. The complex action problem in Monte Carlo simulations of the model turns out to be quite severe and we use the factorization method proposed in hep-th/0108041 for its study. We compute the density of states of the order parameter in the phase quenched model and the corresponding phase factor. Then the large N extrapolation is performed by using their nice scaling properties. The asymptotic behavior is understood by using simple theoretical arguments which enable us to study the important region of configuration space which is heavily suppressed by the fluctuations of the phase. We conclude that the SO(4) rotational symmetry of the four dimensional model is dynamically broken in accordance with the predictions of calculations performed using the gaussian expansion method.

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