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Research projects

In the thesis of Cachazo-Douglas-Seiberg-Witten, let me call this "CDSW", it was concluded that the prepotential $\mathcal{F}$ of the supersymmetric gauge theory is equivalent to the free energy $F_{m.m.}$ of the matrix model.They used this gauge-matrix relation and derived the effective superpotential W_{eff} of the supersymmetric gauge theory from the free energy $F_{m.m.}$ of the matrix model.

In the thesis of Itoyama-Kanno in which they used the supereigenvalue model, there are three equations of the matrix model which equal CDSW's three equations of the supersymmetric gauge theory.So, the thesis of Itoyama-Kanno is regarded as an expansion of the CDSW.And, it is expected that we can find a physical quantity which corresponds to the effective superpotential W_{eff} of the CDSW.

It is necessary to analyse a partition function of the supereigenvalue model for our purpose.Though, we have not get an expected result yet.I studied this model by means of numerical analysis, but there are difficulties to calculate it because we should take $\check{N} \to \infty(\check{N}$ signifies a size of a matrix) and so, we should handle a lot of terms.In order to break through it, I'm improving computer programs and search for analytic ways.

And application of my thesis, arXiv:hep-th/0409060, is in progress. It has various patterns for the breaking of $U(N)$ gauge symmetry.

Then, there is a notion, "Duality", in the background of this subject."Duality" says that two different theories are connected by a coupling constant.AdS/CFT correspondence is one of famous examples of this duality.We can think that gauge-matrix relations of CDSW and Itoyama-Kanno lie in a vein of a duality, and I'm studying this duality.