Research Plan

Reiji YOSHIOKA

I will continue to inquire into research that has been done so far more deeply. In particular, I want to study the quantum theory of superstrings. AdS/CFT correspondence and matrix models and so on are used as the methods. The content is indicated as follows.

• Matrix Model

• Compactification

Since the matrix models are usually defined in ten-dimensional spacetime, we must compactify the spacetime to four-dimensions. Then, we must demand the conditions for compactifications from outside. So far, I have considered about the matrix models compactified by $\mathbb{C}^3/\mathbb{Z}_3$-orbifolding. In similar way, I continue to study the other orbifolded models. On the other hand, I will study spontaneous breaking of ten-dimensional Lorentz symmetry for the matrix models without compactifing spacetime by hand.

• Calculation of partition function

I want to estimate exactly the partition function of USp matrix model. In order to perform this calculation, I use the prescription of Moore-Nekrasov-Shatashvili. In this procedure, matrix models promote to CohFT (Cohomological Field Theory) and the calculation of partition function becomes more easy. Indeed, I calculated the partition function of four-dimensional reduced matrix model by its prescription as mentioned in "Research Result". I want to apply the methods thought out in these simpler models to USp matrix model.

• $AdS_5 \times S^5$ superstring

In the research about $AdS_5 \times S^5$ superstring, I wrote down the Lagrangian in the Lagrange formalism after gauge-fixing and found out the scaling action to the giant magnon in near flat space limit. However, the scaled theory is only limited to the bosonic sector. In order to analyze the entire theory, including fermionic sector into the scaled theory is necessarily required. So I want to derive the full scaling theory including fermionic sector and then analyze this theory quantum-theoretically. Moreover, I will construct the quantum theory around the vicinity of the giant magnon solution which is derived by a current research. It is expected that new information on $AdS_5 \times S^5$ superstring that has not been known so far is obtained by these researches. Moreover, this will also give new information on the gauge theory from the viewpoint of AdS/CFT correspondence.

On the other hand, I try to construct the conserved charges for superstring in $AdS_5 \times S^5$. Here, the enumerated charges are the generators of the isometries of background spacetime and supersymmetries. In order to derive the charges, deciding the infinitesimal transformation law for each field is required. In addition, I will construct the charges in the near flat space limit.

Additionally, I will positively work on the discussions other than the above mentioned subjects.