The Research Plan

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I will continue to analyze the matrix models. Especially, my research purpose is to generate four dimensional spacetime in USp matrix model.

Since the matrix models are usually defined at 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 $\mathbb{C}^3/\mathbb{Z}_3$ orbifolded matrix models and found out fifty solutions. 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.

For these investigations, I estimate exactly the partition function of USp matrix model. This research is progressing now. In order to perform this calculation, we use the method of Moore-Nekrasov-Shatashvili. In this procedure, matrix models promote to CohFT (Cohomological Field Theory) and the calculation of partition function becomes more easy.

In addition to the problem about spacetime such as the dimensionality, I will also investigate about matter. For example, there are the problems such as the number of generations of elementary particles. We do not have the answer which we can theoretically be satisfied with about these. So it is important to understand these from more fundamental principles. The matrix models have necessarily the possibility, since only possible theory is string theory at present. I will investigate the possibility. Moreover, it is understood to be able to compose the theory such as standard model and GUT by orbifolding spacetime in the frame of string theory now. There are overlaps with my research that constructed matrix models orbifolded. I will research such a direction.

Additionally, I will positively work on the discussions other than the above mentioned about matrix models.