Research achievements

We have clarified the relation between IIB matrix model and type IIA perturbative superstring theory, which would give us new aspects on gauge/string duality:

□ We have derived the action and supersymmetry transformation of type IIA Green-Schwarz string from IIB matrix model around a two dimensional noncommutative background in a low energy limit [3]. We have identified string length α' with inverse of noncommutative parameter $\frac{1}{\theta}$.

□ Perturbative string calculations such as correlation functions are carried out by using vertex operators. We have clarified the relation between the vertex operators in IIB matrix model and superstring [2].

□ We have introduced the interaction of multiple strings and identified the string coupling g_s [1].

It is difficult to derive four dimensional gravity theory from superstring theory. We have confirmed the existence of four dimensional massless graviton which is localized on the brane:

□ We have shown that by using noncommutative (NC) gauge theory, two point correlation functions of the graviton vertex operators constructed by the supersymmetry transformations in IIB matrix model behave as four dimensional massless gravitons [5]. We have compactified noncommutative R^4 spacetime into fuzzy G/H coset space in order to regularize the correlators. The remarkable point is that this result is universal with respect to the choice of G/H.

□ We have shown that in the supergravity description which is dual to NC gauge theory, Neumann boundary condition at NC scale makes the Green function of the graviton mode to be proportional to $1/k^2$ [4].

These researches [1-5] have been done in collaboration with Yoshihisa Kitazawa.

Recombination is recognized as the fundamental process which realizes the interaction between D-branes. It is also recognized as the counterpart of the Higgs mechanism in the intersecting D-brane models. We have described the recombination process in string theory:

□ We have obtained tachyon modes which are localized on the intersection point and have shown that the condensation of the tachyon modes is equivalent to the recombination of the intersecting D-branes [9].

This is a first explicit verification of Sen's conjecture analytically, that is, 'tachyon condensation = brane annihilation'. This research has been done in collaboration with Koji Hashimoto.