Statement of Research Interests

Chern–Simons string field theory (CSFT) is one formulation of non–perturbative string theory, and it has same algebraic structure as Chern–Simons gauge theory. Therefore, this theory is suitable to investigate topological aspects of string theory. However, there are almost no work standing on such point of view.

Our "universal solutions" is a topologically non–trivial solutions of CSFT, which correspond to flat connections in Chern–Simons gauge theory. The solutions can be a starting point to investigate topological nature of string theory. If we have obtained large amount of knowledge about such solutions, it is possible to consider "knots and links" in string theory.

I want to investigate universal solutions and CSFT further, and to know topological aspects of string theory. The plan is as follows:

Specify moduli space of universal solutions

In our previous work, I found that each universal solution has an information about world sheet, which is swept by open strings. This information is described by Jenkins-Strebel quadratic differentials. I investigate this quadratic differentials to know properties of moduli space of universal solutions.

Derive purely closed string amplitude

I do similar calculations to paper 3 on singular point of moduli space. This will yields purely closed string amplitude, and such results correspond to a new formulation of closed string using open string degrees of freedom.

Derive D–brane tension

I derive an energy of universal solutions $\mathcal{E}$ from CSFT action. This quantity corresponds to "winding number", which is obtained from flat connections in Chern–Simons gauge theory.

From physical requirement, $\mathcal{E}$ must be equal to D–brane tension on the singularity of moduli space. This will be important check to universal solutions.

Syoji Zeze
Facility of Science,
Osaka City University