

論文の内容の要旨

Topological Vertex Formalism on Generalized Brane Web via Ding-Iohara-Miki Algebra (Ding-庵原-三木代数を用いた一般化されたブレンウェブ上の Topological Vertex 定式化)

氏名 朱 睿東

In this thesis, we deal with generalized (p, q) -brane web systems, which are motivated from the string theory realization of gauge theories beyond 5d $\mathcal{N} = 1$ gauge theories with A -type gauge group and quiver structure. We give a (generalized) topological vertex formalism on this kind of webs to reproduce the instanton partition function of the corresponding gauge theory. We use the underlying algebraic structure, the Ding-Iohara-Miki algebra, discovered in the original refined topological vertex formalism as the guiding principle in the generalization. The Ding-Iohara-Miki algebra is a quantum toroidal algebra deeply related to q -deformed \mathcal{W} -algebras. It provides an elegant framework to topics such as the Alday-Gaiotto-Tachikawa correspondence and the integrability of supersymmetric gauge theories. We check our generalized topological formalism by computing the double-quantized Seiberg-Witten curve, i.e. the qq-character, from the Ward identity of the associated algebra. In particular, we consider 5d $\mathcal{N} = 1$ gauge theories with A -type gauge group and D -type quivers and 6d $\mathcal{N} = (1, 0)$ theories in this article. We construct the former class of theories with orientifolds added in the (p, q) brane web and propose that an operator providing the reflection action in the transverse direction to the orientifold is the only new element we need to introduce in the corresponding topological vertex formalism. In the latter case, we find an elliptic version of the Ding-Iohara-Miki algebra as the associated algebraic structure and more strict constraints on the matter contents of the 6d theory from the Ward identity approach to the qq-characters. These constraints agree with the flux conservation condition discussed in the D6-D8 brane construction of 6d gauge theories.