Open string amplitudes in modified Schnabl gauge [1]

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One of the recent striking achievements in string field theory is the analytic proof of Sen's conjectures. In [1], Schnabl constructed an analytic solution for the equation of motion

$$Q_B\Phi + \Phi * \Phi = 0$$

in Witten's cubic string field theory and proved that the height of the tachyon potential at the vacuum is related to the tension of the D-brane. Subsequently, the Sen's third conjecture which states that there is no physical state at this vacuum was proved analytically [2].

The equation of motion is a highly non-linear equation with an infinite numbers of degrees of freedom. In the Siegel gauge $b_0\Phi = 0$, which is traditionally used for the most of the computation, the equation can be solved by tedious numerical calculation such as level truncation. In this gauge, the calculations of the amplitudes are also formidable task.

Recent developments of the string field theory rely heavily on the use of the proper gauge for the calculation. Schnabl realized that the gluing rule of string field theory does not match with the Siegel gauge and used another gauge which is more useful in the star operation. Subsequent proof of the absence of the physical degree of freedom also relies heavily on the use of this gauge.

Another problem in the string field theory is the complicated expression of off-shell amplitudes. In this talk, we have proposed the use of another gauge

$$\hat{\mathcal{B}}_0 R = (\mathcal{B}_0 + \mathcal{B}_0^\dagger)R = 0$$

for the quantum fluctuation fields R. This choice of gauge for the propagator drastically simplifies the calculation of the off-shell amplitudes in Witten's cubic string field theory. We have showed that the modified use can also be applied to WZW-like action of open superstring field theory.

References

[1] M. Schnabl, "Analytic Solution for Tachyon Condensation in Open String Field Theory," [arXiv:hep-th/0511286].

[2] I. Ellwood and M. Schnabl, "Proof of Vanishing Cohomology at the Tachyon Vacuum," [arXiv:hep-th/0606142].

[1] This talk is based on work with H. Fuji and H. Suzuki, hep-th/0609047.