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Bulk-induced D-brane deformations and the string coupling constant

We use String Field Theory (SFT) techniques to investigate bulk RG flows in two-dimensional (B)CFTs triggered by slightly relevant operators of weight $(1-y, 1-y)$, with y small and positive. Specifically, we compute the change in the g-function up to the second order in y. In Conformal Perturbation Theory, this involves a notoriously difficult two-loop computation. On the other hand, in SFT, we accomplish this by identifying the solution to the classical open-closed string field equations of motion corresponding to the background associated with the IR fixed point. On this solution, we compute the disk action, a gauge-invariant quantity that gives the disk partition function
of the new open-closed background, which can be expressed in terms of the g-function and the string coupling constant g_s.

When we apply this procedure to well-known RG flows triggered by an exactly marginal operator or a slightly relevant operator, we make a surprising discovery. We find that the desired
g-function can only be obtained by assuming a change in g_s. Therefore, from the SFT point of view, a bulk deformation generally induces both a change in the (B)CFT background and a variation in the string coupling constant. In particular, we demonstrate that this change in
g_s is universally proportional to the sphere two-point function of the perturbing bulk operator and is independent of the boundary conditions.

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