Virasoro algebra in K-space

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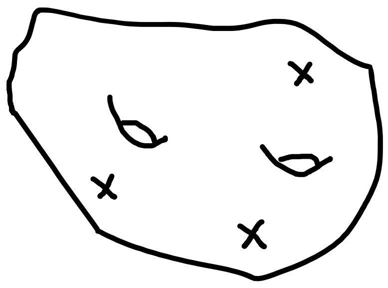
Summary

- **SSD-based (inspired) derivation** of novel representation of Virasoro algebra
- **wedge-based framework of open string field theory**
- 0, 1, 2 D-branes

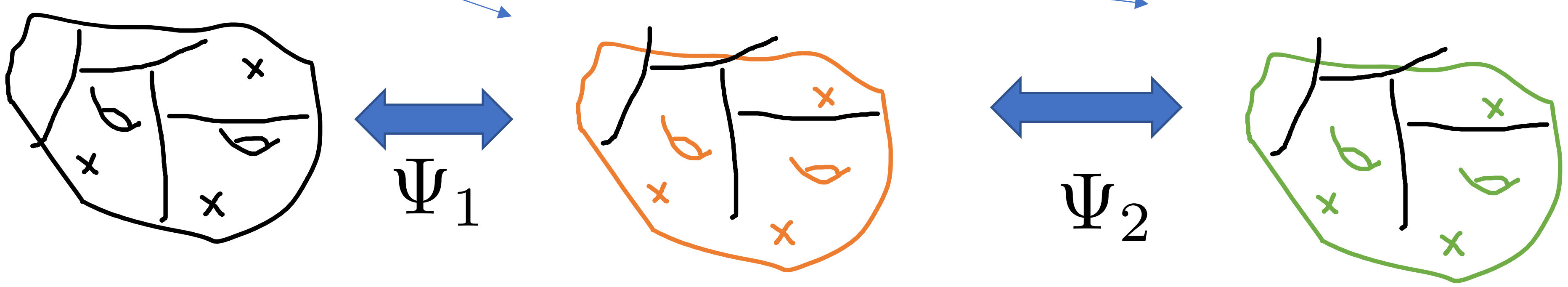
$$\mathbb{L}_m = -K^m L = -K^{m+1}\partial_K$$

String theory = CFT on Reimann surfaces



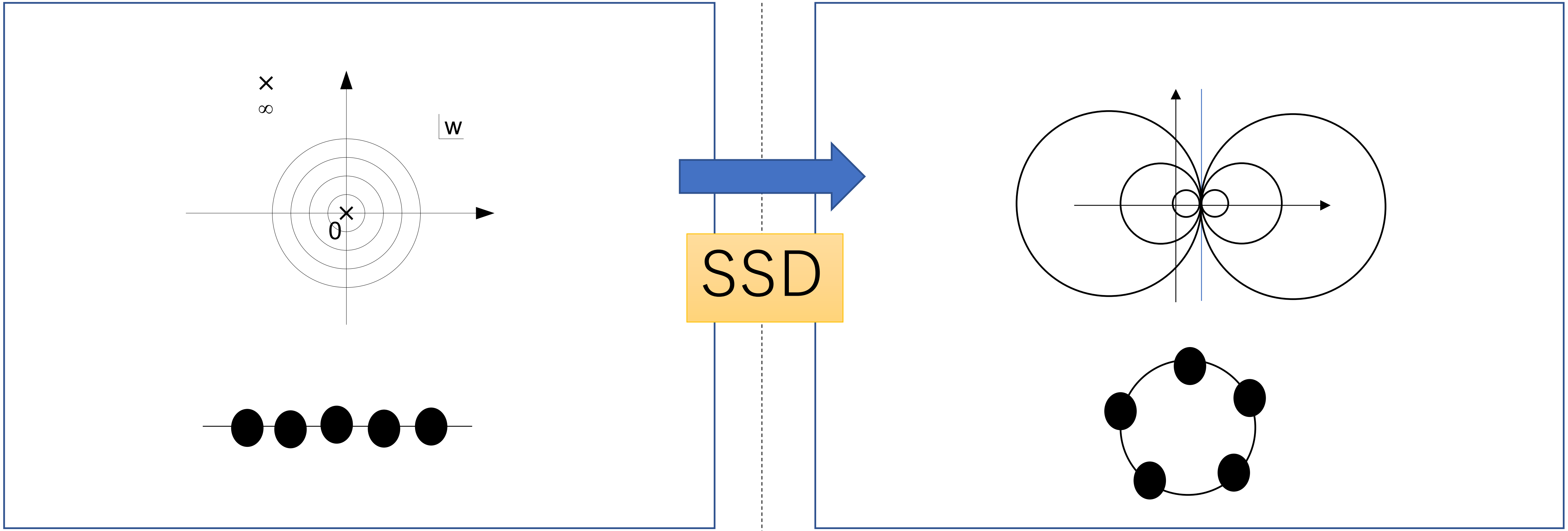
String field theory = CFTs (and more?)

$$S \sim \int \left(\frac{1}{2}\Psi Q \Psi + \frac{1}{3}\Psi^3 \right)$$



SSD as CFT: Dipolar quantization

Ishibashi-Tada



$$H = L_0$$

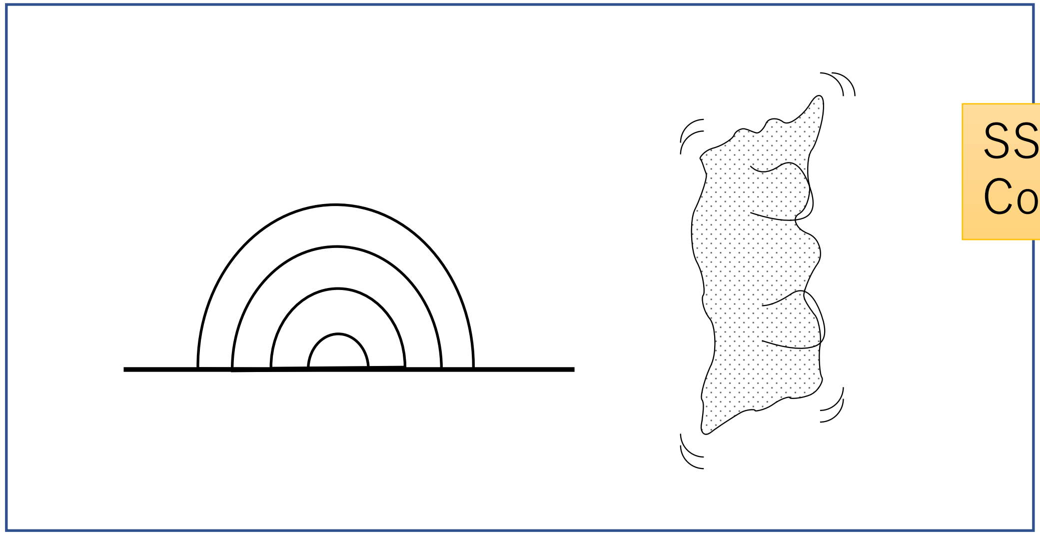
L_m :Discrete

$$H = L_0 - \frac{1}{2}(L_1 + L_{-1})$$

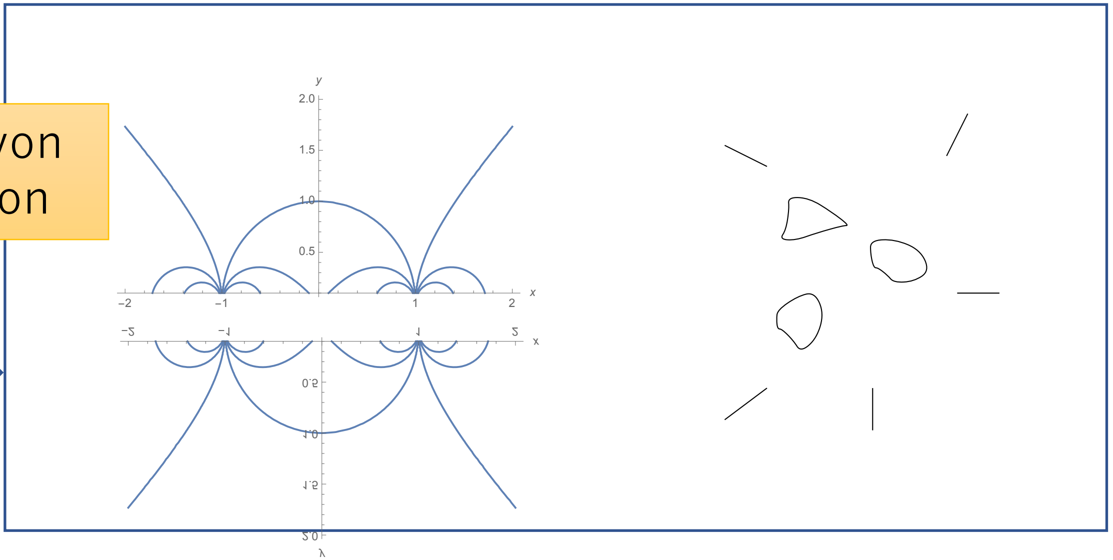
$\mathcal{L}_\kappa$:Continuous

SSD as open string field theory

Kishimoto-Kitade-Takahashi
S. Z.



SSD=Tachyon Condensation



$$H \sim L_0$$

L_m :Discrete

$$H \sim L'_0 - \frac{1}{2}\left(L'_2 + L'_{-2}\right) + const.$$

$\mathcal{L}_\kappa$:Continuous

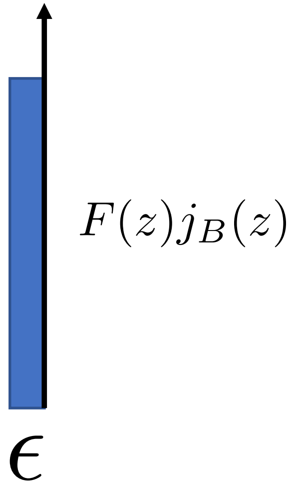
Closed string

Two frameworks for OSFT solutions

Identity based Takahashi-Tanimoto

$$\Psi = \left(\int_C dz F(z) j_B(z)\right) I + \cdots$$

$$F(z) = -\frac{1}{2} - \frac{1}{4}\left(z^2 + z^{-2}\right)$$



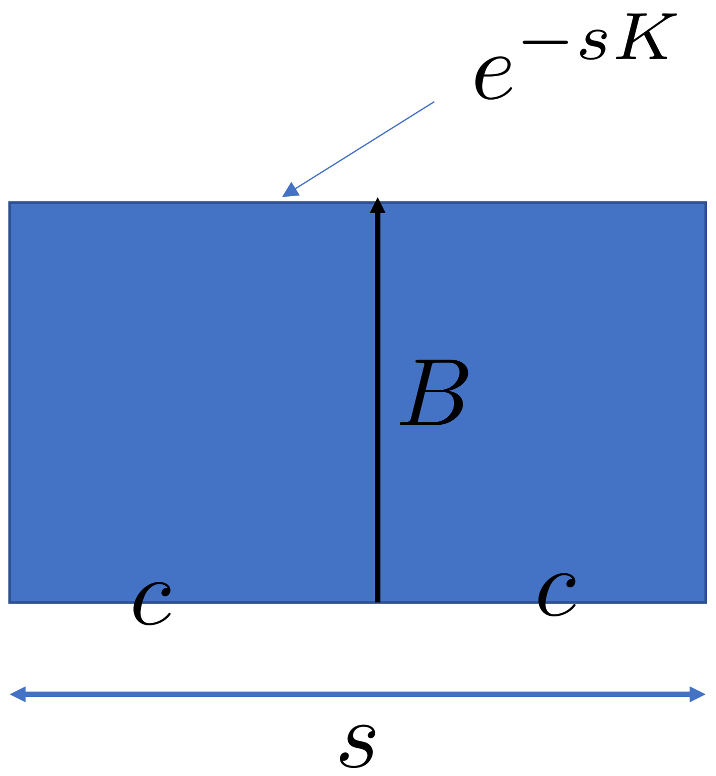
SSD!

Wedge based Schnabl

$$\Psi_G = \sqrt{1-G}\, c \frac{K}{G} B c \sqrt{1-G}$$

$G(K)$

$$\int_0^\infty ds\, g(s)$$



SSD ?

Question

How SSD will work in
wedge-based framework ?

Answer

Virasoro algebra in K-space

KBcL algebra   Mertes-Schnabl

$$Q_B c = cKc, \quad Q_B K = 0, \quad Q_B B = K, \quad Q_B L = 0,$$

$$cB + Bc = 1, \quad c^2 = 0,$$

$$[L, K] = K, \quad [L, B] = B, \quad [L, c] = -c.$$

$$[L, f(K)] = K\partial f(K)$$

$$\mathbb{L}_m = -K^m L = -K^{m+1}\partial_K$$

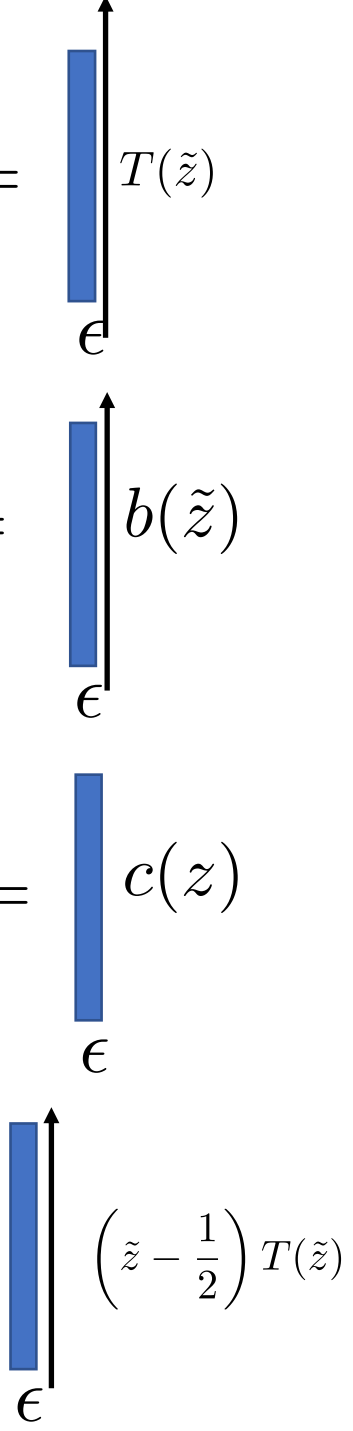
$$[\mathbb{L}_m, \mathbb{L}_n] = (m-n)\mathbb{L}_{m+n}$$

$K =$

$B =$

$c =$

$L =$



Virasoro generators for nontrivial backgrounds (= SSD!)

$$\Psi_G = \sqrt{1-G}c\frac{K}{G}Bc\sqrt{1-G}$$

$$\hat{Q}\Psi = Q_B\Psi + \Psi_G\Psi + \Psi\Psi_G$$

$$u_\lambda = \phi^\lambda u_0,$$

$$v_\lambda = -\frac{\phi^\lambda}{G} - \phi^\lambda\frac{F}{G}BcF - FBc\frac{F}{G}\phi^\lambda$$

$$\hat{\mathbb{L}}_\lambda = \hat{Q}\hat{\mathbb{b}}_\lambda$$
$$= u_\lambda + v_\lambda L,$$

$$\phi(K) = \exp\left(\int^K dK'\frac{G(K')}{K'}\right)$$

$$[\hat{\mathbb{L}}_\lambda, \hat{\mathbb{L}}_{\lambda'}] = (\lambda-\lambda')\hat{\mathbb{L}}_{\lambda+\lambda'}$$

0, 1, 2 branes

$$G(K) = \left(\frac{1+K}{K}\right)^n$$

$$\phi^\lambda(K) \sim \begin{cases} (1+K)^\lambda & \text{for the tachyon vacuum } (n=-1) \\ K^\lambda & \text{for perturbative vacuum } (n=0) \\ e^{-\frac{\lambda}{K}} K^\lambda & \text{for two-branes } (n=1) \end{cases}$$

Tachyon vacuum avoids K=0 singularity ! -> continuous ?

Remark

- More understanding of K-space required > K-space CFT ?
- Splitting (Closed strings)?