# T-duality of worldsheet boundary conditions

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[work with L. Hlavaty and L. Snobl, in preparation]

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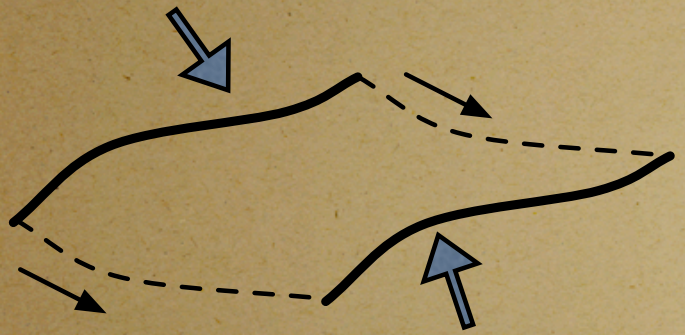
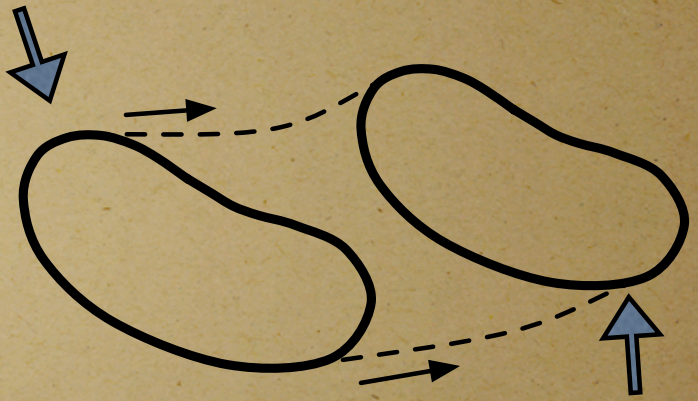
open string at time $\tau_1$



closed string at time $\tau_1$

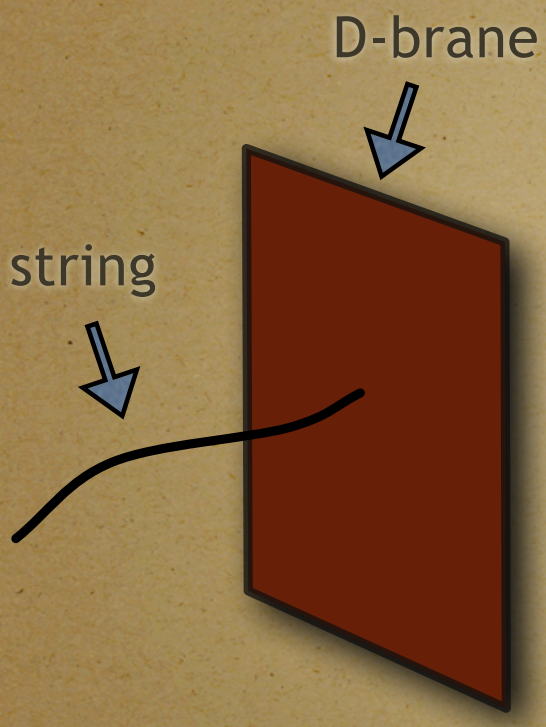


$$S = \int d^2\xi \, \partial_+ \Phi^\mu \, \partial_- \Phi^\nu \, E_{\mu\nu}(\Phi)$$

integral over 2-dim worldsheet

coordinates on target space

background field




The dynamics of the D-brane is determined by boundary conditions of the non-linear sigma model S

Impose symmetries on S, e.g., conformal invariance

=> geometry of D-brane is restricted

Require consistency under **T-duality**:

An equivalence between different string theories

Must preserve the non-linear sigma model in form

The boundary conditions transform under T-duality as

$$\partial_- \Phi^\mu = R^\mu{}_\nu(\Phi)\partial_+ \Phi^\nu$$

$$\Downarrow$$

$$\partial_- \widetilde{\Phi}^\mu = \widetilde{R}^\mu{}_\nu(\widetilde{\Phi})\partial_+ \widetilde{\Phi}^\nu$$

where $$\widetilde{R} = K_-(E)^{-1}\, R\, K_+(E)^T$$

The gluing matrices R and $\widetilde{R}$ encode information about D-branes in the respective model

=> information about how D-branes transform under T-duality

**Poisson-Lie T-duality:** generalisation of T-duality

The gluing matrix transforms as

$$\widetilde{R} = -\widetilde{E}^{-1} E_0^{-1} E R E^{-T} E_0^T \widetilde{E}^T$$

**Poisson-Lie T-plurality:** generalisation of Poisson-Lie T-duality

The gluing matrix transforms as

$$\widehat{R} = \widehat{E}^{-1} M_-^{-1} E R E^{-T} M_+^{-1} \widehat{E}^T$$

where the matrices $M_\pm$ depend on the choice of target spaces

**We found that these transformations do not automatically give consistent models on both sides of the duality; additional constraints are necessary**