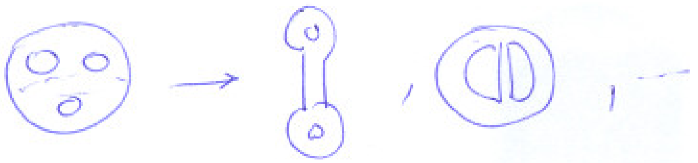
RASTELLI, LECTURE 2

PROVING $\mathcal{M}^{\text{OPEN}}_{g,h} \cong \mathbb{R}^h_+ \times \mathcal{M}^{\text{CLOSED}}_{g,\,p=h}$

OPEN STRING MODULI:
REVIEW: TRIANGULATE g,h OPEN SURFACE WITH STRIPS OF LENGHT π AND 3-VERTICES :



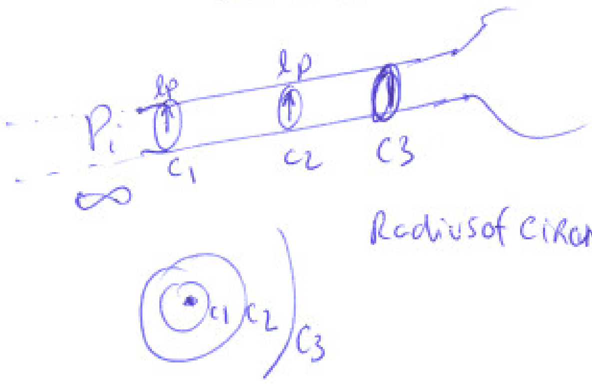
moduli $\{l_i\}$, $i=1 \dots h$
(LENGHT OF CYCLES)

DECOMPOSING CLOSED STRING MODULI:

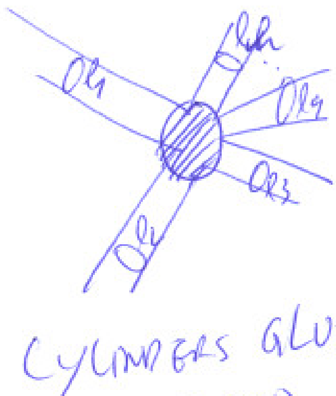
THE APPROACH OF FACTORIZATION IN TERMS OF PROPAGATORS (ON-SHELL STATES) + CUBIC VERTICES DOES NOT WORK : QUARTIC & HIGHER ORDER VERTICES REQUIRED.

USE OTHER APPROACH. (UNIQUE) MINIMUM AREA METRIC, SUCH THAT γ_i CURVES HOMOTOPIC TO THE PUNCTURES HAVE $l_{\gamma_i} \geq l_i$ (min length)

METRIC RESULTING IS OF TYPE 'SEMI-INFINITE CYLINDERS' AROUND P_i

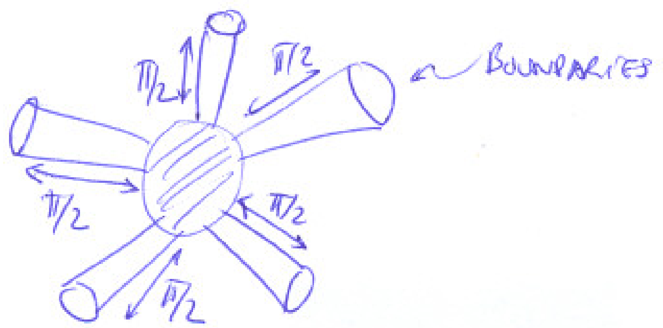


Radius of CIRCONFERENCE $= l_p$

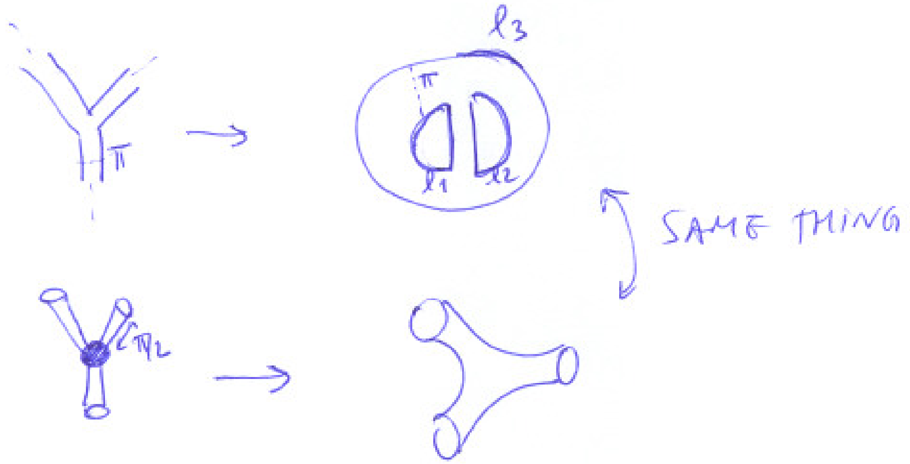


CYLINDERS GLUED IN THE END

TO LINK CLOSED/OPEN, CUT OPEN THE CYLINDERS !



AND THIS IS JUST THE SAME THING AS OPEN CASE, E.G.



WITH THE ISOMORPHISM, WE CAN CALCULATE CORRELATORS FROM THE OPEN CHANNEL, OSFT, (

MATRIX MODEL AGAIN

$$S = \mathrm{TR}\left[\tfrac{1}{2}X^2 Z + \tfrac{1}{3}X^3\right] \qquad Z = \begin{pmatrix} z_1 & & 0 \\ & \ddots & \\ 0 & & z_N \end{pmatrix}$$

ONE FINDS A STRING THEORY AND SET OF BRANES SUCH THAT

$$S = \mathrm{TR}(\cdots) = \tfrac{1}{2}\langle\psi, Q_B\psi\rangle + \tfrac{1}{3}\langle\psi,\psi,\psi\rangle = S^{\text{witten}}$$

LINK TO $c<1$ Liouville NON-CRITICAL STRINGS

$$S^{WS}_{\text{Liouville}} = \int d^2z \; \partial\phi\bar\partial\phi + QR\phi + \mu e^{2b\phi} \qquad c_M + c_L = 26$$

$$c_{\text{ghost}} = -26$$

MINIMAL (2,1) MODEL $\quad c_M = -2$

MATTER VERTEX OP. $V_M \, e^{2\alpha\phi} \quad c_1 |0\rangle$

$\Delta_M + \Delta_L = 1$

$SL(2)$ SINGLET

THERE EXISTS A NUMERABLE INFINITY OF VERTEX OPS. O_{2k+1}

AND $\langle O_{2k_1+1} \cdots O_{2k_n+1} \rangle \sim$