

# AdS<sub>3</sub>/CFT<sub>2</sub> correspondence in action

Roman Geiko

Higher School of Economics, Mathematics Department

April 27, 2017

# Local conformal symmetries

- Conformal transformations in 2d:

$$z \rightarrow f(z), \quad \bar{z} \rightarrow g(\bar{z})$$
$$dzd\bar{z} \rightarrow \frac{\partial f(z)}{\partial z} \frac{\partial g(\bar{z})}{\partial \bar{z}} dzd\bar{z}$$

- Primary fields

$$\phi(z) \rightarrow \left( \frac{\partial f(z)}{\partial z} \right)^{-\Delta} \phi(f(z))$$

## 2d Conformal field theories

- Conserving current:

$$T(z) = \sum \frac{L_n}{z^{n+2}}$$

- Virasoro algebra

$$[L_n, L_m] = (m - n)L_{m+n} + \frac{c}{12}(m^3 - m)\delta_{m,-n}$$

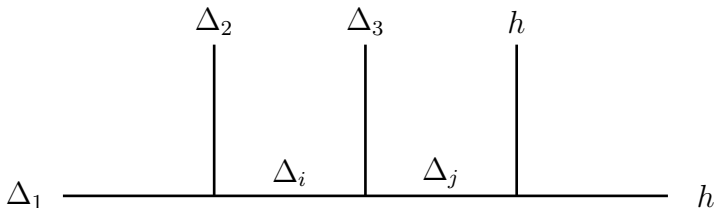
- Operator product expansion

$$\langle \dots \phi_i \phi_j \dots \rangle = \sum_k C_{ij}^k \langle \dots \phi_k \dots \rangle$$

## 2d Conformal field theories

- Conformal block decomposition. Five-point conformal block on a sphere

$$\langle \phi_1 \phi_2 \phi_3 \phi_h \phi_h \rangle \sim \sum_{\Delta_i} |F(\Delta_1, \Delta_2, \Delta_3, h, \Delta_i, \Delta_j, c|z, w)|^2$$



# Semiclassical limits $c \rightarrow \infty$

- Classical block. Exponentiation when all  $\frac{\Delta}{c}$  and  $\frac{h}{c}$  are fixed and  $c$  is large.

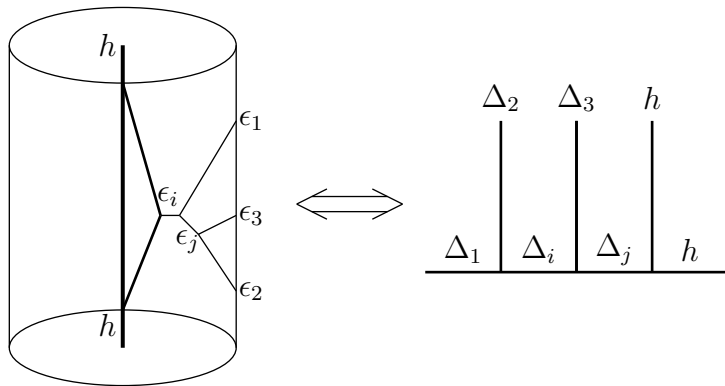
$$V(\vec{\Delta}, \Delta_i, \Delta_j, c|q_1, q_2) = \exp\left(cf\left(\frac{\vec{\Delta}}{c}, \frac{\Delta_i}{c}, \frac{\Delta_j}{c}, |q_1, q_2\right)\right)$$

- Heavy-light block.  $\frac{h}{c}$  are heavy and other  $\frac{\Delta}{c} \ll 1$  are light.

$$f_{hl} = \text{something linear on } \frac{\Delta}{c} \text{ and rational on } \frac{h}{c}$$

# AdS space with angle

$$ds^2 = \frac{\alpha^2}{\cos^2 \rho} \left( -dt^2 + \sin^2 \rho d\phi^2 + \frac{1}{\alpha^2} d\rho^2 \right),$$



# AdS space

Heavy-light conformal block  $\iff$  Action