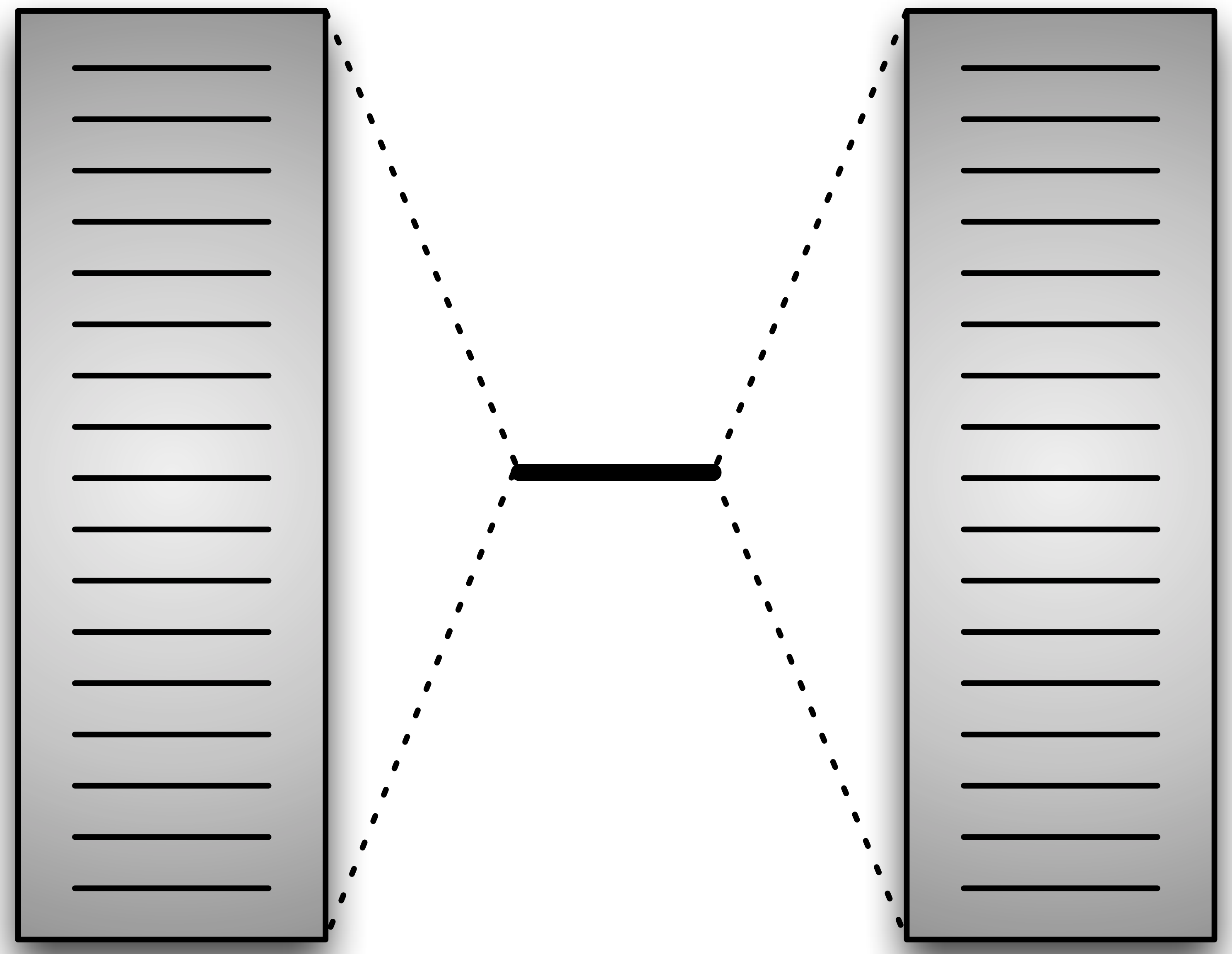
Landauer Model



$$\sum_{k\in L}\epsilon_k \hat{a}_k^\dagger \hat{a}_k + \epsilon_o \hat{a}_0^\dagger \hat{a}_0 + \sum_{k\in R}\epsilon_k \hat{a}_k^\dagger \hat{a}_k$$
$$+\sum_{k\in L} t_k \left(\hat{a}_k^\dagger \hat{a}_0 + \hat{a}_0^\dagger \hat{a}_k\right) + \sum_{k\in R} t_k \left(\hat{a}_k^\dagger \hat{a}_0 + \hat{a}_0^\dagger \hat{a}_k\right)$$

Rewrite terms as matrices

Second quantization $\longrightarrow$ 2x2 Matrices $\longrightarrow$ Classical dynamics

Write the matrix element explicitly:

$$\left\langle \mathbf{n}' \middle| \hat{a}_i^\dagger \hat{a}_j \middle| \mathbf{n} \right\rangle = \underbrace{\delta_{n_i, n'_i+1}}_{\text{raise}} \underbrace{\delta_{n_j, n'_j-1}}_{\text{lower}} \prod_{k \neq i,j} \delta_{n_k, n'_k} \underbrace{\prod_{p=i+1}^{j-1} (-1)^{n_p}}_{\text{normal order}}$$

Each Kronecker delta can be represented as a 2x2 matrix in the occupancy basis

$$\begin{array}{c c} & \begin{array}{cc} |n_i = 1\rangle & |n_i = 0\rangle \end{array} \\ \begin{array}{c} \langle n_i = 1| \\ \langle n_i = 0| \end{array} & \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix} \end{array}$$