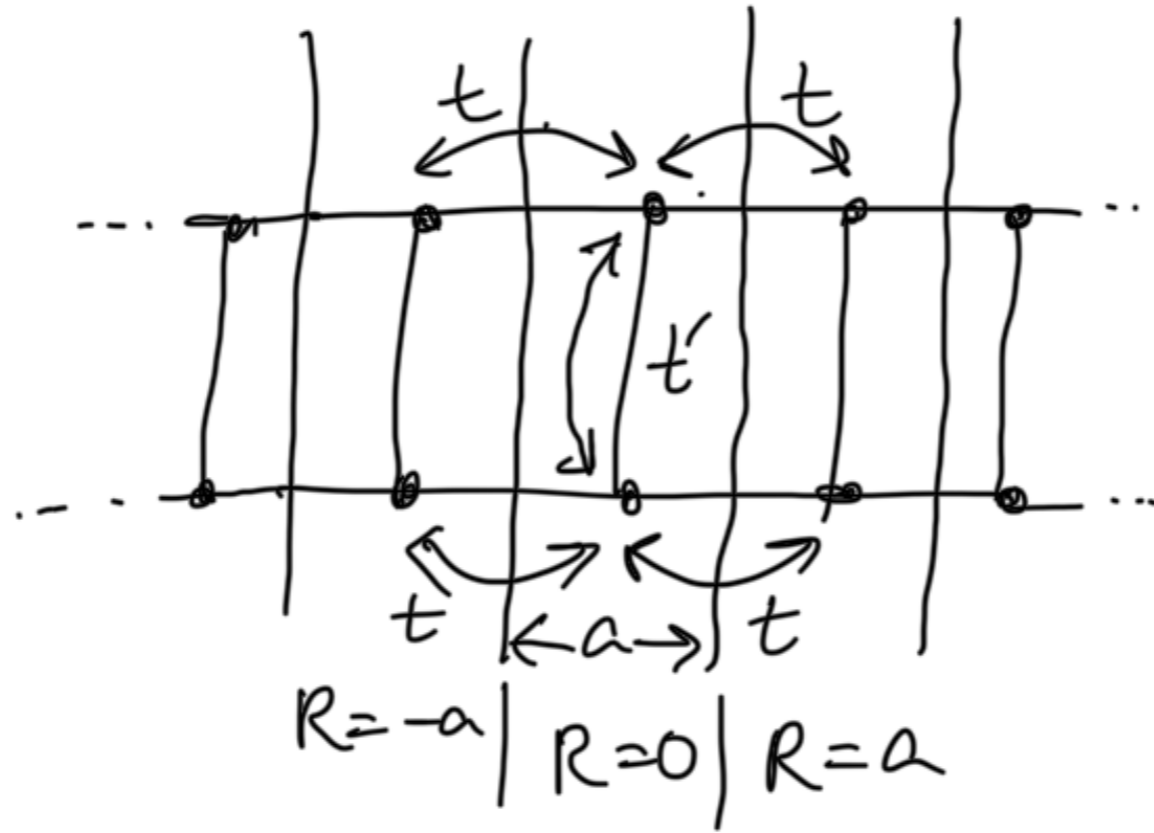


TB model Example

Example (c)



non zero terms

o_j	R_m	$H_{o_j R_m}$
0 1	0 1	$\rightarrow E_0$
0 1	0 2	$\rightarrow t'$
0 1	a 1	$\rightarrow t$
0 1	-a 1	$\rightarrow t$
0 2	0 2	$\rightarrow E_0$
0 2	0 1	$\rightarrow t'$
0 2	a 2	$\rightarrow t$
0 2	-a 2	$\rightarrow t$

$$\sum_R \beta_{vk} e^{i\mathbf{q}R} \sum_m^{N_b} H_{o_j, Rm} C_m = E_{\mathbf{q}} C_j$$

$$\sum_m^{N_b} \left(\sum_R \beta_{vk} e^{i\mathbf{q}R} H_{o_j, Rm} \right) C_m = E_{\mathbf{q}} C_j$$

$$\begin{bmatrix} E_0 + \frac{-ia\eta}{t\ell} + \frac{+ia\eta}{t\ell} & t' \\ t' & E_0 + t\bar{e}^{ia\eta} + te^{+ia\eta} \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} = E_g \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} (E_0 + 2t \cos \eta a) & t' \\ t' & (E_0 + 2t \cos \eta a) \end{bmatrix} \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} = E_g \begin{bmatrix} c_1 \\ c_2 \end{bmatrix}$$

$$\Rightarrow \det \begin{bmatrix} (E_0 + 2t \cos \eta a - E_g) & t' \\ t' & (E_0 + 2t \cos \eta a - E_g) \end{bmatrix} = 0$$

$$\Rightarrow (E_0 + 2t \cos \eta a - E_g)^2 = t'^2$$

$$\Rightarrow E_g = \pm t' + E_0 + 2t \cos \eta a$$

