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Chapter 1

Introduction

1.1 The half-infinite double chain

For the half-infinite double we define the Hamiltonian as

$$H = \sum_{i=1}^{\infty} \epsilon \left[|i,1\rangle \langle i,1| + |i,2\rangle \langle i,2| \right] + \left[|i,1\rangle \langle i+1,1| + |i,2\rangle \langle i+1,2| \right] + t \left[|i,1\rangle \langle i,2| + h.c. \right]. \quad (1.1)$$

However in this model one assumes, that the binding t is the same between the positions parallel to the chain and between the upper and lower site of position i in the chain. A more general approach would be to also take models into account where the binding t and $\bar{t}$ aren't the same as it is depicted in figure 1.1.

is h.c. correctly set?

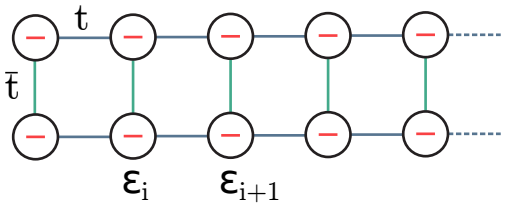

Figure 1.1: Half-infinite double chain

For this one needs to just slightly alter the Hamiltonian of equation 1.1 to

$$H = \sum_{i=1}^{\infty} \epsilon \left[|i,1\rangle \langle i,1| + |i,2\rangle \langle i,2| \right] + t \left[|i,1\rangle \langle i+1,1| + |i,2\rangle \langle i+1,2| + h.c. \right] + \bar{t} \left[|i,1\rangle \langle i,2| + h.c. \right]. \quad (1.2)$$