Contents

List of Figures

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?

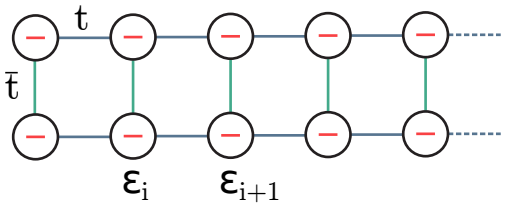
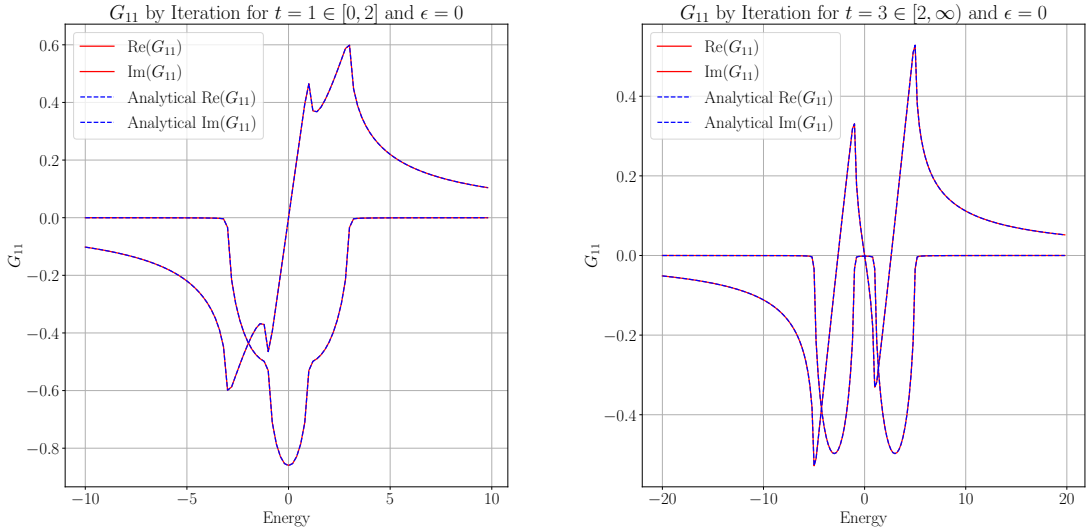


Figure 1.1: Half-infinite double chain

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

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

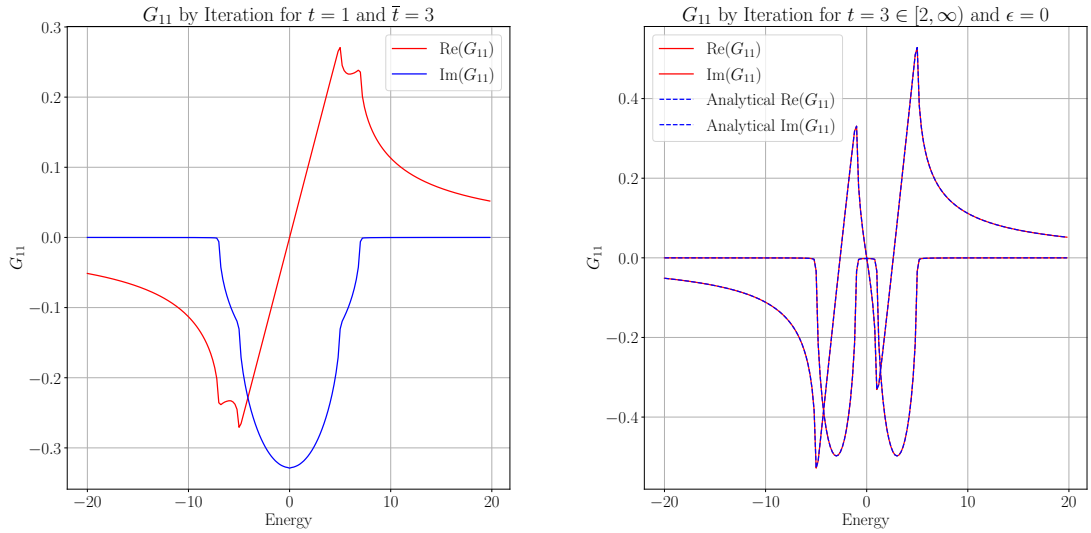
Instead of the plots depicted in figure 1.3



(a) G_{11} by iteration for $t = 1 \in [0, 2]$ and $\epsilon = 0$ (b) G_{11} by iteration for $t = 3 \in [2, \infty)$ and $\epsilon = 0$

Figure 1.2: Surface Green function for G_{11}

one gets



(a) G_{11} by iteration for $t = 1, \bar{t} = 3 \in [0, 2]$ and $\epsilon = 0$ (b) G_{11} by iteration for $t = 3 \in [2, \infty)$ and $\epsilon = 0$

Figure 1.3: Surface Green function for G_{11}