ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Computational Quantum Physics
Exercise 10

FS 12
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Problem 10.1 Continuous time Quantum Monte Carlo

In this exercise, we will solve the $(0+1)d$ Ising model, given by the Hamiltonian

$$H = \Gamma\sigma_x \tag{1}$$

using a continuous-time segment update Monte Carlo method as discussed in the lecture.

- Think about good data structures to implement the domain boundaries.
- Be careful with correctly implementing the periodic boundary conditions and with detailed balance.
- In the end, you should be able to reproduce the magnetization curve $\langle\sigma_x\rangle = \tanh\beta\Gamma$. You can calculate the magnetization in the Monte Carlo scheme as

$$\langle\sigma_x\rangle = \frac{\#\text{ of kinks}}{\beta\Gamma} \tag{2}$$