UNIVERSITY OF HELSINKI
DEPARTMENT OF PHYSICS

BASICS OF MONTE CARLO SIMULATIONS

Exercise 4

Student: Caike Crepaldi

Professor: Flyura Djurabekova

February 2016

Note. In order to run the exercise's source codes, use the command *make all* (see the Makefile for more compilation commands and details). The graphs and plots are available in the ./Figures/ folder.

Problem 1

Please compile and run the **ex4p1** program. The output is the RMS for 10^6 points. If needed, the user can declare the number of points as an optional command line argument.

The comparison of the expected distribution and the one obtained by the Markov Chain Monte Carlo can be seen in figure 1. The chosen optimal value for ΔE_{MAX} was 0.1, see the plot in figure 2.

See the shell script in order to see the commands used to create the data ploted in the figure 3. We can notice that the RMS values follow what it seems to be a distribution that resembles a function like $f(x) = x^{-1}$. In the graph we have a basic fitting, in this case I tried $f(x) = ax^{-3} + b$, with 2 adjusted parameters, a and b.

Problem 2

The second problem is not completed. I was not able to develop the algorithm in order to solve the needs of the presented situation. The unfinished source code is available to be graded. It represents the slide algorithm up to step 8.

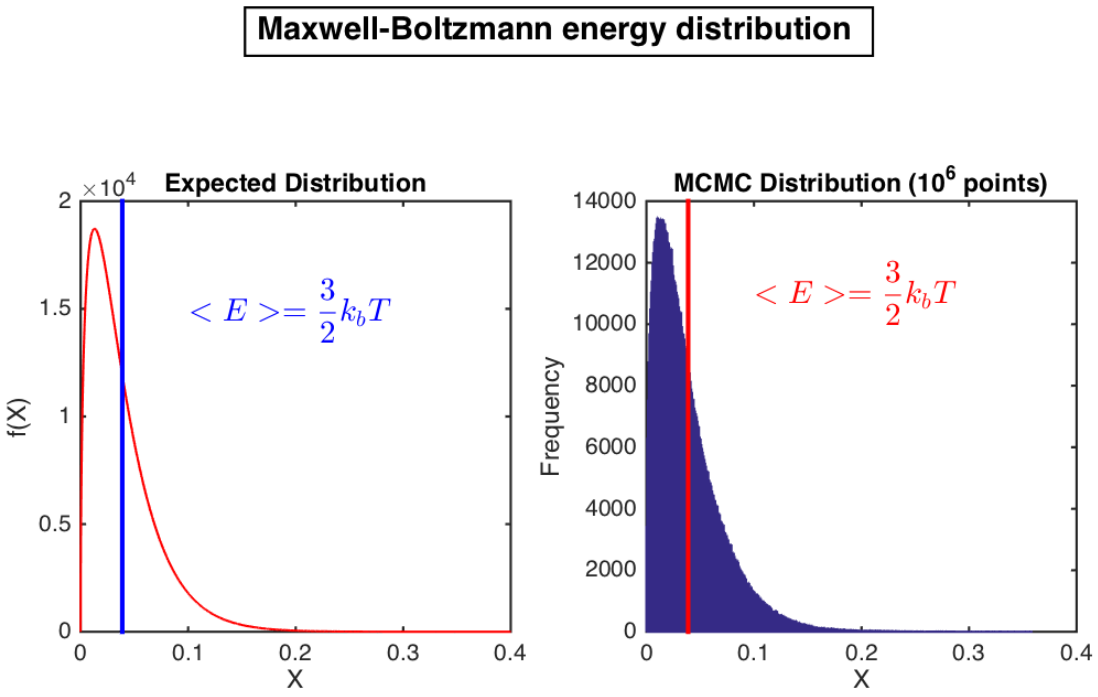

Figure 1: Maxwell-Boltzmann energy distribution for particles: The expected distribution and the one obtained by the MCMC method for 10^6 points.

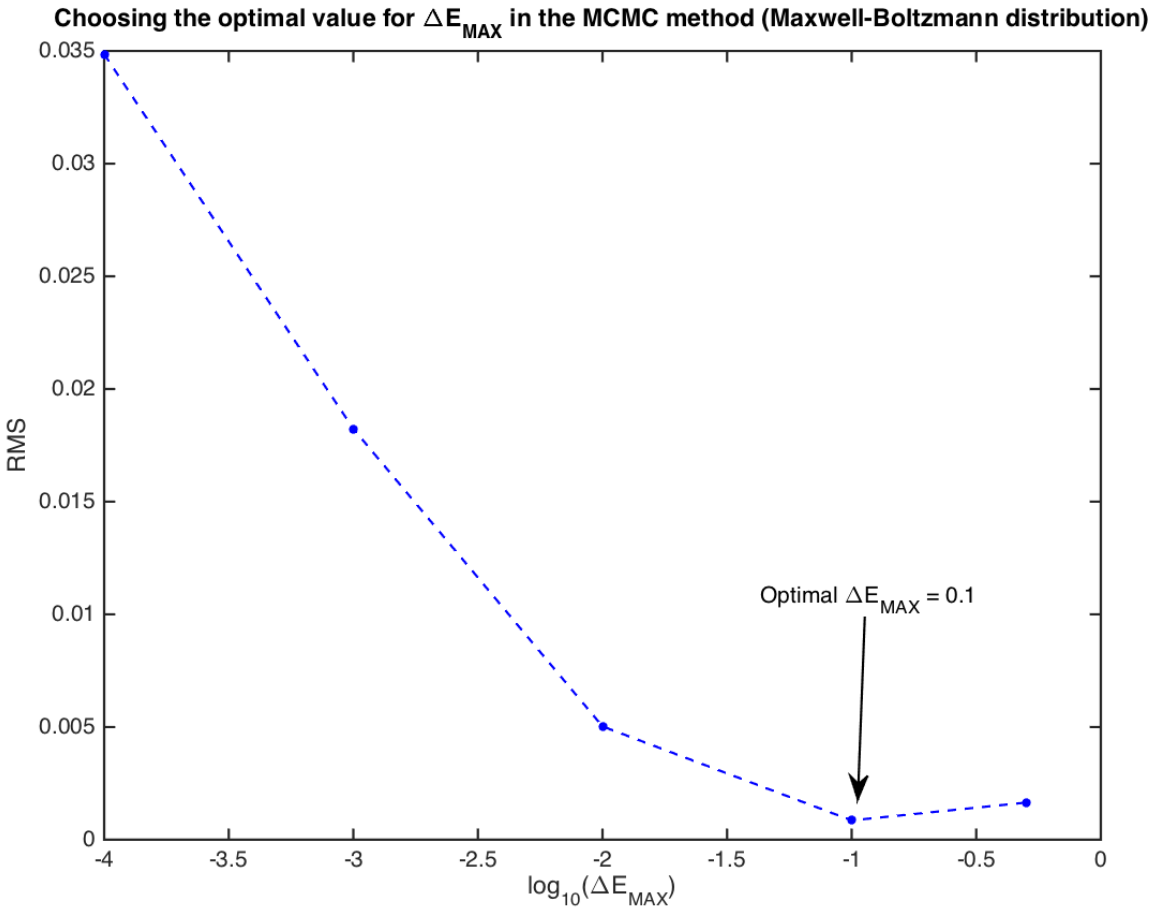

Figure 2: Mean Square (RMS) Error from ΔE_{MAX}.

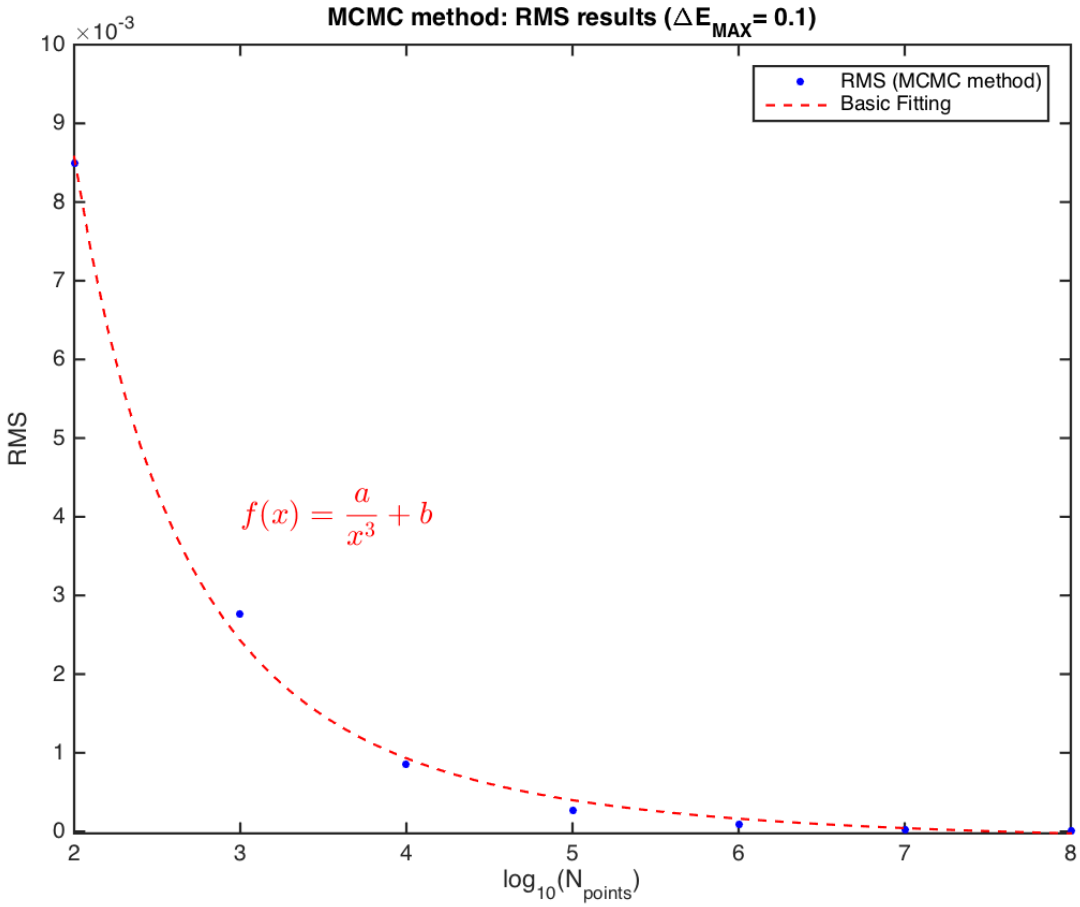

Figure 3: Mean Square (RMS) Error from several runs.