ELEC 4700

Assignment 1

Monte-Carlo Modeling of Electron Transport

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Due Date: Sunday, February 7, 2021.

Introduction:

In this assignment, the modelling of semiconductor electrons moving with thermal velocities and semiconductor scattering was simulated using the Monte-Carlos technique in MATLAB. The Monte-Carlos technique promotes for the modelling of the motion of particles and how they react or the particles and their characteristics within a confined boundary. Furthermore, a semiconductor with dimensions of 200x100nm and effective mass of 0.26m0, must only have particles moving with the specified boundary.

Assignment Plots:

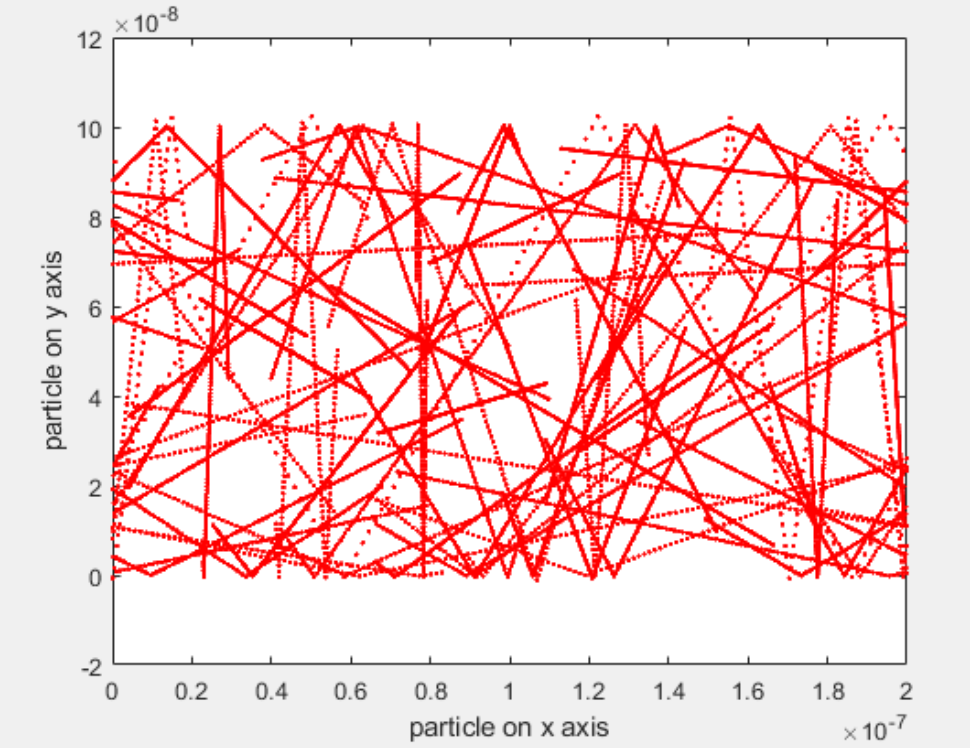

Figure 1: 2-D plot of particle trajectories without bottleneck implemented

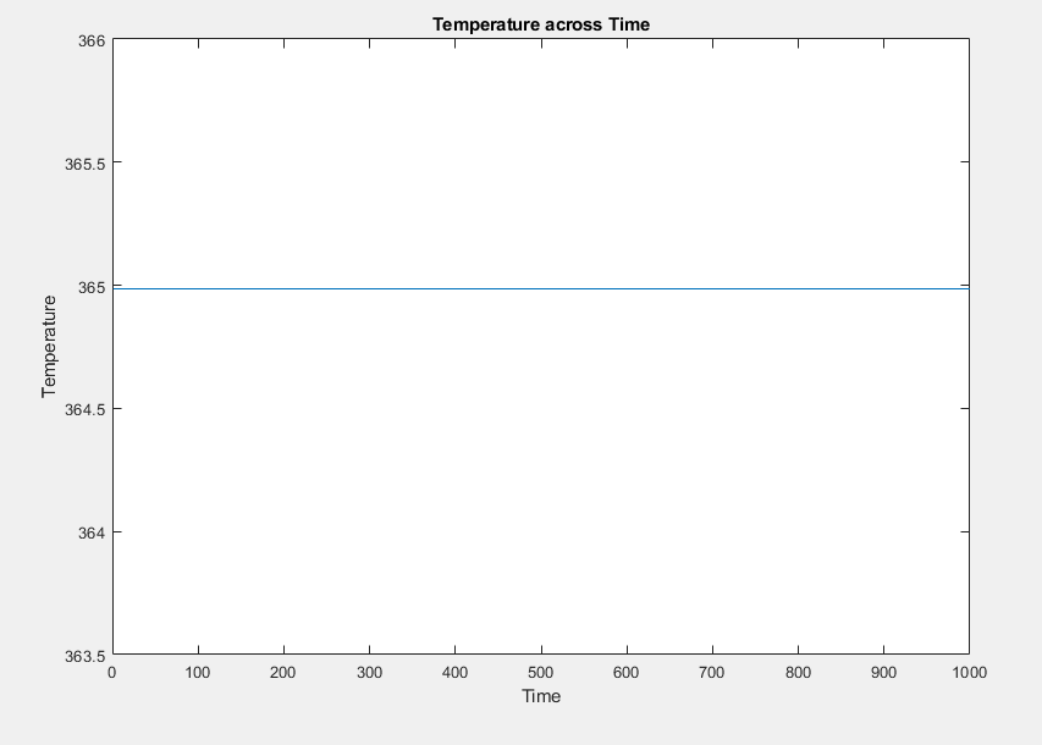

Figure 2: Temperature vs Time plot

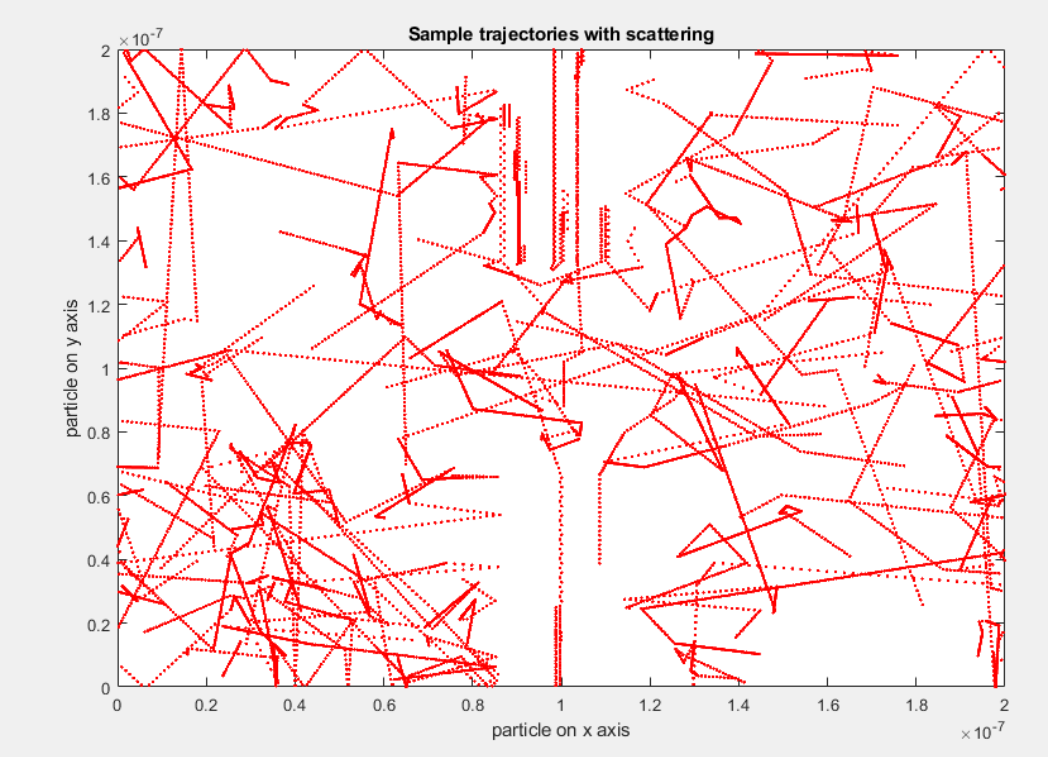

Figure 3: Particle trajectories with scattering

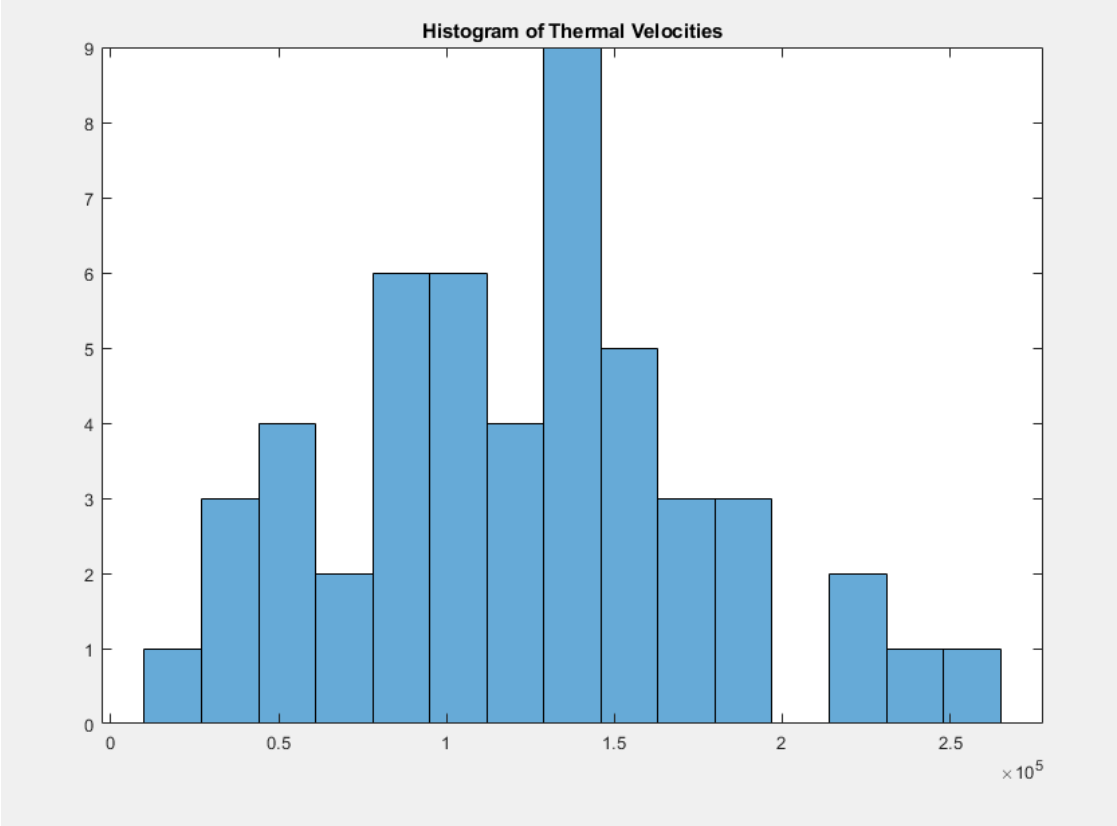

Figure 4: Histogram for particle velocity of 1000 particles

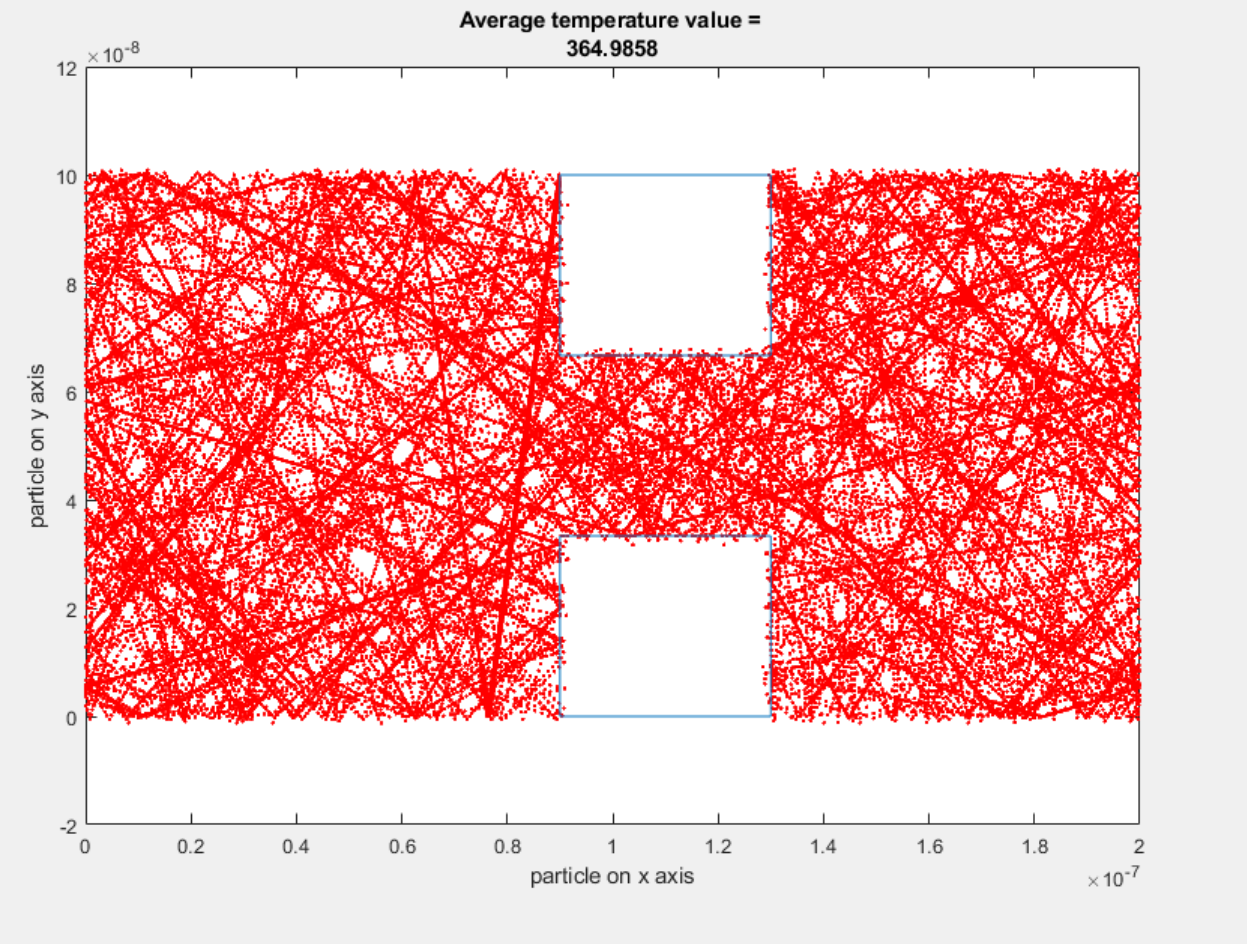

Figure 5: Particles trajectory with bottlenecks added

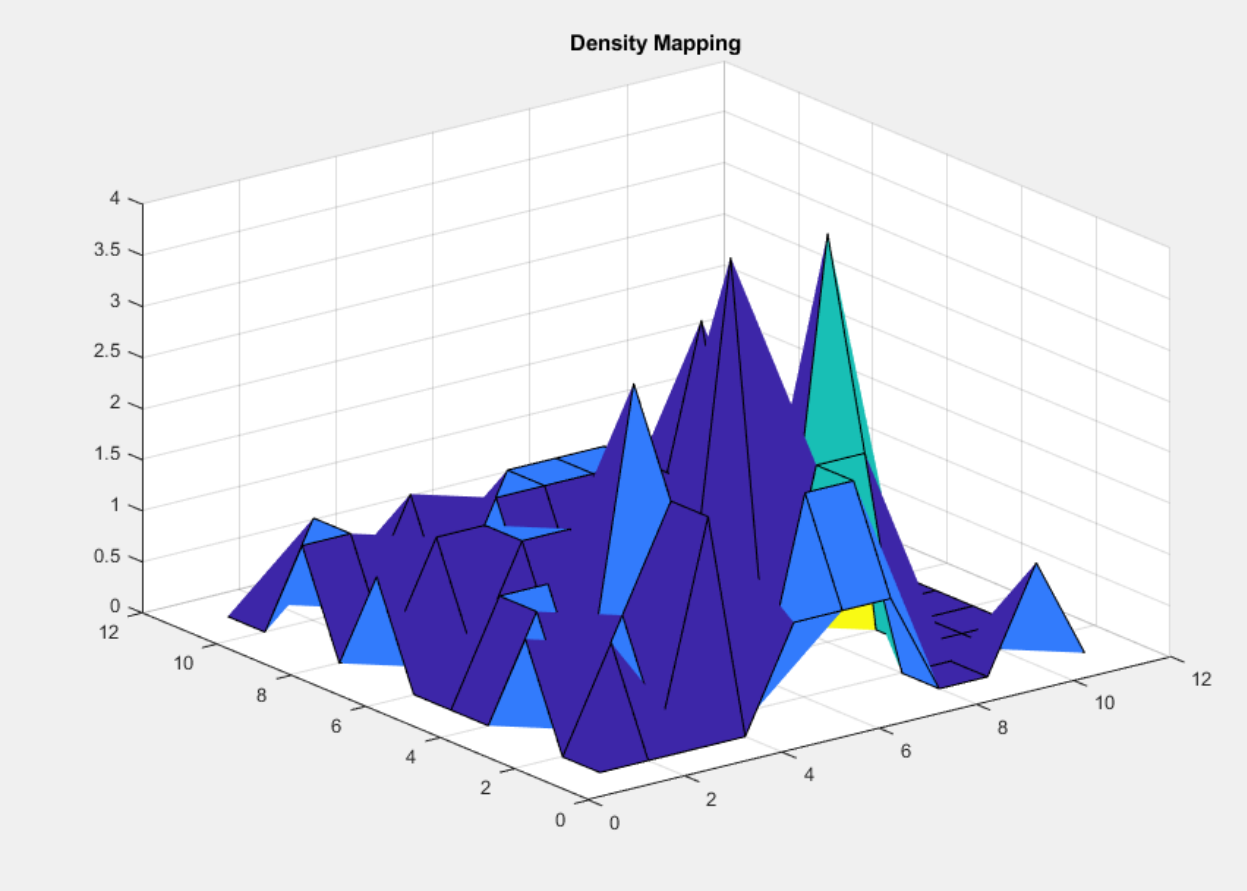

Figure 6: The electron Density map

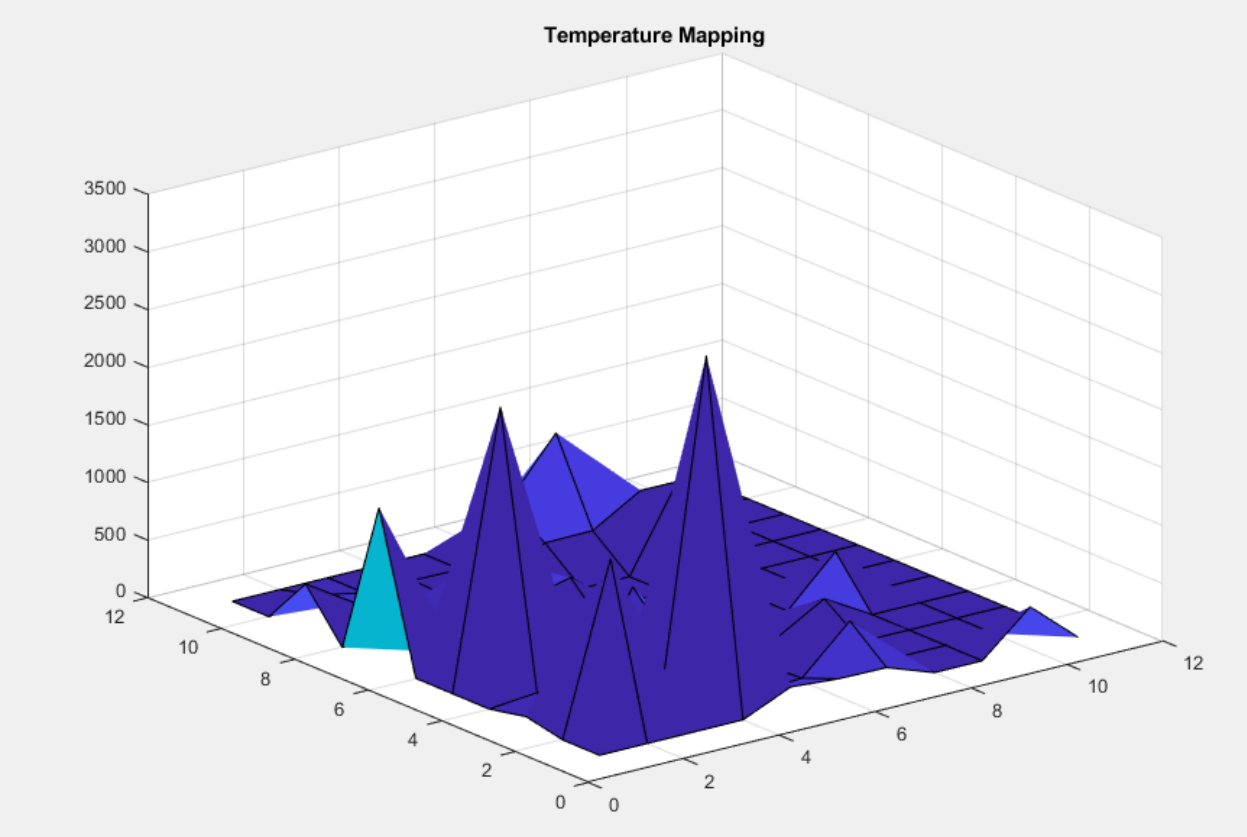

Figure 7: The Temperature Map