ELEC 4700 Assignment 3

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Introduction

This assignment was to combine the previous to assignment to create a better simulation of electrons particles through the Finite Difference method and the Monte Carlo simulation. This assignment proved difficult as I could not get the third part to work properly.

Monte Carlo Enhancements

In this section the Monte Carlo simulation was edited to take into effect an electric field reacting with the charged electron particles. In this section the current density was also calculated as well as adding a temperature grid. To save on time, the density and temperature plots were only updated every 5 cycles to try and run a little faster. I do believe that an error was made when changing the code as the temperature shoots of into the thousands while simulating for only a short interval. I couldn't find the error and had to move on the next problem. After creating the code, the electric field was found to be $5x10^{5}$N/C, and from that the force to be $8.01x10^{-14}$N. The acceleration was then calculated to be $3.3x10^{17}$m/s^{2}. There were no values in the y direction as there was only a force in the x direction. The simulation was then run and yielded the plots in the pdf for the published code.

Finite Difference Method Enhancement

The next section saw the changes made to the file from assignment 2, to determine the solution for the problem at hand. This meant that the file was changes to produce the electric field and voltage spread for the area from part 1. The change made involved populating the sigma matrix before populating the g matrix, as well as changing the values and locations that were assigned to the g matrix. Finally, the outputs were changed to deliver the voltage spread from the area, as well as the quiver plot showing the electric fields. The output plots ca be found in the published code for part 2.

Combining Both Parts

This is where the wheels fell off the train. I was able to combine both programs and generate the plots from the Finite Difference method, but a matrix mismatch error (which I didn't have time to solve because of our round robin games) prevented the simulation from completing. I tried to trouble shoot but eventually ran out of time, and I look forward to discussing what the issue is with either Aaron or Scott. Hopefully for assignment four I'm not away at another curling event!