Assignment2
Finite Difference Method

ELEC4706A
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Part1:

a) 2-D plot of V(x) is shown below

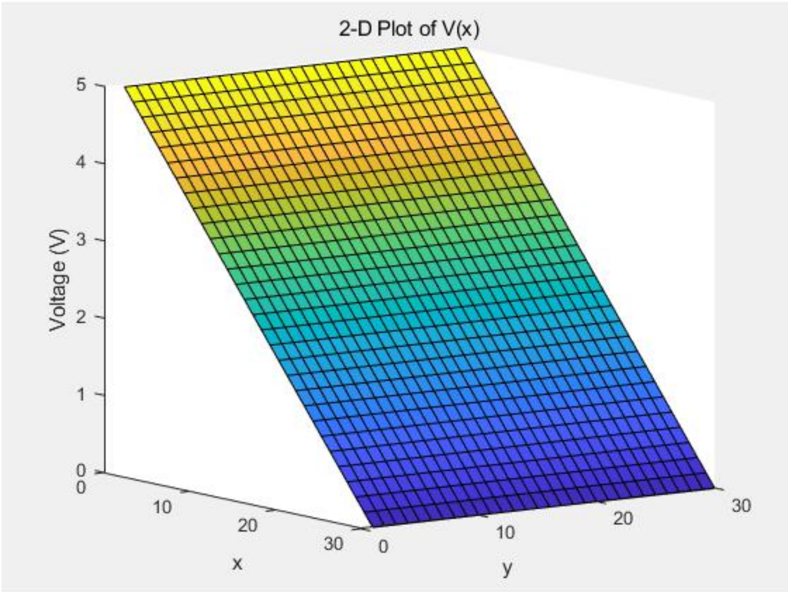

Figure1: 2-D plot of V(x).

b) Matching surface plots of V (x, y) is shown below

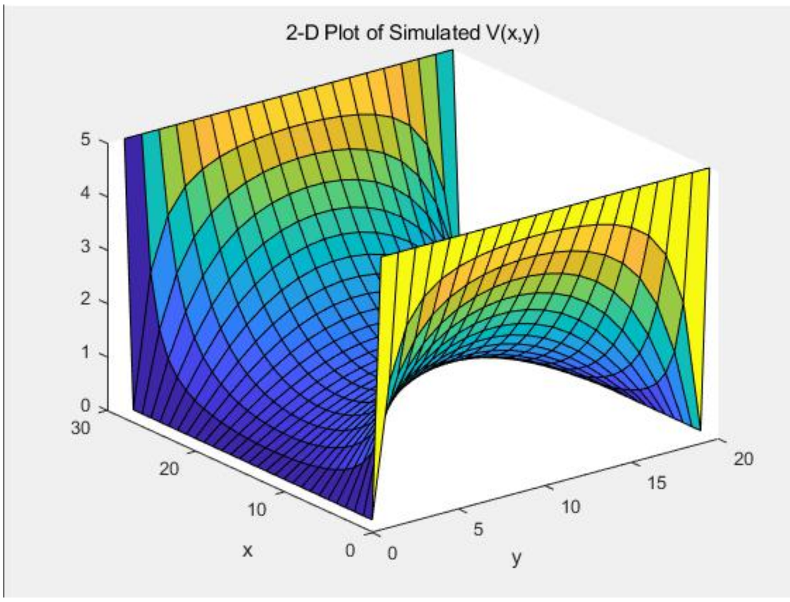

Figure2: Surface plots of Simulated V (x, y).

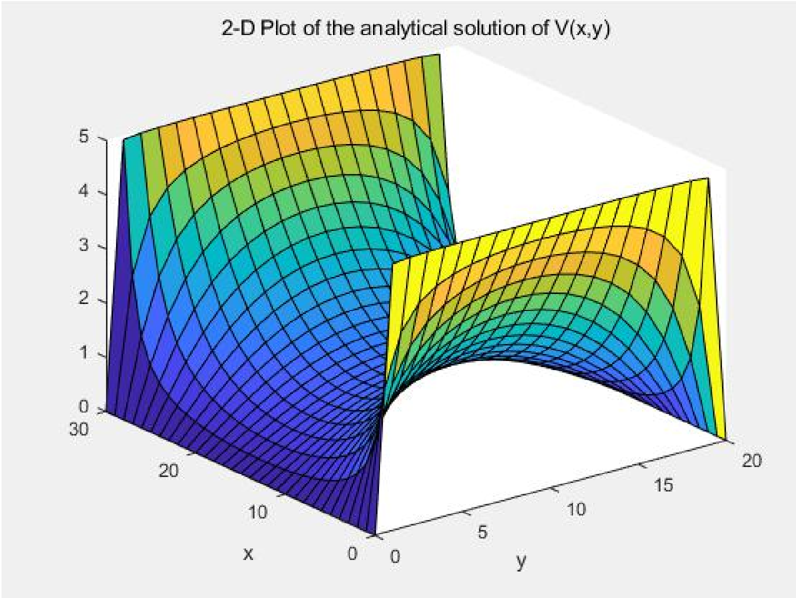

Figure3: Surface plots of analytical V (x, y).

According to the figures above, the simulated result is similar to the analytical result.

The increasing mesh size will increase the precision of the results, and it will also increase the simulation time.

In the same mesh size condition, the time for getting the result for the simulated solution is longer than that of the analytical solution.

Part2:

a) Current is 2.08A

Plot of the σ(x, y) is shown below.

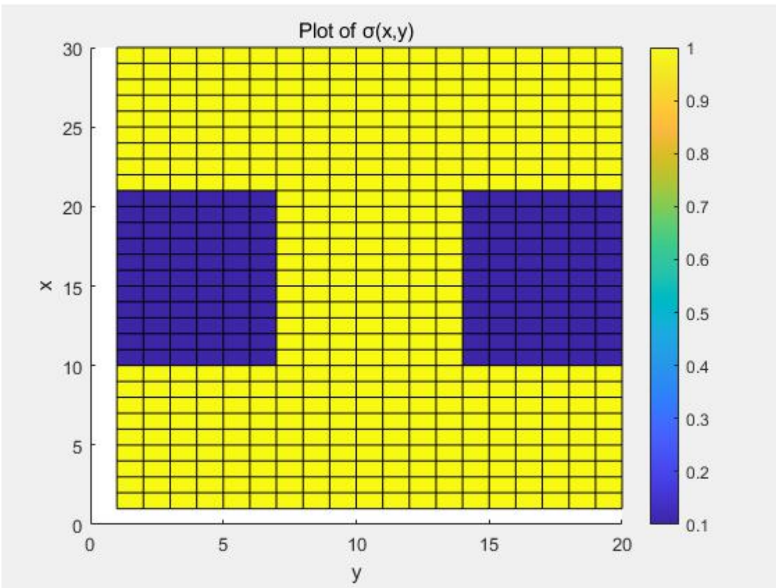

Figure4:Plot of the σ(x, y).

Plot of the V(x, y) is shown below.

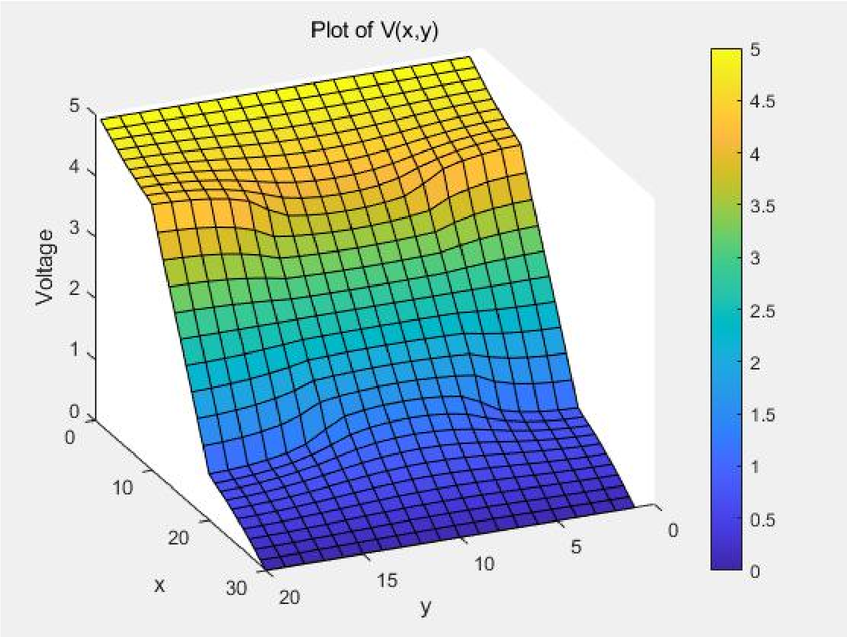

Figure5:Plot of the V(x, y).

Plot of the E(x, y) is shown below.

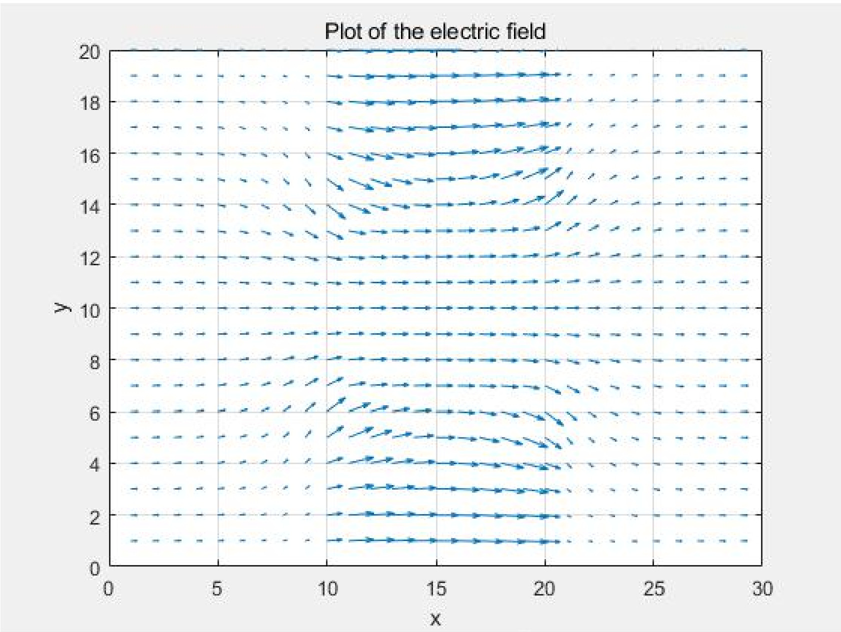

Figure6:Plot of the E(x, y).

Plot of the J(x, y) is shown below.

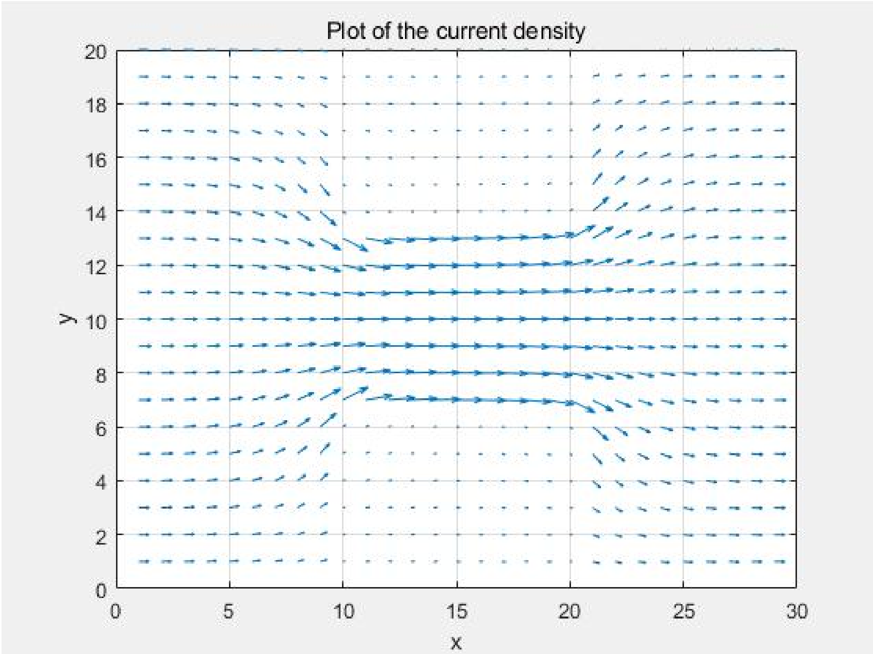

Figure7:Plot of the J(x, y).

b) Graph of current vs mesh size is shown below

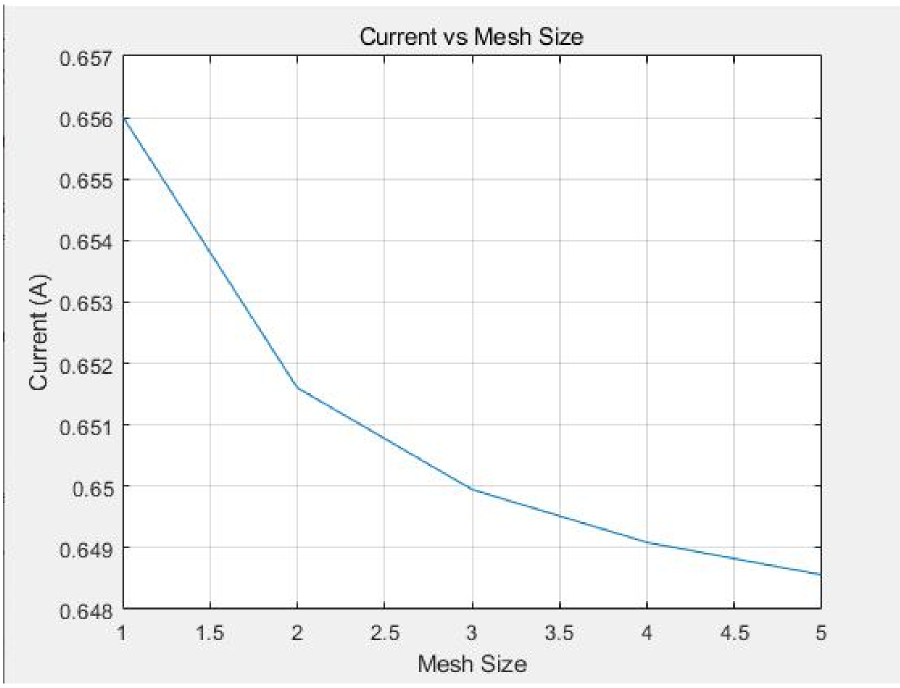

Figure8: Current vs mesh size.

According to the figure above, the current decreasing when the mesh size increasing. Mesh density = 1/mesh size, therefore, current will increase when mesh density increases.

c) Graph of current vs various bottlenecks is shown below.

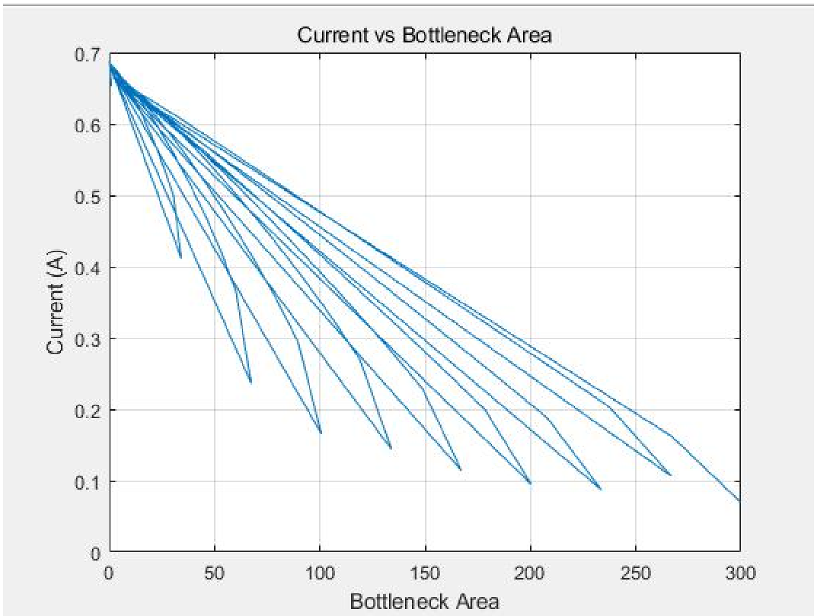

Figure9: Current vs Bottleneck area.

According to the figure above, the current decreasing when the bottleneck area increasing. This is because the bottleneck controls the current flow. When the bottleneck area increases, less amount of current can flow through this region.

d) Graph of current vs σ is shown below.

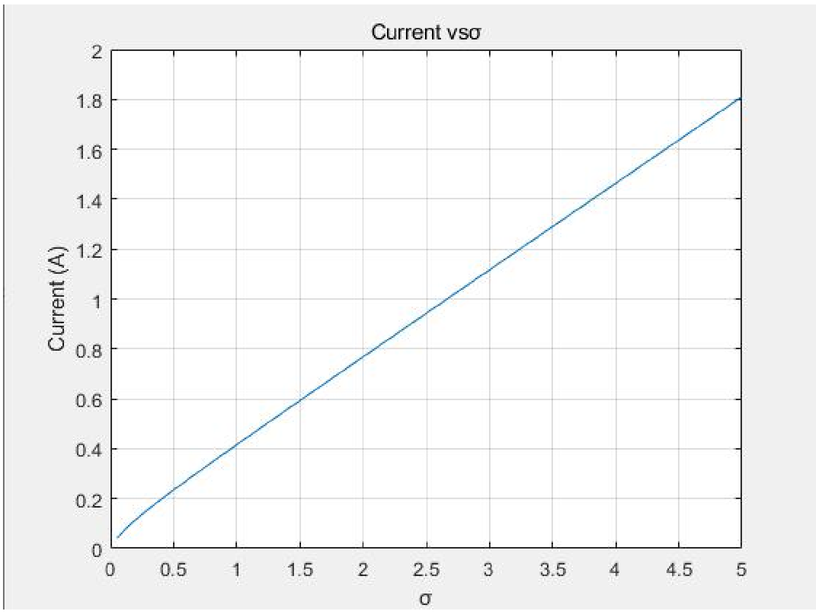

Figure10: Current vs σ.

According to the figure above, current increases when the conductivity inside the bottleneck increasing.