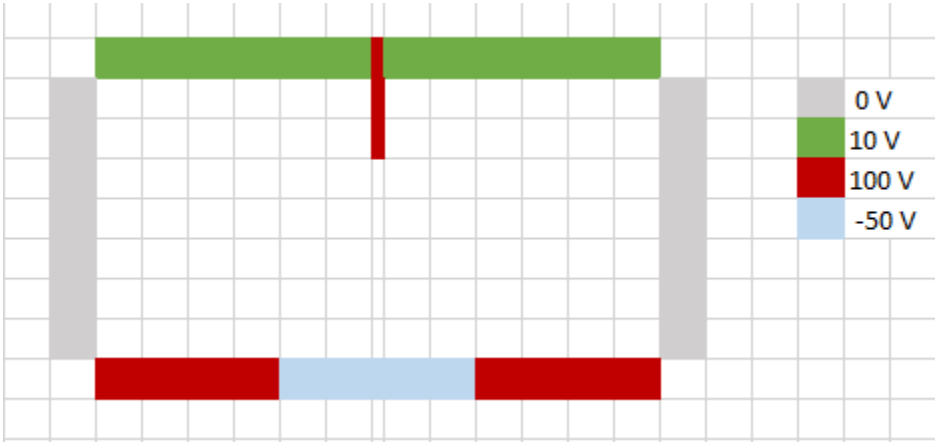
PHY 350:

Computational Assignment #4

1) 1D Relaxation Method.
   a. Use the given program, constructing a series of 100 points. Fix point 1 to V = 10 V, and point 100 as V = 18 V. These are fixed points, and are not to be changed. For the other points, assign random values between 0 and 30 V (not a great initial guess). **Plot voltage vs. distance**, assuming each point has equal spacing.
   b. Use the subprogram, that for each iteration, re-writes each point: $V_i(j) = \frac{1}{2}(V_{i-1}(j-1) + V_{i+1}(j-1))$. Your boundary points are fixed and cannot be changed.
   Every 10 iterations make a new plot of voltage vs. distance.
   c. **How many iterations** does it take for all points to be within 1% of the theoretical solution?

2) 2D Relaxation:

This time we have the following situation:



Each square has dimensions of 1 cm x 1 cm. The narrow antenna in the middle has a width of 1 mm. Use the given program. First, run it a few times and to fully understand how it operates. Then modify it such that the boundaries look as above.

   a. Use a grid of points 1 cm apart to calculate the potential everywhere. **Make a 2D plot of the potential, and of the electric field**.
   b. Use a grid of points 1 mm apart to calculate the potential everywhere. **Make a 2D plot of the potential, and of the electric field.**

3) Use the program to solve for another 2D boundary condition, this time with the boundaries set to potentials of your choice.