Use MATLAB and the method of moments to solve the following problem. Use pulse basis functions and point matching.

Two square metal plates have unit area (you can think in terms of meters or inches or whatever). One plate has a potential of +1 V while the other has a potential of −1 V. The plates are parallel to each other and separated by a distance of one-twentieth of the unit distance.

Write your code so that the user can specify the number of patches in which the plates are partitioned. However, you can restrict things so that only a square number of patches are used per plate—thus the user might be asked to specify the number of patches per side.

EE 417: Find the charge distribution on one of the plates when the two plates are directly above each other. Plot the charge distribution (as a surface plot or in some other informative fashion). Do this for two different discretizations and make sure they are consistent. It is likely they will differ near the edges, but should be nearly identical away from the edges. If they differ away from the edges, try a finer discretization.

EE 517: Consider two cases: one where the plates are directly above each other and the other where one plate is offset diagonally one-tenth of the unit distance from the other. Thus, assuming the plates lie in constant \( z \) planes, the corners are no longer aligned but offset one-tenth of the unit distance in both the \( x \) and \( y \) direction. If one corner used to be at \((x = 0, y = 0, z = 0)\) it is now at \((x = 0.1, y = 0.1, z = 0)\) (the location of the other plate does not change). Instead of plotting the charge on the plates, plot the electric potential in the vicinity of the edge of the plates, i.e., we are interested in the “fringing field” and how that changes with the displacement of the plates. You should make plots both near the corners and near the mid-point of the edge. Consider both vertical and horizontal slices through space.