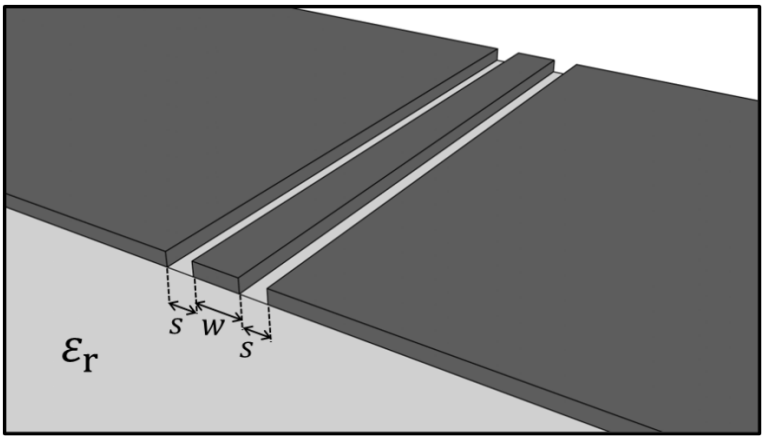
Problem Statement

A coplanar waveguide (CW) is a planar transmission line commonly used in printed circuit boards (PCBs). The consist of a signal line surrounded by two semi-infinite grounds. The parameters describing the CW are shown in the figure below and consist of the line width w, separation length s, and dielectric constant ε_r of the substrate. The superstrate is air, which has a dielectric constant of 1.0. The grounds, the superstrate, and the substrate are all considered to be semi-infinite.



During Homework 10a and 10b, you will develop a program to analyze this transmission line using a two-dimensional finite-difference method and calculate the transmission line parameters including the distributed capacitance C, distributed inductance L and characteristic impedance Z_0.

In this assignment, Homework 10b, you will write the code in MATLAB that analyzes the coplanar transmission line using a two-dimensional finite-difference method. The results of this analysis will be post-processed to calculate the transmission line parameters C, L, and Z_0.

Problem #1: Finish MATLAB Program to Simulate Microstrip

Starting with the MATLAB program you wrote for the previous homework, add the code which analyzes the device using the two-dimensional finite-difference approach covered in the course lectures. Remember to use $w = 2.5$ mm, $s = 1.0$ mm, and $\varepsilon_r = 3.5$. Provide the following data along with their proper units (if applicable):

a. The distributed capacitance C of the line.
b. The distributed inductance L of the line.
c. The characteristic impedance Z_0 of the line.
d. Visualize the scalar potential $V(x, y)$.
e. Visualize the electric field $\vec{E}(x, y)$.

Hint: Your graphics might look something like what is shown below. Try to beat this level of professional graphics.