

OS7201 Electromagnetic Analysis Using FDTD Method

Homework #6 Due: 11/29/2022 at 2 p.m.

1. (100%) Implement the basic 2-D FDTD update equations with simple Dirichlet boundary conditions for the E_z mode. Your goal is to repeat the animation shown on slide 4 of Lecture 11. Use a Gaussian pulse as a soft source propagating in free space and use the Dirichlet boundary conditions. The highest frequency component of the pulse and the critical dimension of a *dummy* structure are assumed to be 193.41448 THz and 1000 nm, respectively.

Some hints are provided below:

- a. Follow closely the block diagram at the end of Lecture 11.
- b. There are no iterations of updating \mathbf{H} from \mathbf{E} and updating \mathbf{E} from \mathbf{H} as you have seen in the 1-D FDTD algorithm. Remember that at each time step, the variables obtained from the previous time step get manipulated and stored in the variable on the left-hand side of an equation.
- c. Pay attention to the connections between arrays of variables and the actual positions of x -low, x -high, y -low, and y -high of the simulation region.

Make sure the pulse propagation looks smooth and not glacially slow.

Starting from Homework #5, an additional one-week extension is given with 0% of your scores taken off, if you need more time to complete the homework. Therefore the last date to turn in Homework #6 is 12/06/2022.

Also, I suggest you refrain from asking your classmates for help. However, having some meaningful discussions with your classmates is perfectly fine. But you all need to *complete the work independently*. This is the only way to build up your confidence and skills in solving problems.