

Physic 640
Project 2
Sept 25, 2007

Today we would like to do:

- 1) Implement a Fortran code to a) Initialize the propagation with the Gaussian pulse
- b) The 1D FDTD algorithm
- c) Writing results out into a file

***How to write the Fortran code?**

Look at the example we did for DFT, use Notepad, start writing in column #7, start with “program”

then variable declaration (real fx(100,101); integer nn, nx, ibar) and definition (dt=0.1; pi=3.141592654); then do initialization; then propagation. The code should end with the statement “end”

```
*      This code propagates a gaussian pulse in 1D using FDTD
*      Physics 640, Sept 24, 2007
      program prop

*      Variable declaration
      real fx(100,101), var, sigma, dx, dt, c
      integer nx, nn, ibar
*      parameter definition
      pi=3.141592654
      .....
      do 20 i=1,nx
        do 10 k=1,nn+1
          fx(i,k)=0.
10      continue
20      continue

*      initialization (Gaussian pulse)
      .....

*      propagation (FDTD in 1D)

      .....

*      output
      open(10, file='prop.prb')
      do 70 n=1,nn+1
        do 60 i=1,nx
          write(10, *) fx(i,n)
60      continue
70      continue
      close(10)
      end
```

Initialization: for fx at a fixed time instant (second index of fx); need one “do” loop over spatial indices i

Propagation: for fx; need two “do” loops over spatial and time indices i and k

- 2) Write a Matlab code to read in the output file; then plot; then grab frames to make a movies file

```
%Code to read in output file from prop.f and visualize the wave
propagation
%in 1D
%Physics 640 Sept 25, 2007

clear all;
close all;

load prop.prb;
. . . .

% Make file reading into 2D array

.....

%Movies

fname='prop1D.avi';
avi=avifile(fname,'compression','none');
for j = 1:nn+1
plot(fx(:,j)), axis([0 100 0 10])
    Fb = getframe;
    avi = addframe(avi,Fb);
    clear Fb;
end;
avi=close(avi);
```



