User Guide For FDTD Based Seismic Wave Simulation

FDTD based simulation source codes was written in language of MATLAB. MATLAB program with 6.5 and higher version and windows operating system should be used to run simulation. Information about models and related computation done in simulation can be found in the "Seismic Crystals And Earthquake Shield Application " article, which can be found at http://arxiv1.library.cornell.edu/abs/0902.1429.

You can use, change and distribute these codes as you will. Pease cite article arXiv:0902.1429 in your reference list if you use the codes or article in your study. For any question and sugesstion, e-mail: alagozb@oncubilim.net

How to run simulation:

1- Open your Matlab program and set your current directory to where you put source codes. (You can use Currect Directory list in Toobar or use 'cd' command in command window to change current directory to folder where source codes residing)
2- To start simulation, write in command line "*ElasticWaveFDTDSimTransientEng.m*", which is the name of file source code reside.
3- Wait until simulation reaches to end and resulting Figure windows appears. (It may take some time depending on simulation parameter and speed of computer. It may take up to one hour to complete simulation.)

Modifying Presettings And Simulation Variables:

Following list of parameters can be modified by user in the *ElasticWaveFDTDSimTransientEng.m*:

Parameter to modify	Explanation	Typical
YogunlukDosya	Name of density map image file	*Filename.bmp*
BulkDosya	Name of bulk modules map image file	*Filename.bmp*
NormYogunlukSiyah	Normalized density value for black color code	*1*
NormYogunlukBeyaz	Normalized density value for white color code	*10*
NormYogunlukKirmizi	Normalized density value for red color code	*0*
NormYogunlukMavi	Normalized density value for blue color code	*1*
NormYogunlukYesil	Normalized density value for green color code	*1*
NormBulkSiyah	Normalized bulk modules value for black color code	*1*
NormBulkBeyaz	Normalized bulk modules value for white color code	*0.1*
NormBulkKirmizi	Normalized bulk modules value for red color code	*0*
NormBulkMavi	Normalized bulk modules value for blue color code	*1*
NormBulkYesil	Normalized bulk modules value for green color code	*1*
SimulasyonSure	Number of iteration in simulation (Determines simulation end time)	*1600*
DurmaPeriyodu	Period for snap shot of pressure wave. It draws pressure wave image on the screen once every number of DurmaPeriyodu iteration.To avoid snap shot, DurmaPeriyodu should be set to zero.	*50*
Co	Speed of seismic wave in the host material	*3000*

Rx, Ry	Constants that must obey Courant condition for the stability of wave propagation.	*0.350*
DeltaX	Spatial differences (DeltaX = DeltaY)	*40*
Genlik	Sets amplitude for wave source producing multi-frequency seismic wave	*1*

How to design Density and Bulk Module Maps:

Before starting a new design for density and bulk module map, have a look at older designs delivered with source codes. Name of these files are DepremBosl.bmp, DepremEliptic.bmp, DepremHilalKristal.bmp, DepremUcgenGenisOval.bmp, DepremUcgenMulti.bmp.

1- Open any graphics program, which can produce image file in Bitmap (.bmp) format. The most basic and common one is Paint program found in Windows.
2- Paint whole drawing area to black color representing host material (Ground). Then, draw scatters (hole) in white color. For the wave source, use blue color. Blue point infers point source and blue line infers plane wave source. Red color is reserved for refraction walls if needed.

   An example design from elliptic crystals is illustrated in Figure 1. Blue point source and elliptic crystal with white color placed in host material in black color.

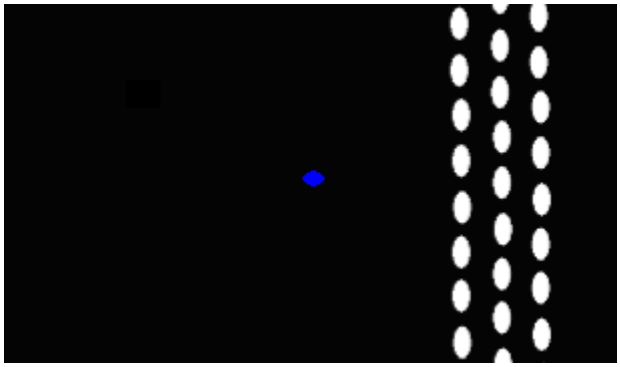

Figure 1. Design example

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