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Guidance for Prestack Anisotropic Reverse-Time Migration Package (ARTM)

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Prestack Anisotropic Reverse-Time Migration Package (ARTM)

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Abstract

The packages are written under the platform of matlab to implement the prestack anisotropic reverse-time migration with pseudospectral method, which handles 2D VTI and TTI media. The theory can be referred to the paper (Du, et al., 2007) in Geophysical prospecting.

It reads the shot gathers file with SEGY format, velocity and anisotropic parameters file in binary format. The migration result is stored as binary file as well. There is extra matlab function to view the image. It automatically interpolates the seismic data to satisfy the stability condition.

It can define which shot will be migrated and how many shots will be image. The time cost will be counted for computation consideration.

References:

Du, X., Bancroft, J. and Lines, L., 2007, Anisotropic reverse-time migration for tilted TI media: Geophysical Prospecting, 55, 853–869.

Du, X., Bancroft, J. Lawton D. and Lines L., 2006, Evaluations of prestack anisotropic Kirchhoff, phase-shift-plus-interpolation and reverse-time depth migration methods for dipping TI media: 76th Mtg. Soc. Expl. Geophys., Expanded Abstracts, 179-183.

Du. X. 2007, Prestack depth migration methods for isotropic and polar anisotropic media: Ph.D. dissertation, CREWES, university of Calgary.

Functions

ttiparmain.m: definition of the input, output files and parameters.

- premigrtmtti: the kernel of ARTM migration
- spongeABC.m: absorbing boundary condition
- rickerw.m: ricker wavelet for source

plotfile.m: plot the migration file

Notes: if you correctly define the parameter in ttiparmain.m, you can directly run this file and obtain the migration result. After that, you can use the function plotfile to view the migration result.

Parameters

ttiparmain.m

```
shotsfile='singleshot.sgy';%input shot gathers file with SEGY format

velfile='vels.bin';        %velocity file

delfile='deltas.bin';      %delta file

epsilonfile='epsilons.bin';%epsilon file

phifile='thetas.bin';      %phi file (tilt angle file)

migfile='ttimig.bin';      %output migration file

dx=20;           %the space interval in x direction of velocity model

dz=10;           %the space interval in z direction of velocity model

nxo=456;         %the size of x direction of velocity model

nz=200;          %the size of z direction of velocity model

nxshot=1;        %the shots number designed to be migrated

lpad=20;      %the padding traces of left side for migration apertures

rpad=20;      %the padding traces of right side for migration apertures

fpeak=25;     %the source wavelet peak frequency

ixshot_start=50; %the first shot to be migrated

%the kernel of migration
premigrtmtti(shotsfile, velfile, epsilonfile, delfile, phifile, dx, dz,
nxo, nz, nxshot,lpad, rpad, fpeak, ixshot_start, migfile);
```

```
plotfile(migfile, nxo, nz, dx, dz); %plot the migration result
```

plotfile.m

```
 plotfile: plot the migration file (binary format)
   imagefile: migration file (binary format)
   nx: the size of x direction
   nz: the size of z direction
   dx: the space interval of x direction
   dz: the space interval of z direction
```

Installation & Use

1. Unzip the file prertmtti.zip, you can find two subdirectories: src and demo, which means source area and demo directories
2. Open matlab program, go to menu [File]->[Set Path…], add the ‘src’ directory of unzip file.
3. Go to demo directory, and check the parameters in ttiparmain.m
4. Run ttiparmain to do migration. After migration, it automatically show the image result.

Notes: the part of thrust model for testing.