Forward Modeling GOCAD Modules

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1 ABSTRACT

We are developing GOCAD modules for the UTAM forward modeling codes. At this time, a GOCAD module has been created for the 2-D elastic code PSVR4. The input file and velocity model can be created in GOCAD, the PSVR4 modeling code can be launched and the seismograms can be displayed with the GOCAD interface. Modules for the 2-D acoustic code and the 3-D elastic code are almost completed. I will complete these modules by the Feb. 1998 annual meeting and will present a short tutorial on their implementation.

2 INTRODUCTION

GOCAD is a powerful rendering and visualization software package that can construct 3-D earth models for Geophysical, Geological and Reservoir Engineering applications. It also
offers a user-friendly interface that can be easily adapted to the users specific needs.

I have rewritten the PSVR4 code so that it can read the velocity and density values at each nodal point of a model created by GOCAD. The user can modify the finite-difference parameters directly in the dialog window. An online help about setting the parameters will soon be implemented. The seismograms are displayed as a property ”Amplitude” of a GOCAD Voxel.

3 INSTRUCTIONS FOR USAGE

Figure 1 shows the GOCAD interface for the UTAM module. It will pop up when utam is executed. There are now four sub-menus under the UTAM module: ”2D Acoustic”, ”2D Elastic”, ”3D Elastic” and ”Display Results”. Each of the modules has several functions such as ”Create Indat File”, ”Create Vel File” and ”Run Model”. I will introduce the ”2D Elastic” module here.

At first, you should build a Voxel model with GOCAD, and update the properties velocity (vp), density (ρ) and vs-to-vp (vs/vp) for this model. You will also need to generate the voxets for the source and receiver locations.

When you click the button ”Create Indat File”, it will pop up a dialog window named ”Create 2D Elastic Parameter File”, as shown in Figure 2. You can choose the model object, source and receiver objects, and modify the parameters through this window. If you click
on the button ”OK” or ”Apply”, the parameter file ”indat” will be created. Then you can create the file containing the velocity and density values for the model by clicking on the button ”Create Vel File”. The dialog window ”Create 2D Elastic Model” is shown in Figure 3.

When you click on the button ”Run Model”, you can choose two different ways to run the PSVR4 code: one is to run on an xterm window, and the other is to process to a logfile. The function of ”Display Seismogram” is to create a Voxel, the property of which is the amplitude of the seismic wave field (see Figure 4). The source or receiver voxel should be chosen as a reference voxel to display the common receiver gather or the common shot gather.

Modules for the 2-D acoustic code and the 3-D elastic code are almost completed. I will complete these modules by the Feb. 1998 annual meeting and will present a short tutorial on their implementation.

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Figure 1: The main menu for UTAM module.
Figure 2: The dialog window for the function "Create Indat File". The object in the Camera is a 3-D model built with GOCAD.
Figure 3: The dialog window for the function "Create Vel File". The object in the Camera is a vertical profile cut from the 3-D model.
Figure 4: The dialog window for the function "Display Seismogram". The object in the Camera is a common shot gather for the 2-D model in Figure 3.