Geophysical Image Processing with Seismic Unix
GP 461/561 Lab, Spring 2011
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1 The final assignment, due during Final exam week (special arrangements may be made for those who wish to present earlier).

During the semester you have been exposed to a number of aspects of seismic processing, both in the lecture and the lab. These range from reading data from SEGY format, sorting data into CMP gathers, viewing and windowing datasets, multiple suppression with the radon transform, velocity analysis, normal moveout correction, stack, horizon picking for building velocity models, and migration with those velocity models. Now is the time to put it all together.

1.1 The scenario

Each of you is a small geophysical contractor who has been asked by a client to design and execute a processing sequence on a test dataset to prove you are a capable, knowledgeable, and creative in order to to be contracted to process seismic data for the client.

The client requires:

- the test dataset to be the Viking Graben line,
- the processing environment to be Seismic Unix,
- you to begin with the raw data, perform all processing steps you deem necessary, produce a poststack migrated image,
- that you may work in groups of no more than two people, or you may work by yourself. It should be clearly stated who did what part of the processing
- that the final product is to be one poster per group (but no more) describing your processing steps, any images you want to show, including such things as the NMO-stack image, the poststack migrated image, and the velocity model you used to make the image.

- you will give an oral presentation to Walt Lynn, John Stockwell, and third geophysicist (yet to be selected) describing what you did. The format is similar to that which is encountered in the business world, or at professional society poster sessions, so expect that we will interrupt you with questions and make comments during your presentation both for clarification and to test your understanding.
- be creative, try things that were not done in the lab.
- that you start immediately!

Is this realistic? Yes. Often there are test datasets given by those seeking to hire contractors, and there may be (for better or for worse) requirements that the contractor follow a particular prescription, or that the client has particular prejudices regarding the "correct" way that processing is to be conducted.

This can include recommending preferred processing software, processing methods, and even preferred parameter settings in programs! While you would likely be asked to use a commercial package, industrial users *do* make use of SU and other non-industrial strength software for prototyping purposes, so being asked to use SU for processing is not an impossible situation in our scenario.

Indeed, you may find that part of your training in a company environment involves working with free software, such as SU. Several students have reported that processing data with SU was given as a warmup assignment at their companies.

1.2 Resources

You have as your resources:

- Steve Hill's course notes,
- all printed and online materials regarding Seismic Unix that you can find,
- published materials on past processing of the Viking Graben dataset,
- any other published papers that you can find,
- shell scripts and examples given in class,
- more than 100 other programs in SU that you may not have seen, but which may be used if desired,
- you will definitely need to work in the lab at times other than regularly scheduled class times. **Start immediately**.

1.3 Hints

There are other resources on the system. For example, for each X-windows graphics program, there is a corresponding PostScript graphics program. For example **supsimage** corresponds to **suximage**, **supswigp** (and **supswigb**) correspond to **supswigb**, **psimage** corresponds to **ximage**, and **pswigp** (and **pswigp**) correspond to **xwigb**. You have experience in capturing images and importing them into documents, either by screen capture or by writing PostScript files. This time you will likely find that making PostScript images works best.

Recall also that you can convert PostScript files to .gif or .jpg format file via the **convert** command. For example

```
% convert filename.eps filename.gif
```

or

```
% convert filename.eps filename.jpg
```

Such .gif or .jpg images can be readily imported into a PowerPoint document, which then can be printed on a poster printer in the Computing Center. You may access PowerPoint on machines in the Computing Center. Alternately, you may prepare your document in PDF if you are familiar with this system. The poster will be presented on final exam day as a 10 minute "poster session" presentation, not unlike the poster sessions at a professional society meeting, such as the Society of Exploration Geophysicists Annual Meeting.

It is not uncommon in industry for processors to contact software vendors and other technical experts with questions. You are free to ask Walt and John, or anybody else questions. Please note that John is significantly more familiar with SU than is Walt, and that Walt knows more about seismic processing than John. You are **encouraged** to share information, but each poster should be original. Industry competitors do talk to each other about technical matters.

There is considerable lattitude in choosing parameters, and in choosing processing steps. Or perhaps you want to study the sensitivity of data to certain processing parameter choices?

In a real life scenario, some of these variations might be considered "trade secrets." At most, here you are interested in learning, but retaining originality in your final presentation.

1.4 What is expected of you

You should have

- a poster only, no overhead slides, no exceptions.

- present no more than 1 poster per group; you may work in teams of 2, with work divided as you see fit
- be able explain all processing steps you are applying,
- list processing steps by programs run, (SU program names and seismic processing steps, not shell script names)
- explain why you are applying these steps,
- synthesize materials from the lecture and the lab,
- experiment with processing techniques not presented in the lab,
- explain the reasoning you used to choose any parameters you have set,
- bring your own expertise into the project,
- give some notion of what the geology is, but we are not really asking you to interpret the section. Even a processing contractor must know something about geology.
- it is ok to have notes. You don't have to do this out of your head.

What we want

- There is no perfect processing flow or perfect choice of parameters. There is no perfect standard for the result. However, it there are many ways of doing it badly, particularly if you do not understand how your tools work, or don't put the effort into improving your results.
- We are most interested in the reasoning you use for choosing the processing steps.
- We want to see that you understand what you are doing and why you are doing it.
- We want to see you go beyond what was presented in the lab, synthesizing materials from the lecture, as well as from outside sources. We don't want to see a simple regurgitation of material presented.
- Posters should have references, just like a technical paper. Give credit where credit is due.
- You will need to return your copy of the copy of SEG Open File Report, by Keys and Foster to John Stockwell.

You will need to talk to the people in the Computing Center regarding printing posters early. Do not wait too long to do this! There is always a crunch for resources at the end of the semester. The Geophysics department in the past has paid for one non-glossy ($30.00 maximum no more) for each student. We have to find out if they will do this again, this year.

If you want to do a poster on glossy paper ($60.00) then you pay the difference. You may present as individuals, or work in teams of two (no more than two students per team).

You may need to do your poster at Kinkos, if the campus plotter is down or unavailable. Paste-up posters are acceptable if there is an emergency. Content is more important than presentation, but we don't want to see a "night before" paste-up job.

Start early, because you will have to redo everything that you have done so far in this course in order to complete the project satisfactorily.