

GP60/EE60 – Man vs. Nature: Coping with Disaster Using Space Technology

Fall 2005

Lab Exercise #4

Topography

We'll be looking at several different methods of displaying topographic (land elevation) data of Hawaii. As you'll see, some methods are better than others, at least for particular applications.

Download and unzip the Ex. 4 folder from the homework page on the web site. Place the Ex4 folder on the desktop and open. Inside are several programs you will, run plus a data file entitled "Hawaiiidem."

Part I. Topography data

1. Start Scion Image. Select Import (in the File menu), click Custom, and choose Set. You will need to set the image size as 735 x 927. Select Hawaiiidem and click OK.

This is a DEM (digital elevation model) image of Hawaii. You can think of a DEM as a matrix (say an x-y grid), with the value of the matrix at a particular point representing the elevation of that point.

2. Move around the image with the hand tool, or select 'scale to fit window' under the Options menu. As you move around the image with the cursor, the x, y and value numbers in the Info box change. (If you don't have an Info box, go to the Windows menu and select 'Info').

What does value represent?

Using this knowledge, identify the features of the island. Where is the ocean, and where are the high points? What is the elevation of the highest point of the island? The second highest? (Each increment on the value number is 20 meters.)

Part II. Contour maps

We can use different color tables to display the image and see contour lines.

1. Under Options, select color tables, and 20 colors. This image is similar to a contour map of the island; elevations in certain ranges are displayed as different colors.
2. Change the color table to 32 colors. This has the effect of making each contour interval smaller as this color table has more steps.
3. Using this image, sketch a map of the island in the space below. Label the peaks, the ridges, any saddle points, and any particularly steep or gentle slopes. Don't forget that you can zoom in using the magnifying glass.
4. You might want to use different color tables to help with this task. Try using the System color table. This color table allows you to see small variations near the coastal zones quite easily. Try other color tables as well.

What causes some of the contour lines to end abruptly near the coast in the lower part of the island?

What are the forking patterns at the top of the island?

If you were planning to hike across the island and you were averse to very steep climbs, what path would you take?

Part III. Shaded relief maps

1. Go back to the grayscale image (select grayscale under Options.)
2. Start the program 'shadebyte.exe' (in the Ex4 folder).

Input dem file?	Hawaiidem
Output file?	shade.out
Illumination direction	'top' or 't'
Scale?	20

Let the program complete.

3. Using Scion Image, Import the file 'shade.out'.
4. Convince yourself that the illumination is from the top of the image. Good places to look are the canyons at the top of the image.
5. Locate craters on the island. Locate cliffs.
6. Based on this shaded relief image, add any pertinent information to your sketch map. For example, include the position of any new cliffs on your map.
7. Repeat the above process for right and bottom illumination. Is there anything unusual about the bottom-illuminated image?

Part IV. Perspective plots

You can generate realistic perspective views from the topographic data. We will first make a perspective image, and then generate a 3-D image, called an anaglyph, that we can view with special glasses.

1. Run the perspective view program from the Ex4 directory called 'per.exe'.
2. Enter 20000 for the distance from the scene.
3. Enter 10000 for the height above ground.
4. Enter 45 for azimuth angle in degrees.

This program outputs a file called per.out, which is 1024 by 1024 points in size.

5. View per.out in Scion Image. Use Import, click custom, and choose set. The file size height and width are each 1024.

6. Ignore any warning message and you will see a perspective view of Hawaii. Note the various volcanoes on the island.

7. You can experiment with other azimuth angles. Best results obtain when you leave the distance and height at 20000 and 10000, respectively.

8. Now, for 3-D. Regenerate per.out using the original parameters: 20000 for the distance, 10000 for the height, and 45 for azimuth angle.

9. Run the program 'loadred' in the Ex4 directory. Note: this program will execute quickly. Only run it once.

10. Re-run per, but now use these parameters:

Distance:	20000
Height:	10000
Azimuth:	50

11. Run the program 'loadgreen'. Again the program executes quickly.

12. Now, Import the file 'anaglyph' into Scion Image through the Import menu.

13. Finally, in Scion Image, set the color table by using "Open" under the file menu to read in the file 'redgreen'.

14. Using the colored glasses, view the perspective. By moving your head from side to side you will see a 3-D image floating in front of the screen.