EE/GP140-The Earth From Space- Winter 2008 **Handout #23**
Lab Exercise #5

Up to this point, we have been primarily concerned with looking at images and explaining how various features look in different wavelengths. Now we will use the information to classify different regions according to their land use. Several classification schemes exist; we will use one that has three levels. Level I is the most general, while Levels II and III increase in detail. Since we are limited by the resolution of our images, we will only be concerned with Level I today.

The Level I classes are as follows:
100 Urban
200 Agriculture
300 Range land
400 Forest land
500 Water
600 Wetlands
700 Barren land
800 Tundra
900 Perennial snow/ice

This scheme has been used to classify a Landsat image of the Los Angeles region; the map has been reproduced for you here as an example, along with the corresponding Landsat image. It is your task to make a similar classification map for the San Francisco Bay area using TM (visible and near-IR) images and the radar images we've looked at previously.

I. Visual Classification

1. Download the Ex.5 zip file, and uncompress. Open MultiSpecW32.exe.

2. Using the images sf6by6-rgb (visible), sf6by6-cir (color infrared), and sf800x1175 (radar) create a classification map. You can open all three images at once, and use information from each to determine land use. Begin with simple classes (water, etc), and develop a basic classification map. Just draw lines on the large paper map provided, and label the different zones using the classes listed above. Refer to the L.A. maps to get a sense of how to classify the Bay area.

3. Put your name on the paper map you created and turn it in to the TA at the end of the lab session. For now save it as a reference for the automatic classifications you are about to compute. Close all of the images except for sf6by6-cir.

II. Digital Classification

MultiSpec can calculate classifications automatically for you, once it is "trained" to do so. We will compute a supervised classification where you select "training areas" that have the characteristic spectral signature of a class that you're interested in (forest, city,

water, etc.). The computer then classifies each image pixel into the class to which it is the most similar. Essentially, you "train" MultiSpec to recognize different classes of land use by analyzing the statistics of their spectral signature.

Training Sample Selection

4. We will begin with the color IR image. Open sf6by6-cir if it is not already open.

5. Go to Processor, and select Statistics.

6. Select the 'Projector Statistics Options' button. Select 'Mean and Standard Deviation' and press 'Ok' to exit both windows. A new window will appear.

7. Now select an area that will represent a particular landform class ('ocean' might be a good place to start). Drag the mouse over a representative part of the landform to create a rectangle.

8. Click 'Add to List'.

9. Name the Class accordingly ('ocean', 'forest', etc). Don't worry about the 'Field' name.

10. From the 'Select Field' pop-up window select 'New' from the Class dialog box at the top. Make sure to provide a 'New' Class Name (not 'Field' name) for each new training area before clicking 'OK'.

11. Draw another rectangle, and add the training area to the list.

12. Continue this procedure until you are happy with your training areas. Possible training areas include: ocean, bay, forest, urban, residential, agricultural, barren…

Classification

13. Once you are finished selecting training fields, select 'Classify' from the 'Processor' menu. Select the 'Write Classification Results' to the 'Disk File' option. Leave the other options set as they are. Press 'OK'. When the other windows pop up, Update Project Statistics, and save the classified image in Users. Wait until the image statistics are computed.

14. Close sf6by6-cir. Open your classified image.

15. Under Project, select 'Add as Associated Image' to see the training areas.

16. You can change the colors of the image by double-clicking on the legend color boxes.

Comparison

17. Compare the image you just created with you visual classification map. Are they in agreement? How would you explain any discrepancies? How does the computer actually classify the image? How does this compare with your own visual methods? What can you say about resolution of the two methods? Answer these questions in a discussion with other students in the lab. Note areas of agreement and disagreement on the paper maps you created in step I above.

Accuracy

18. Go to Processor, select List Results. A new window will pop up. Click 'Ok'. The results from the classification will appear in the text window. Among the parameters listed is the Reference Accuracy. What do you think these numbers refer to? Comment on these values while considering the differences between your classes, and how easy it is to distinguish each from the others.

19. Close the image.

Radar Image

We will now digitally classify the radar image.

20. Open sf800x1175.

21. Go to Step #5 and repeat as above, classifying the region from the radar data rather than the IR image. Write your answers to the same questions as before, on the map page from the visual classification.

21. When you are finished, close MultiSpec and log out of your PC. Turn in your paper map to the TA.