Projects for 690D: Remote Sensing

ASTER data is available for the years 2000 – 2006 for Southern California (Ventura and Los Angeles counties). The locations of each of these scenes are contained in files with names like: ASTER_SCa_locations_2000.xml, contained in the folder \ASTER\Documentation. Several steps must be followed in order to translate the ASTER HDF files into a format compatible with most image processing software, including *Imagine*. You will need to use the HEG tool to do this. Instructions are contained in ASTER_HDF_file_conversion_instructions.doc.

Landsat data is available through the EOS gateway for a price ($425/scene). There is some free Landsat data available. You can explore the availability of this from the Global Land Cover facility site http://glcfapp.umiacs.umd.edu:8080/esdi/index.jsp and from http://www.landsat.org/ortho/index.htm. You may also wish to refer to a Landsat path/row map Landsat_path_row_CA.jpg to speed up your data search. Information on the Landsat satellite can be found at: http://landsathandbook.gsfc.nasa.gov/handbook/handbook_toc.html.

Other data is also available online, though much of it at a charge. Look for AVHRR, SRTM, AVIRIS data.

You will be responsible for choosing data appropriate for your project.

You may suggest your own projects to me, or choose one from my suggestions below. Ideally I would like students to work in groups of three. However, where scheduling or other constraints do not permit, I will allow individual projects. Some of the project suggestions below are the creation of tools which others can use now, or in the future and may not involve the manipulation of images. This is often the case in research projects – first one has to build a toolset, and then the actual data analysis can begin. These are still valuable learning tools.

Project Suggestions

1. (One or two person project)
(a) Build a tool in ArcGIS which will read the ASTER location files like ASTER_SCa_locations_2000.xml and plot polygons on a map showing the location of each scene. There should be a layer of polygons for each year (2000 – 2006). Selecting a polygon should give the user information on the filename for that scene. By selecting a series of polygons users should be able to export a table of ASTER filenames that they require for a selected project.
(b) Build a similar tool to project the Landsat row and path information on a GIS map. Refer to http://landsathandbook.gsfc.nasa.gov/handbook/handbook_htmls/chapter5/chapter5.html#section5.3 for path and row information. The coordinates are contained in the file: WRScornerPoints_R1.xls.

2. (Two or three person project)
There is a laboratory spectrophotometer in the geography department. It can be used to measure the spectral signature of minerals (amongst other things), but has not be used for several years. Find out how to work it. Learn how to measure spectral signatures of different specimens. Write instructions on how to do this. Learn how to incorporate those spectral signatures into *Erdas* Imagine. Make comparisons of the spectral signatures you have measured with those of existing ones within Imagine's spectral signature library. Use the spectral signature library and/or your measurements to look for the presence of certain elements (vegetation/minerals etc) in an image.

3. (Three person project)
Investigate the expansion of urban and suburban development into natural (undeveloped) areas over the past few years. (Choose one or two cities to look at. Decide how to define a developed area and how to define a natural or undeveloped area. Look at how these areas have changed.)

4. (Three person project)
Investigate the land cover classifications developed by the EPA in the National Land Cover Database (NLCD) (http://www.epa.gov/mrlc/). Choose a local area and see whether you can generate classifications using Imagine and ASTER and/or Landsat data that resemble those of NLCD. Carry out a change detection algorithm to determine which areas have changed the most and what kind of changes in land cover have taken place.

5. (Three person project)
Find an area of natural vegetation within the Santa Monica Mountains or San Gabriel Mtns for which you know, or can identify the vegetation type. Monitor the greenness/growth of the vegetation seasonally and from one year to the next. How much does the growth vary from one year/season to another? To what extent is the growth affected by rainfall and temperature? How might this affect the fold supply for native fauna?

6. (Three person project)
(a) Choose an area in Southern California which is subject to fire and examine encroachment into this area by development over the last few years. You can use the USGS Landfire data (http://landfire.cr.usgs.gov/viewer/) to assess fire potential.
(b) Look at a burn area and examine the recovery of this area. How long does it take an area to recover? How does vegetation regrowth in the burn area compare to growth in the surrounding area?

7. (Three person project)
Vegetation on San Clemente Island was severely impacted by thousands of feral goats in the 1980s and earlier. In the 1970s the Navy began an eradication program, which was later blocked by the Fund for Animals. After a court battle and the netting and export of thousands of goats, the last goat was eradicated from the island in 1991.

(http://en.wikipedia.org/wiki/San_Clemente_Island_goats) How well has the vegetation on the island recovered?

8. (Three person project)
(a) Examine the sediment load of different bodies of water or
(b) See how the sediment load of a body of water varies with distance from the mouth of an estuary (eg. Santa Clara River). (Map the area of distribution.) How is sediment distribution affected by ocean currents?
(c) See how sediment load varies with rainfall and river flow rate – Can you correlate the sediment load (and its distribution) from the Santa Clara River with rainfall and stream gauge measurements?

Project requirements

Each member of the project team must contribute to the project, and each must turn in their own research paper describing the project. See instructions: Instructions_term_paper.doc. In addition to the term paper you should provide a separate (short) description of your role in the project. The group as a whole must prepare an oral presentation of the project to be given in the last two weeks of the semester.
Your grade will be based upon your contribution to the project, your term paper, and the group's oral presentation.