GEO 427/EVS 527
Exercise 1: Registration and mosaicing data from different sources

Registration is one of the most important parts of using remote-sensed imagery, since it is in the registration process that one actually determines the spatial accuracy and integrity of the image. There are several ways to do registration, and you did one of the simplest in the introductory course. We will not repeat a major registration in this course (at least not yet). But we will compare different bases for registering an image, and we will discuss how best to do it.

First, you should consider the resources you have for registering a satellite image or aerial photograph. These include the data built into the image itself, Geographic Positioning Satellites (GPS), DLGs, DOQQs, digitized aerial photographs, DRGs, paper maps, etc. In this laboratory, we will examine each of these as useful bases for image registration.

First, let us discuss each of these resources. Do you know what they are? Do you know how to access them? Specifically, with regard to a local quadrangle (for CSU, this would most likely be the Cleveland South Quadrangle, which includes the university), how do you get the resources we do not have in the laboratory?

We have satellite images of everywhere in Ohio from the Landsat-5, Landsat-7, and SPOT. The TM images are available from OhioView, and all 3 sets of images are available on the CSU Archival Image Server (water.sr-02-01.csuohio.edu, or 137.148.161.29). In the CSU Environmental Remote Sensing Laboratory, this server appears as the R: drive. The TM images are catalogued by path and row. Path 18 covers eastern Ohio; path 19 covers central Ohio; path 20 covers western Ohio.   Row 31 covers northern Ohio; row 32 covers central Ohio; row 33 covers southern Ohio. All of the TM images on the archival image server were downloaded as GeoTIFF files; many have been combined into an ERDAS Imagine image. TM images prior to July, 1999 are from Landsat-5; Those dated subsequently are from Landsat-7. TM images downloaded from OhioView are in GeoTIFF format. SPOT images on the CSU archival image server are stored in the directory "SPOT_Images_of_Ohio" and have been mosaiced by OGRIP into 15-minute quadrangles. There is an index of coverage in a pdf file in the SPOT directory. All of the SPOT images are GeoTIFF files; the image covering Cleveland is called N41W0813.tif.

DLG and DOQQ files for greater Cleveland can also be found on the CSU archival image server; these files from other parts of Ohio can be downloaded from the OGRIP web site (You can access that site from a browser using the address ftp://ftp.geodata.gis.state.oh.us or by a standard FTP client using the address ftp.geodata.gis.state.oh.us). You can also download DEMs and DRGs (i.e. USGS topographic maps) from this site, but we will not use these files in this exercise. The naming standard for OGRIP files is somewhat idiosyncratic, although one gets used to it fairly quickly. There is an index to place names on the OGRIP site. If you have not used it in the past, you should take a look at the index. The first 5 characters in the file names designate USGS quadrangles. The remainder of the name indicates the type of file and (sometimes) projection. DOQQ files contain the numbers 0016, 0017, 3401, and 3402. Files containing the 0016 and 0017 designations represent UTM projection in zone 16 and 17, respectively. Files containing the 3401 and 3402 designations represent State Plane projection in the Ohio North and Ohio South zones, respectively. DOQQ files are in MrSID format. Be sure to download both the *.sid and *.sdw files when downloading individual DOQQ files! DLG files contain the notations, bd, hp, hy, mt, pl, rd, and rr. These refer to DLGS of boundaries, hypsography (contour lines), hydrography, miscellaneous transportation, public land survey, roads, and railroads, respectively. The ERDAS Imagine viewer can read TIFF and MrSID files directly; DLGs have to be imported into Arc Coverage format in order to be read by the viewer.

All of the imagery mentioned so far have been supplied in a registered form. How accurate is the registration in each image? How would you tell?

Between now and Thursday, each of you should identify at least 4 points each, for which you can specify an easting and northing for each of the data types quite precisely. We will discuss the accuracy of these specifications and their implications for the practical use of TM imagery. You should have a matrix showing the easting and northing of each of your four points for each of the data types indicated in the laboratory. In all cases, you should be sure to use the same projection for all data types. For ease of comparison, this should be UTM; it makes little difference whether you use NAD 27 or NAD 83. Note that you may have to use image-processing software to change some of your imagery from one NAD to another.

	Site 1	Site 2	Site 3	Site 4
GPS	E: N:	E: N:	E: N:	E: N:
DLG	E: N:	E: N:	E: N:	E: N:
DOQQ	E: N:	E: N:	E: N:	E: N:
Landsat-5	E: N:	E: N:	E: N:	E: N:
Landsat-7	E: N:	E: N:	E: N:	E: N:
SPOT	E: N:	E: N:	E: N:	E: N:

When you have completed your measurements, the table should be posted on the course bulletin board. This can be accessed in several ways. If you wish to use a browser, you can contact the bulletin board at the address http://www.bges.csuohio.edu/cgi-bin/dnewsweb.cgi?cmd=xover&group=bges.geo427. Alternatively, you can use the address news://www.bges.csuohio.edu/bges.geo427 to establish a subscription to the bulletin board in news reader software (e.g. Mozilla or Outlook Express). If you have subscribed to the bulletin board with news reader software, you should be able to click on the bulletin board name (bges.geo427) on the server address (www.bges.csuohio.edu) to access it.