WILD 5750/6750
LAB 2
SEPTEMBER 18, 2006

GEOMETRIC CORRECTION
-OR-
GEORECTIFICATION
-OR-
POLYNOMIAL RECTIFICATION
Image Rectification

• **Rectification** is the process of projecting the data onto a plane and making it conform to a map projection system thus removing systematic and non-systematic anomalies.

• The fundamental, and hence, usefulness of all data utilized in a RS or GIS application is that the data can be linked to a specific coordinate or region on a surface.

• Assigning map coordinates to the image data is called georeferencing. Since all map projection systems are associated with map coordinates, rectification involves georeferencing.
Image Rectification
Image Rectification
Types of Correction: Systematic

**Systematic correction**
When the geometric reference data or the geometry of sensor are given or measured, the geometric distortion can be theoretically or systematically avoided. For example, the geometry of a lens camera is given by the collinearity equation with calibrated focal length, parameters of lens distortions, coordinates of fiducial marks, etc. The tangent correction for an optical mechanical scanner is a type of system correction. Generally systematic correction is sufficient to remove all errors.
Types of Correction: Non-Systematic

**Non-systematic correction**

Non-systematic correction

Polynomials to transform from a geographic coordinate system to an image coordinate system, or vice versa, will be determined with given coordinates of ground control points using the least square method. The accuracy depends on the order of the polynomials, and the number and distribution of ground control points.

Types of Correction: Combined

Combined method
Firstly the systematic correction is applied, then the residual errors will be reduced using lower order polynomials. Usually the goal of geometric correction is to obtain an error within plus or minus one pixel of its true position ($\text{RMSE*} = \pm 1$ pixel).

*Root Mean Square Error*
Process

**Geometric correction** is used to reduce geometric distortions and is achieved by establishing the relationship between a image coordinate system and a geographic coordinate system using calibration data of the sensor, measured data of position and attitude, ground control points, atmospheric condition etc.

[Link](http://www.profe.udec.cl/~gabriel/tutoriales/rsnote/cp9/cp9-4.htm)
Process

(1) **Selection of method**
Consider the characteristics of the geometric distortion as well as the available reference data.

(2) **Determination of parameters**
Parameters which define the mathematical equation between the image coordinate system and the geographic coordinate system should be determined with calibration data and/or ground control points.

(3) **Accuracy check**
Accuracy of the geometric correction should be checked and verified. If the accuracy does not meet a predetermined criteria, the method or the data used should be checked and corrected.

(4) **Interpolation and resampling**
Geo-coded image should be produced by the technique of resampling and interpolation. There are three methods of geometric correction.

Lab Assignment

This week we will follow the Polynominal Rectification section (Chapter 7) in the ERDAS Imagine 9.0 Tour Guide.

The TourGuide.pdf is located on your computer at: (Hyperlink Below)

C:\Program Files\Leica Geosystems\IMAGINE and LPS 9.0\help\hardcopy

The data for the assignment is located in:

C:\Program Files\Leica Geosystems\IMAGINE and LPS 9.0\Examples

Make sure that you are saving your data to YOUR account.
Lab Assignment

1. Complete Chapter 7 of the ERDAS Imagine 9.0 Tour Guide

2. Complete and submit the following questions:
   
a. Define and explain GCPs. What are their use in georectification?

b. How many GCPs are needed to calculate a transformation?

c. Take a screen shot (Print Screen button, or Cntl-Alt-Print Screen for just the active window, then Paste it into your Word document) of your subpixel coregistered image (section 3 of chapter 7).

d. List and discuss each resample method. Explain the basic differences, (without calculus and geometry!) for each method.

e. What is RMSE? Why is RMSE important with respect to polynominal rectification? What is the RMSE sought when rectifying imagery?