GLOSSARY

Absolute orientation;
The scaling, leveling, and orientation to control points of a relatively oriented stereoscopic model or group of models (Terrazas, 1986: 216).

Accuracy;
"The degree of conformity with a standard, or degree of perfection attained in a measurement. Accuracy relates to the quality of a result, and is distinguished from precision which relates to the quality of the operation by which the result is obtained" (Terrazas, 1986: 122).

Aerial photogrammetry:
Photogrammetry utilizing aerial (vertical or oblique) photographs.

Air base (or in the context of this project, base distance):
The distance between the camera positions at which the left and right stereo images are taken.

Affine transformation:
A mathematical operation used to modify a two-dimensional surface. It is characterized by the fact that, unlike the conformal model, it applies different scaling to the x and y axes. This transformation requires four points to reach a solution. If at least one more point is used, a better solution can be obtained with the least squares adjustment method (Wolf, 1983: 584).

Analogue stereoplotter:
A stereoplotter implementing all orientations and corrections with optical and mechanical means.

Analytical photogrammetry:
Photogrammetry in which orientations and corrections are performed mathematically rather than with mechanical and optical means.

Analytical stereoplotter:
It "is a stereo comparator, encoded so that coordinate measurements on photographs can be passed to a computer and converted into digital form." (Warner, 1990 : 571 from Koency G. 1980). Contours and features are digitized off the hardcopies and plotted out from the computer.

Base Distance (close-range equivalent of air base):
For the purpose of this project, we refer to the distance between the two camera positions at which the left and right stereo images are taken, as the base distance.

Base-height ratio (B:H):
Term used for stereo images referring to the ratio between the air base (base distance) and the flying height (camera distance). A recommended value is 1:6.

Byte:
Unit used to express the size of digital data. Typically, one character occupies one byte of digital storage.

Calibrated focal length:

"An adjusted value of the equivalent focal length so computed as to distribute the effect of lens distortion in a desired manner over the entire field used in a camera" (Terrazas, 1986: 99).

Camera calibration:

"The determination of the calibrated focal length, the location of the principal point with respect to the fiducial marks, the point of symmetry, the resolution of the lens, the degree of flatness of the focal plane, and the lens distortion effective in the focal plane of the camera and referred to the particular calibrated focal length" (Terrazas, 1986:35).

Camera distance (close-range equivalent of flying height):

For the purpose of this project, we refer to the distance between the film plane and the average depth of the object or area photographed as camera distance.

Check point:

Points of known three-dimensional coordinates and visible on both stereo images which are used to assess the quality of the absolute orientation solution.

Close-range photogrammetry:

It applies to terrestrial photogrammetric applications for which the camera-object distance is less than three hundred meters (Wolf, 1983: 477).

Conformal transformation:

A mathematical operation used to modify a two-dimensional surface. It is characterized by the fact that it applies the same transformation to the x and y axes i.e. it preserves a surface's proportions. This transformation requires two points to reach a solution. If at least one more point is used, a better solution can be obtained with the least squares adjustment method (Wolf, 1983: 576).

Contour line:

A line on a map or photograph joining points of equal values for a continuous phenomenon such as elevation.

Control field (frame):

In order to obtain accurate measurements from a stereo pair, one needs to have at least six control points located on or around the object recorded. Each one of these points must have known three-dimensional coordinates with respect to a single origin. These points then define a three-dimensional reference system to which the object or feature being photographed can be related.

Control point:

Points of known three-dimensional coordinates and visible on both stereo images which are used to perform the absolute orientation.

Convergent/monoscopic photogrammetry:

It is characterized by the use of two or more cameras positioned at an angle converging towards the object of interest. Although it does not allow the three-dimensional viewing of a stereo pair, this method is considered more versatile and more accurate than stereo-photogrammetry and is used primarily for industrial applications.

Coordinates:

Values which indicate the location of a point with respect to a chosen system or frame of reference.

Cursor:

(on computers) A point displayed on the computer screen which indicates position and can be moved around using a pointing device such as a mouse, stylus or puck.

(on digitizer) A hand-held device with a cross hair or other reference mark for recording position on a digitizer or digital tablet. (Terrazas, 1986: 77).

Digital Elevation Model (DEM):

A matrix (rows and columns) of elevations at even ground spacings.

Digital Terrain Model:

"A digital representation of the terrain in several forms:

Contours: polylines (vectors) representing constant elevations.

Digital Elevation Model (DEM): a matrix (rows and columns) of elevations at even ground spacings.

Triangulated Irregular Network (TIN): a model of the terrain using points which form the vertices of a net of triangles

Can include "breaklines", which define the geomorphology of the terrain by tracing ridges, valleys, rivers, roads, etc. that force contours to cross at right angles to lines" (Molander and Hoffman, 1995).

Digitizer:

A computer-based system to convert point, line and area features from a hardcopy to a digital format.

Distortions:

Lens aberrations affecting the one-to-one correspondence between a feature and its representation on a photograph.

"The most important ones are radial (symmetric) and decentering lens distortions... While these distortions are unique for individual lens, and thus occur in both metric and non-metric cameras, their amounts are often kept negligible by design for metric cameras. In addition to commonly large distortions, the situation for non-metric cameras is further complicated by focusing changes which result in change in these distortions" (Faig, 1989: 72)

Emulsion:

A suspension of either light-sensitive silver salts, diazos, or photopolymers, in a colloidal medium which is used for coating photographic film, plates and papers (Terrazas, 1986: 106).

Exposure:

The act of exposing a sensitized photographic material to a light source.

Fiducial marks:

Four or eight marks etched on the focal plane - in the corners and in the middle of the edges- which are imprinted on the negative at the time of exposure.

Film base:

A thin, flexible, transparent sheet of stable plastic material to which a light-sensitive emulsion may be applied (Terrazas, 1986 :288).

Floating mark:

"A mark seen as occupying a position in the three-dimensional space formed by the stereoscopic fusion of a pair of photographs and used as a reference mark in examining or measuring the stereoscopic model" (Terrazas, 1986: 146).

Flying height (or in the context of this project, camera distance):

The distance between the aircraft and the average terrain elevation of the area photographed is called flying height.

Focal length:

"The distance from the plane of infinite focus to the center of a thin lens (Wolf, 1983: 30).

Focal plane:

"[T]he plane in which all incident light rays are brought to focus (Wolf, 1983: 70).

Gigabyte (Gb):

One gigabyte represents one thousand megabytes.

Interior orientation:

"The determining of the interior perspective of the photograph as it was at the instant of exposure. Elements of interior orientation are the calibrated focal length, location of the calibrated principal point, and the calibrated lens distortion" (Terrazas, 1986: 216).

Kilobyte (Kb):

One kilobyte represents one thousand bytes.

Least squares adjustment:

"Least squares is a procedure for adjusting observations containing random errors... [M]ost probable values of the unknowns can be determined by the method of least squares" (Wolf, 1983: 564). This is achieved using redundant observations.

Megabyte (Mb):

One megabyte represents one million bytes or one thousand kilobytes.

Non-metric and semi-metric cameras:

"A non-metric camera is a camera whose interior orientation is completely or partially unknown and frequently unstable... A metric camera, on the other hand is characterized by a stable, known, and repeatable interior orientation, defined by fiducial marks;... a semi-metric camera falls somewhere in between." (Faig, 1989 : 71)

Orthoimage:

"A digital orthophoto in which the effects of terrain and geometry of the photograph are removed to produce a plan view (orthographic projection) of the image" (Molander and Hoffman, 1995).

Overlap:

Area covered by two photographs taken in a sequence.

Photogrammetry:

"Photogrammetry is defined by the American Society of Photogrammetry as the art, science, and technology of obtaining reliable information about physical objects and the environment through processes of recording, measuring, and interpreting photographic images and patterns of recorded radiant electromagnetic energy and other phenomena. (Wolf, 1983: 1)"

Pixel:

A picture element data with assigned intensities representing grey shades (monochromatic) or colors. (Molander and Hoffman, 1995)

Rectification:

"The process of projecting s tilted or oblique photograph onto a horizontal reference plane" (Terrazas, 1986: 270).

Relative orientation:

"The determining of the position and attitude of one of a pair of overlapping photographs with respect to the other photograph" (Terrazas, 1986: 216).

Reseau plate:

A plate on which a grid or cross hairs have been etched and precisely measured. It is placed on the focal plane to provide more fiducial-like points which can be used as part of the interior orientation to correct for film unflatness.

Residual:

"The difference between any measured quantity and the most probable value for that quantity (Wolf, 1983: 560).

Resolution of a digital image:

The size of the sensors used to gather the digital information dictates the density of information actually recorded. Resolution is an indicator of this density. A slide scanned at a resolution 15 micrometers will be stored as a table or matrix where each cell represents an area of 15 x 15 micrometers. Similarly, a 400dpi scanner transforms a hardcopy image into a grid of cells or pixels, each representing a 1/400 x 1/400 of an inch. In the same fashion, a 30 meter satellite image is one where each pixel represents a 30 x 30 meter area on the ground.

Scanner:

A scanner allows the transfer of a hardcopy image into digital form. The scanning head consists of charge coupled devices (CCD) or sensors rectangular in shape which are moved over the image and measure for each portion they stop over the amount of red, green or blue. The highest resolution of a scanner is determined by the size of each CCD. Those used to scan aerial photographic films have CCD as small as 7.5 micrometers. Office-grade scanners typically have a resolution of 600 dots per inch or 40 micrometers.

Softcopy photogrammetry

The field of softcopy photogrammetry was initiated in the 80's and is dedicated to the photogrammetry process of digital images. It addresses issues such as the gathering of data digitally, the scanning of photographic transparencies, as well as those pertaining to a fully computer-based photogrammetric process.

Standard deviation or Root Mean Square Error (RMSE):

"A quantity used to express the precision of a group of measurements (Wolf, 1983: 561)". It is expressed as follows:

$$RMSE = \sqrt{\frac{\sum r^2}{d}}$$

where r stands for the residuals and d for the number of degrees of freedom.

Stereocomparator

A stereoscopic instrument for measuring parallax; usually includes a means of measuring photograph coordinates of image points (Terrazas, 1986: 120).

Stereo pair:

A pair of images which are digitally re-sampled to produce a clear stereoscopic model. Each line in the image is an "epipolar" line in which a separation in pixels between two images yields a change in depth in the stereomodel. (Molander and Hoffman, 1995)

Stereo-photogrammetry:

Stereo-photogrammetry is based on the concept of stereo-viewing, which derives from the fact that human beings naturally view their environment in three dimensions. Each eye sees a single scene from slightly different positions. The brain then "calculates" the difference and "reports" the third dimension.

Stereoscope:

"A binocular optical instrument for helping an observer to view photographs, or diagrams, to obtain the mental impression of a three-dimensional model. The design of stereoscopic instruments use a combination of lenses, mirrors and prisms" (Terrazas, 1986: 121).

Strip of stereo photographs:

A series of overlapping photographs taken while moving the camera in one direction and at regular intervals so as to generate a sequence of stereo images.

Stereoplotter:

"An instrument for plotting a map or obtaining spatial solutions by observation of pairs of stereo photographs" (Terrazas, 1986: 29).

Target:

"The distinctive marking or instrumentation of a ground point to aid in its identification on a photograph (Terrazas, 1986: 213).

Terrestrial photogrammetry:

Photogrammetry applied to non-aerial applications is called terrestrial.

Traditional photogrammetry

"The use of film photography (usually diapositives) with analogue or analytical stereoplotters." (Molander and Hoffman, 1995)