



IMAGE BASED CONTROL



STATEMENT OF THE PROBLEM

A key element to the realization of the potential use of remote sensing data is ground control. If the imagery does not line up with the data within the GIS or GPS systems then it is perceived to be of limited value and will not be forwarded into standard operations and decision trees within the local government.

PRESENT SITUATION

It became apparent early within this process that the control and monumentation currently existing within the City, County, and private sector were not suitable for image rectification. Basically you could not see the features used for control from the imagery.

POTENTIAL BENEFITS

The need for a consistent system of image based control for future use in the acquisition of imagery from service providers or in compiling new imagery in-house necessitated the development of a system of control that would form the base of control for years to come and allow for the seamless integration of imagery from different temporal periods for use in such things as change detection, accurate monitoring and inventory, etc.

TECHNICAL APPROACH TAKEN

Ground control points were established at three intervals covering the Columbia and Ashland area. Each control point was pre-selected from IKONOS imagery, and then the real world location was captured using GPS. Points were stored as latitude/longitude coordinates in three separate files according to their time of collection. The latitude/longitude coordinates were converted by hand into decimal degrees in order to generate a point coverage in Arc. The coverage was projected into State Plane (NAD 83) to coincide with the images' projection. The point coverage was then opened in ArcEdit along with the associated background image for a location reference. The same image was opened in ENVI 3.2. The background images were a combination of digital orthophoto quarter quadrangles (DOQQs) and IKONOS imagery. The images from the DOQQs (Figure 1) are, on average, five to ten years older than the recently

taken IKONOS images (April, 2000)(Figure 2). This creates temporal discrepancies between the two formats around rapidly urbanizing areas since the ground control points were selected from IKONOS imagery.

Points that were visible on the DOQQs were used first, because of the potential for registering and mosaicing the DOQQs to form a base map. Points that were not visible on the DOQQs were selected from the IKONOS images. A ground control point was selected in ArcEdit, along with its approximate location in relationship to the unregistered background image. The same location was found on the ENVI image. With the help of diagrams (Figure 3), demarcated aerial photographs, and hand-held digital camera images (Figure 4), the precise location of the real world ground control point was marked on the ENVI image.



Figure 1 Site on DOQQ



Figure 2: Site on IKONOS Image

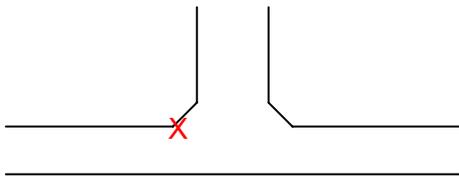


Figure 3: Site Sketch



Figure 4: Site Photograph

The image location and the real world State Plane coordinates were saved into a ground control point file in ENVI. A large-scale image of each ground control point was converted into a TIFF file (Figure 5) for visual referencing.



Figure 5: Small Scale Image of Site Context

The coordinates found in every ground control point file were transferred to an Excel spreadsheet and combined into a master list. The master list contains a unique identification number, the State Plane coordinates, the name of the DOQQ or IKONOS image that it was taken from, and the original GPS point name as given by the surveyor.

PRODUCT CREATED

A digital file containing a series of image based control for the City of Columbia, and portions of Boone County to include: a unique identification number, the State Plane coordinates, the name of the DOQQ and/or IKONOS image that it was taken from, the original GPS point name as

given by the surveyor, sketch map of site, up to three photographic images of the site itself, and a site context image.

ANTICIPATED IMPLEMENTATION PROBLEMS WITH LOCAL GOVERNMENT

Maintenance of the file and the development of a full suite of imagery based control for the entire county will need to be pursued. Format and conversion issues with the images and data base files should be minimal.

ADDITIONAL WORK

Development of the full county image control base is needed to complete the data base. The structure and design is in place and usable. There may be user interface issues that will need to be addressed. As well, these points need to be posted on the web site for all to use and be made aware of their existence.

PROJECT PARTICIPANTS

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