Section 18: Rectification Workflows

Section Objective

Rectification is the process of projecting the data onto a plane and making it conform to a map projection system. Images can be converted to real-world ground coordinates by referencing the image to another source that is in the desired map projection. Source information may be obtained from another image, vector coverages, or map coordinates. In order to accomplish this task, ground control points (GCPs) need to be selected from both the input source and the reference source. GCPs are points that are used to depict the same location on the Earth's surface.

Assigning map coordinates to the image data is called georeferencing. Since all map projection systems are associated with map coordinates, rectification involves georeferencing.
In this workflow, you rectify a Landsat TM image of Atlanta, Georgia, using a georeferenced SPOT panchromatic image of the same area. The SPOT image is rectified to the State Plane map projection.

Class Notes

Rectification Workflows

Objective:

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Task 1: Start Multipoint Geometric Correction Workspace

1. Open the image ***tmAtlanta.img***, or your image that has not been rectified. The file tmAtlanta.img is a Landsat TM image of Atlanta and has not been rectified.

   The image ***tmAtlanta.img*** displays in 2D View #1

2. Click **Multispectral** tab > **Transform & Orthocorrect** group > **Control Points** to start the Multipoint Geometric Correction workspace. Next steps

   The Set Geometric Model dialog opens

3. In Set Geometric Model dialog, select **Polynomial** and click **OK**

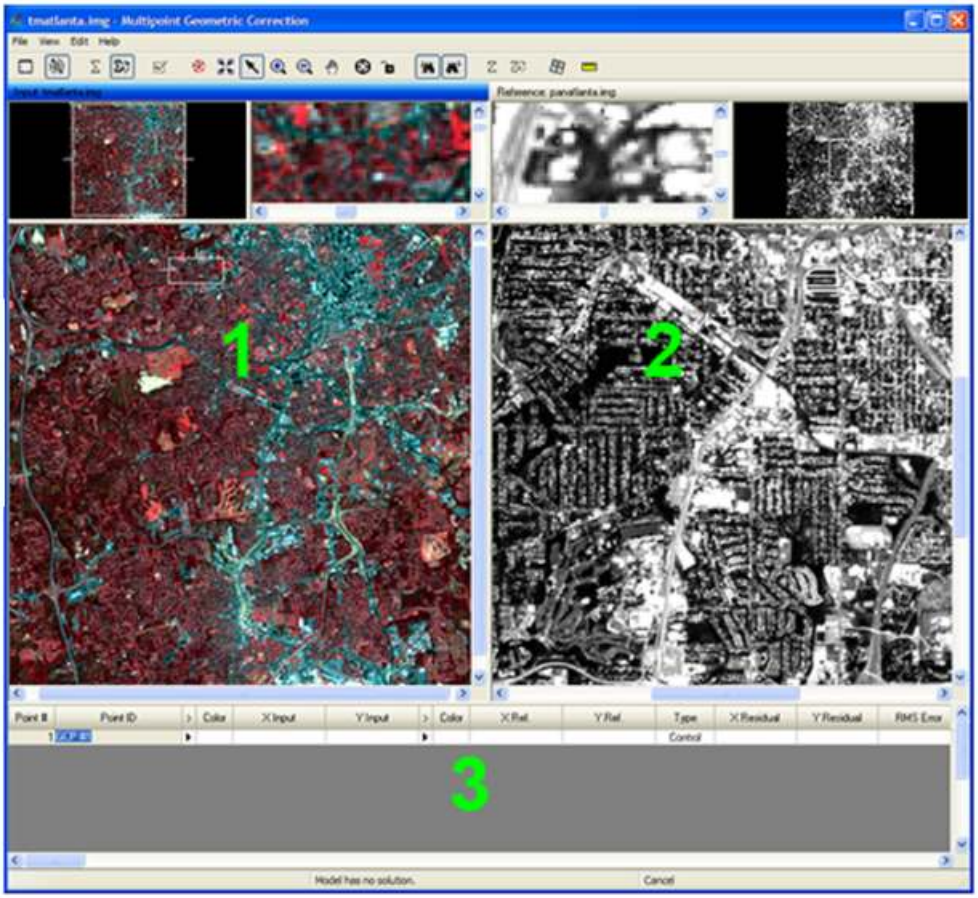
   The Multipoint Geometric Correction and the GCP Tool Reference Setup dialog both open. The input image ***tmAtlanta.img*** is loaded in the group of three Input Views of the Multipoint Geometric Correction workspace

4. In GCP Tool Reference Setup dialog, accept the default setting **Image Layer (New Viewer)** by clicking **OK**

5. The GCP Tool Reference Setup dialog closes. The Reference Image Layer File Selector opens. Navigate to the image file ***panAtlanta.img*** and select it. Click **OK**

   If you wanted to change the map information for a reference image, it is possible to modify it using the Reference Map Information dialog.

6. When you click **OK**, wait a few moments for the second group of three Views to open in the Multipoint Geometric Correction workspace. This group is the Reference Views, displaying the reference image, ***panAtlanta.img***



Window 1 - Input image Views

Window 2 - Reference image Views

Window 3 - GCP CellArray

Task 2: Collect GCPs

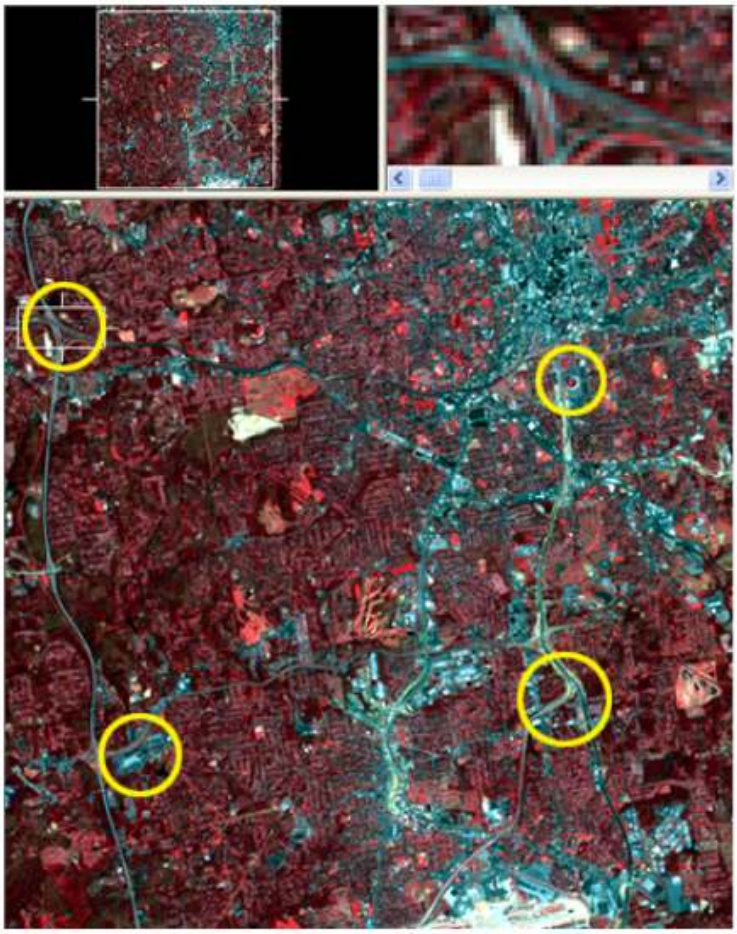
Here you collect Ground Control Points (GCPs) in the Input image (the image to be rectified) and the corresponding GCPs in the Reference image

The Multipoint Geometric Correction workspace is set in Automatic GCP Editing mode by default

The Toggle Fully Automatic GCP Editing Mode icon is active, indicating that this is the case

1. In the Main View for ***tmAtlanta.img***, drag the zoom bounding box to one of the areas shown in Figure 2. The circled areas are good locations for GCPs. You should choose points that are easily identifiable in both images, such as road intersections and landmarks

Figure 2: Good Targets to Collect GCPs



2. Click **Create GCP** , then click in zoom bounding box in Main View to collect the first GCP for the Input image (***tmAtlanta.img***)

   The point you have selected is marked as GCP #1 in the three View panes. The X and Y coordinates for GCP #1 are listed in the CellArray as X Input and Y Input.

3. In Zoom View pane, click and move the GCP to the desired position

4. In order to make GCP #1 easier to see, right-click in **Color** column to the right of GCP #1 in the GCP CellArray and select the color **Yellow**

5. Click in the Main View for ***panAtlanta.img***, then scroll your mouse wheel a bit to zoom out, until it is zoomed to approximately the same scale as ***tmAtlanta.img***. Locate the geographic link box and drag it to the corresponding image area in panAtlanta.img where GCP #1 is located in the other image

6. To change the color of the link box, right-click on the link box and click **Link Box Color...** In Link Box Color dialog, click the arrow of the Chooser button to select a different color

7. Now you collect a GCP for the corresponding point in the reference image. Click Create GCP , then click in the Zoom View for ***panAtlanta.img*** to collect the corresponding GCP #1 in the reference image (***panAtlanta.img***). In the GCP CellArray, note the X and Y coordinates for Reference image GCP #1 are reported as **X Ref.** and **Y Ref.** in the same row (1)

8. In the Main View for ***tmAtlanta.img***, click and drag the link box to an area suitable for collecting the next GCP

9. Click in Zoom View pane to collect the next GCP. Right-click in **Color** column in the GCP CellArray and select a contrasting color

10. Click in Main View for ***panAtlanta.img***, then move the link box to the corresponding area where you just collected the GCP in the Input image

11. Collect a GCP for the corresponding point in the reference image. Click **Create GCP** , then click in the Zoom View for ***panAtlanta.img*** to collect the corresponding GCP in the reference image (***panAtlanta.img***)

    The GCPs you collect should be spread out across the image, and should not forma single line

12. Collect at least two more GCPs by repeating steps 7, 8, 9, and 10

    After you collect the fourth GCP in the Input View, note that the GCP is automatically matched in the Reference View. This occurs with all subsequent GCPs that you collect

13. After you finish collecting GCPs in the Views, the GCP CellArray should look similar to below:

    When you select a Point # row, the Status bar displays the Control Point Error for X coordinates, the Control Point Error for Y coordinates, and the Total Control Point Error. A total error of less than 1 pixel error would make it a reasonable resampling

GCPs may be designated as control points or check points. Control points are used to calculate the geometric transformation model. Check points are not used in the calculation, but used to independently evaluate the error in the transformation

14. In GCP CellArray, change the color of all of the GCPs to yellow by right-clicking **Point #** column and click **Select All**, then right-clicking in each of the two **Color** columns and selecting **Yellow**
15. To deselect the GCPs, right-click in Point # column and click **Select None**
16. In the last row of the CellArray, right-click in each of the two **Color** columns and select **Magenta**

    All of the check points you add in the next steps are Magenta, which distinguishes them from the GCPs
17. Select the last row of the CellArray by clicking in the **Point #** column next to that row
18. Select **Edit > Set Point Type > Check** from the Multipoint Geometric Correction menu bar

    All of the points you add in the next steps are classified as check points
19. Select **Edit > Point Matching** from the menu bar

    The GCP Matching dialog opens
20. In GCP Matching dialog under **Threshold Parameters**, change **Correlation Threshold** to **0.8**, and then press Enter on your keyboard
21. Click **Discard Unmatched Point** checkbox to activate it
22. Close the GCP Matching dialog
23. Now create five check points in the Input View and in the Reference View, using the same method as you did when creating the GCPs

    Start by creating the first check point near to GCP #1, then continue in sequence

    The Point IDs, X and Y Input coordinates, X and Y Reference coordinates, and Match values are reported in the CellArray

    If the previously input points were not accurate, then the check points you designate may go unmatched and are automatically discarded
24. Click **Compute Error** to compute the error for the check points
25. **Select** the last GCP check point in the CellArray.

    In Status bar, the Check Point Error for X coordinates, the Check Point Error for Y coordinates, and the Total Check Point Error display. A total error of less than 1 pixel error would make it a reasonable resampling
26. To view the polynomial coefficients, click **Model Properties**

    The Polynomial Model Properties dialog opens.
27. Click **Transformation** tab and note the transformation coefficients to be used in the polynomial equations. Close the Polynomial Model Properties dialog

Task 3: Resample the Image

Resampling is the process of calculating the file values for the rectified image and creating the new file. All of the raster data layers in the source file are resampled. The output image has as many layers as the input image.

ERDAS IMAGINE provides these widely-known resampling algorithms: Nearest Neighbor, Bilinear Interpolation, Cubic Convolution, and Bicubic Spline.

Resampling requires an input file and a transformation matrix by which to create the new pixel grid.

1. Click **Resample** icon in the toolbar

   The Resample dialog opens

2. In Resample dialog under **Output File**, enter the name ***tmAtlanta_georef.img*** for the new resampled data file. This is the output file from rectifying the ***tmAtlanta.img*** file to the coordinate system of the ***panAtlanta.img*** file

3. Under **Resample Method**, select **Bilinear Interpolation**

4. Click **Ignore Zero in Stats**., so that pixels with file values of zero are excluded when statistics are calculated for the output file

5. Click **OK** in Resample dialog to start the resampling process

   The Process List dialog opens to let you know when the processes complete

6. **Close** the Process List dialog when the job is 100% complete

Task 4: Verify the Rectification Process

One way to verify that the input image (tmAtlanta.img) has been correctly rectified to the reference image (panAtlanta.img) is to display the resampled image (tmAtlanta_georef.img) and the reference image and then visually check that they conform to each other

1. Minimize the Multipoint Geometric Correction workspace.
2. Maximize the IMAGINE ribbon Workspace. The image ***tmAtlanta.img*** is displayed in the 2D View
3. Click **Home** tab > Add Views > **Create New 2D View**
4. Open ***tmAtlanta_georef.img*** in the second 2D View

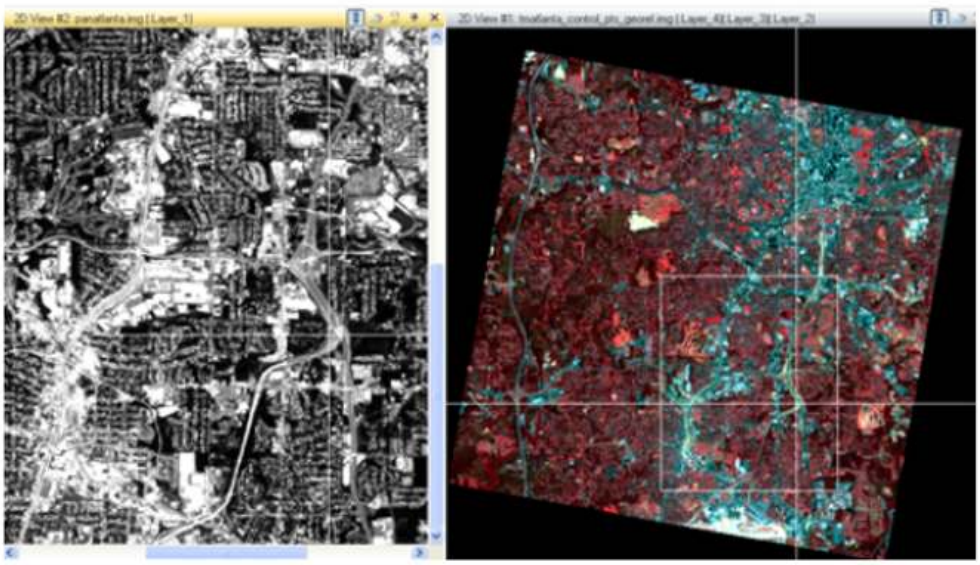
   Note that when you move your mouse within the View containing ***tmAtlanta_georef.img***, map coordinates in meters are reported in the Status Bar, compared to file coordinates reported for the ungeoreferenced ***tmAtlanta.img***

5. Click to make 2D View #1 active, and click **Clear View** in the Quick Access Toolbar

   The image ***tmAtlanta.img*** is removed from 2D View #1
6. Open ***panAtlanta.img*** in 2D View #1
7. Click **Home tab** > **Link All Views**

   2D View #2 is now linked to 2D View #1
8. Click **Home tab** > **Inquire Cursor** to open an Inquire Cursor in both Views

   The Inquire Cursor (a crosshair) is placed in both Views. An Inquire Cursor dialog also opens
9. Drag the Inquire Cursor around to verify that it is in approximately the same place in both Views. Notice that, as the Inquire Cursor is moved, the data in the Inquire Cursor dialog are updated



Class Notes