Tessa Vu

GEOG 4140-001

Dr. Wan

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Lab 2: Deliverable 3

a. Describe the difference between a *geographic coordinate system* and *projected coordinate system*.

A geographic coordinate system's units are usually in degrees and represent the global/spherical shape of Earth, while a projected coordinate system's units are usually linear (e.g. meters, feet, etc.) and represent a flat surface.

b. In which coordinate system did you choose to keep your final line feature? Explain your choice.

I had two coordinate systems to choose from: NAD 1927 UTM Zone 12N, which was for the satellite imagery (the photos were older, taken in the 1950s, so the other system did not yet exist), and NAD 1983 UTM Zone 12N, which was for the scanned map. I kept the projected coordinate system as the latter because it is the most recent of the options and would more accurately represent what the trailhead looks like currently.

c. Discuss the limitations of geographic coordinate systems and projected coordinate systems.

Geographic coordinate systems (GCS) are accurate for plotting points, or coordinates, but people use flat surfaces for their maps and navigation so a round shape would not help, this is where the projected coordinate system (PCS) comes in. Certain PCS have different kinds of distortions, whether distorting area, distance, etc., so they have different uses as well—the

mercator is ideal for sailing ships for example and it preserves distance, but distorts size as they reach the poles.

    d. What were your transformation types and RMSE values for the georeferenced images? What does the RMSE value indicate?

All the transformation types were "1st order polynomial" or "affine" transformations, which means that the georeferencing preserved the lines and parallelism of the rasters. The RMSE, or root mean squared error, values indicates how erroneous a georeferencing application is, and in ArcGIS when there are four control points, the RMSE is set to zero. The RMSEs for the second lab are below; after three attempts to georeference, the satellite images still had much higher values (towards the thirties) compared to the scanned maps, and some of the scanned maps were slightly over one unit.

Farnsworth Peak

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 1.431846

Inverse: 0.002349

Forward-Inverse: 0.000000

Fort Douglas

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 2.161285

Inverse: 0.003545

Forward-Inverse: 0.000000

Magna

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 0.488329

Inverse: 0.455674

Forward-Inverse: 0.000000

Mountain Dell

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 1.143192

Inverse: 1.066947

Forward-Inverse: 0.000000

North Salt Lake

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 1.189445

Inverse: 1.109842

Forward-Inverse: 0.000000

South Salt Lake

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 0.767580

Inverse: 0.716140

Forward-Inverse: 0.000000

Sugar House

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 0.980829

Inverse: 0.915246

Forward-Inverse: 0.000000

Hastings 1

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 31.534669

Inverse: 32.227527

Forward-Inverse: 0.000000

Hastings 2

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 7.794883

Inverse: 0.015220

Forward-Inverse: 0.000000

Hastings 3

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 22.404764

Inverse: 0.043206

Forward-Inverse: 0.000000

Hastings 4

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 25.264424

Inverse: 0.025663

Forward-Inverse: 0.000000

Hastings 5

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 48.792925

Inverse: 0.046047

Forward-Inverse: 0.000000

Hastings 6

Transformation: 1st Order Polynomial (Affine)

Controls Points: 4 / 4

Total RMS Errors

Forward: 34.954604

Inverse: 0.069242

Forward-Inverse: 0.000000