Back to QGis: Georeferencing

Summer School on Digital Humanities

Web site: https://bit.ly/dt4h-gis

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Back to QGis: Georeferencing

- Georeferencing involves transforming an image into a map
  - assigning geographic coordinates to each pixel in the image
- To achieve this, match points on the image with corresponding locations on an accurate reference raster (e.g., OSM)
- A georeferencing tool then calculates the coordinates for all pixels
  - Accuracy improves with the number of reference points
  - The image may need morphing (non-linear transformation)
  - Optimal reference points are distant and non-aligned
- QGIS provides tools for this task

Georeferencing: Preparation

- We want to georeference the map avaliable at
  - Download the *png* file

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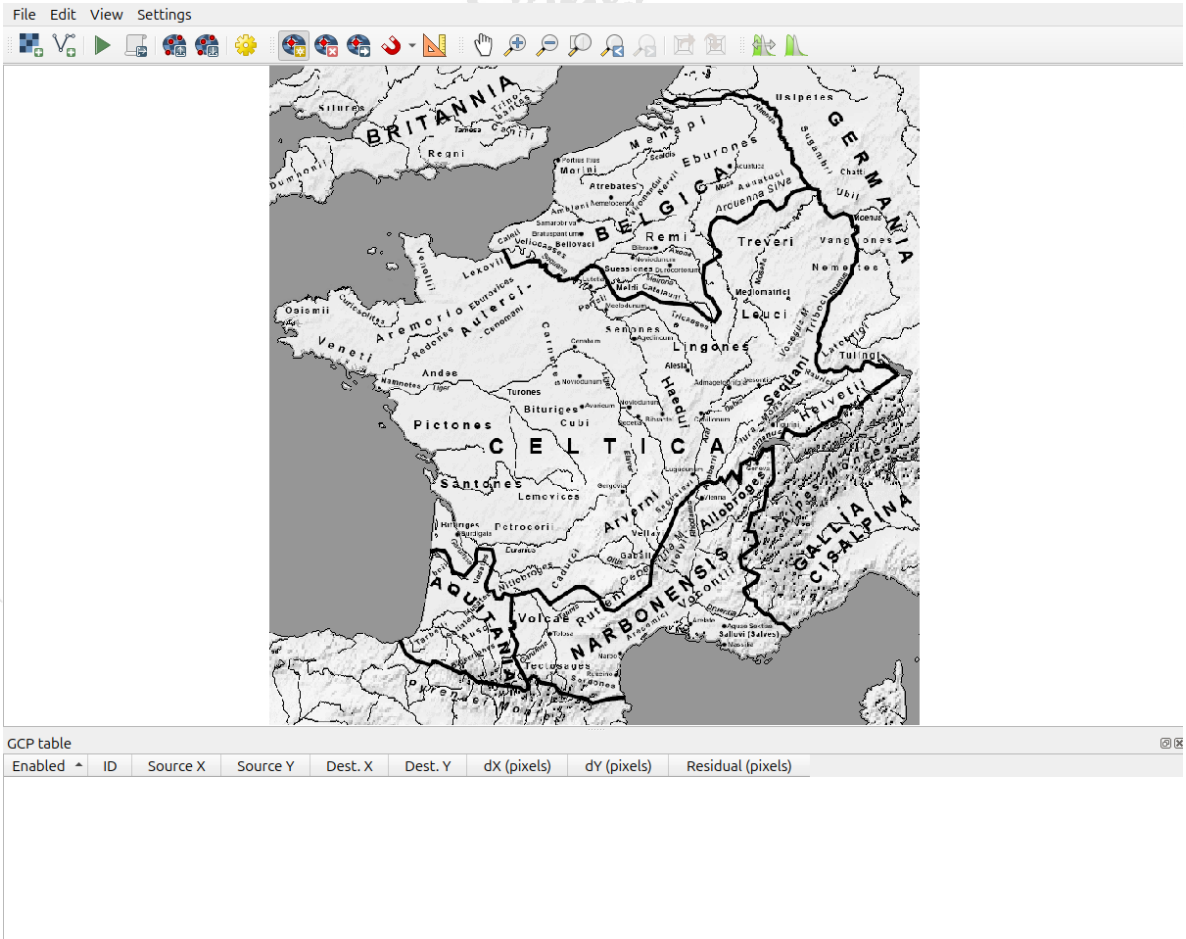
https://it.m.wikipedia.org/wiki/File:Map_Gallia_Tribes_Towns.png
```

- Create a new project and load the reference raster (OSM)
- Adjust the scale to match the area covered in the map
- Observe the code in the bottom right corner: EPSG:3857 (WGS84 - Pseudo Mercator)
- Open the Georeferencer tool:
  - Select Layer -> Georeferencer... to open a new window
- In the *Georeferencer* window:
  - Select File -> Open Raster
  - Locate and open the image file you downloaded

Unreferenced image loaded



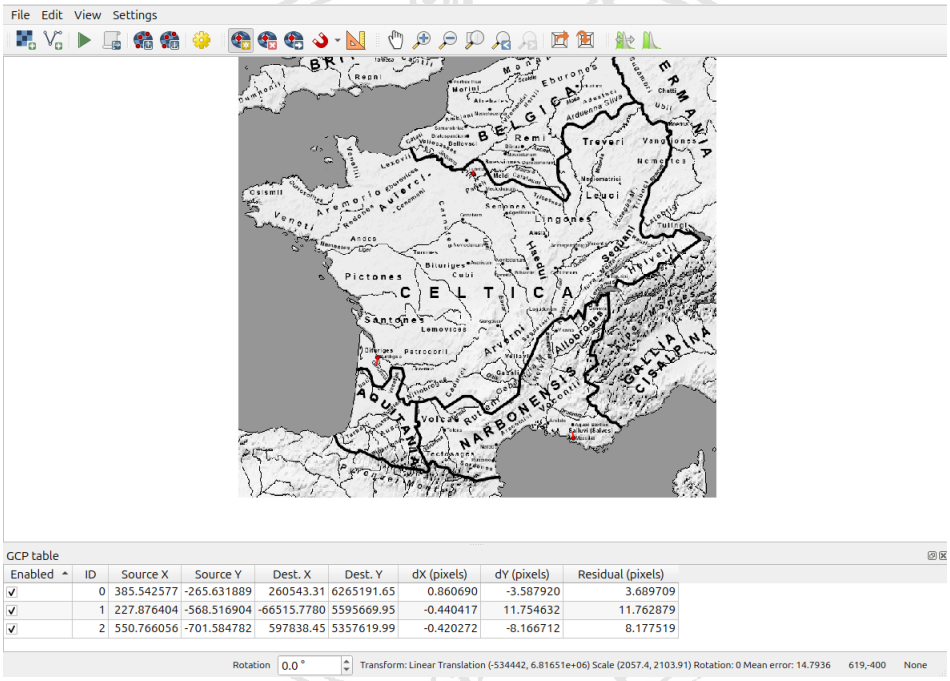
Setup the transformation type

- Configure transformation settings:
  - Select Settings -> Transformation Settings
  - Choose a transformation type (TPS is generally suitable)
  - Ensure the SR is set to EPSG:3857 - WGS84/Pseudo-Mercator
  - Specify a target file for the result
  - Enable "Load in project when done"
  - Click OK to apply the settings and return to the Georeferencer window

Matching Points

- Repeat the following steps for at least three (distant, non-aligned) points on your map image:
  - Identify a recognizable detail on the map image that also appears on the reference raster
    - e.g., in an ancient map of France, *Lutetia* corresponds to modern Paris
    - Use arrow keys to move and the mouse wheel to zoom, or select the *Hand* icon to use the mouse
  - Click when the crosshair is positioned over the reference detail (e.g., *Lutetia*)
  - A window appears to input the coordinates
  - Click the From Map Canvas button
  - The map and dialog disappear, and you return to the OSM raster with a crosshair pointer
  - Locate the corresponding point (e.g., *Paris*) on the raster and click
  - QGIS extracts the geographic coordinates from the OSM raster
  - The map reappears with the coordinates filled in
  - Click OK and repeat for at least three points

The map before georeferencing



GCP table

Enabled	ID	Source X	Source Y	Dest. X	Dest. Y	dX (pixels)	dY (pixels)	Residual (pixels)
☑	0	385.542577	-265.631889	260543.31	6265191.65	0.860690	-3.587920	3.689709
☑	1	227.876404	-568.516904	-66515.7780	5595669.95	-0.440417	11.754632	11.762879
☑	2	550.766056	-701.584782	597838.45	5357619.99	-0.420272	-8.166712	8.177519

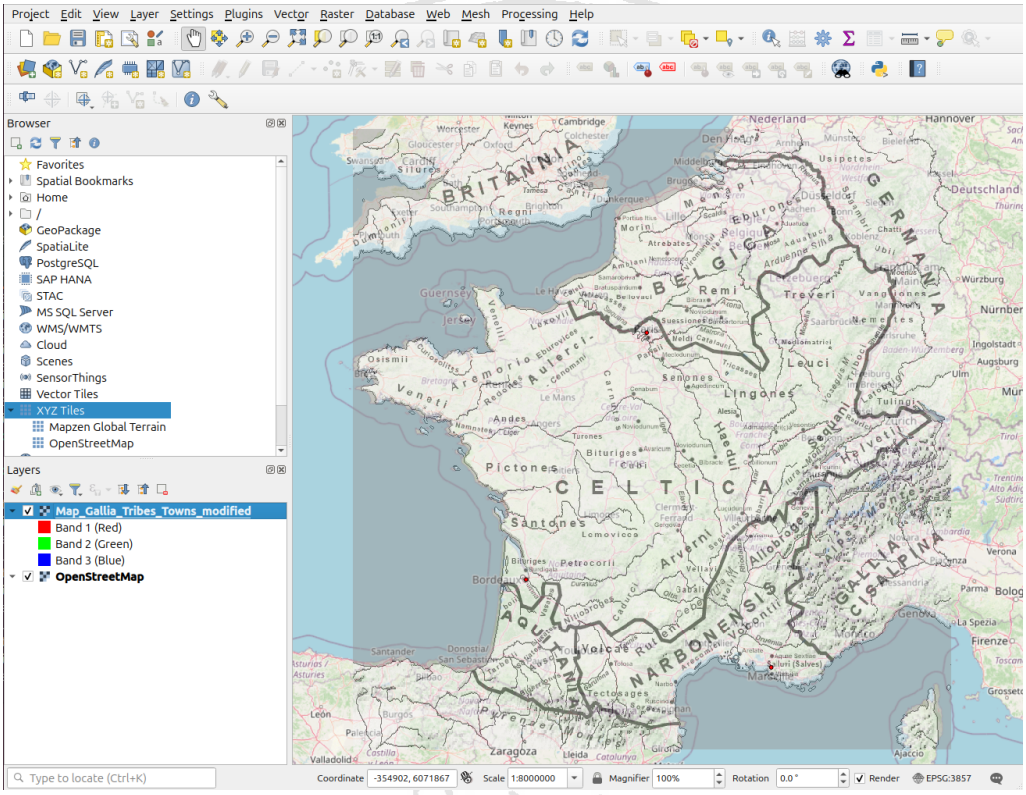
Running the Georeferencer

- Once all reference points are set, apply the georeferencing algorithm
- Click the green triangle in the *Georeferencer* toolbar to start the process
- A pop-up will confirm completion
- Keep the Georeferencer window open and switch to the main QGIS window to inspect the result

Inspecting the Result

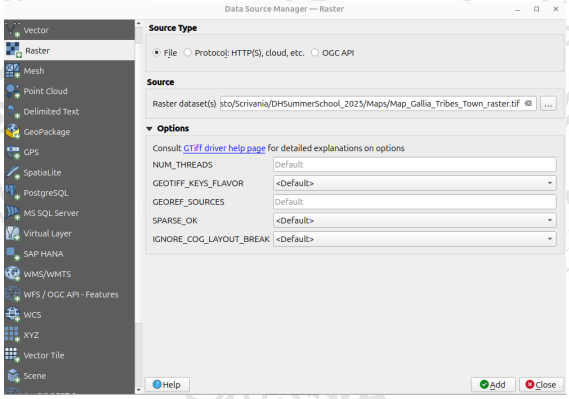
- The image appears as a new raster layer in the *Layers* panel
- To assess the georeferencing accuracy, adjust transparency:
  - Right-click the new layer in the Layers panel and select Properties -> Transparency
  - Set Global Opacity to approximately 50
- The next slide illustrates an OSM raster of France with a georeferenced historical map of ancient tribes
- The three reference points used: Paris, Marseille, and Bordeaux
- Observe how the northern coastline differs between the maps
- If the result is unsatisfactory:
  - Remove the layer
  - Return to the *Georeferencer* window to add more points
  - Repeat the georeferencing process
    - Hint: use small islands instead of towns

Referenced image generated



Use Your New Raster in QGIS

- During the georeferencing process, you specified a location to save the new raster
- To load it in QGIS, open a new project and access the Data Source Manager
  - Select Raster as the data source type
  - Click File to choose the raster format
  - Browse your filesystem and set the Source field to the path of your new raster



More Resources

- Find in-depth QGIS tutorials at `https://www.qgistutorials.com/en/`
- Access geographic data (such as OpenStreetMap) from regional and global sources:
  - `https://earthexplorer.usgs.gov/` (Explore available *datasets*)
  - `http://wms.pcn.minambiente.it/mattm/servizi-di-scaricamento/` for downloading *WFS* resources to import into QGIS
- Try an engaging tutorial: `https://www.qgistutorials.com/en/docs/3/working_with_terrain.html`
  - Learn to add contour lines to QGIS maps