Digital Scholarship Foundations: Digital Mapping

Week 2: Working with Spatial Data

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Today’s Objectives

- Explore how to represent your data
- Learn how to effectively structure data for visualization
- Use OpenRefine to prepare data for visualization
- Learn how to create raster data through georeferencing
- Extract vector data from georeferenced map

Now What: Structuring our Data

Structuring: Organizing our data and gathering additional data

Why:

- Mapping platforms needs coordinates not placenames
- Make your data flexible/transferable
- Add more meaning/layers of interpretation
- Think critically about your data

Questions to ask yourself and of your data:

- What do you want your map to display?
- What columns do you need to organize and add data?
- What data will be visible to the end user?
- Is your data consistent?
- How do you make your data mappable?

Representing your Data

Potential Representations

- Points
- Lines
- Polygons

Accompanying Representations

- Pop-up cards
- Icons
- Legends
- Layers

Thinking About your Spreadsheet

Non-display Data

- filenames
- coordinates
- source
- address

Often this data is meant to be read by the software/platform you are using, not your viewer/visitor.

Display Data

- title
- subject
- description
- other interpretative data

This data will help your viewer/visitor interpret what they’re seeing and help further convey your argument.

Sample spreadsheet

church	type	nationality	address	city	latitude	longitude	source
Sacred Heart Parish	Catholic	Anglo	2540 Madison Ave	Kansas City, Missouri	39.080632	-94.595527	Bing Maps
Church of the Assumption	Catholic	Anglo	204 W 8th Avenue	Topeka, Kansas	38.4074273	-96.1825197	Bing Maps
Our Lady of Guadalupe	Catholic	Mexican	210 N Branner	Topeka, Kansas	39.0563548	-95.6552217	Bing Maps
Mexican Mission at St. Thomas Church	Catholic	Anglo/Mexican	632 S Pyle	Kansas City, Kansas	39.086914	-94.6271638	Bing Maps
Sacred Heart Church	Catholic	Anglo	102 Exchange	Emporia, Kansas	38.3990296	-96.1750435	Bing Maps
Our Lady of Guadalupe	Catholic	Mexican	5023 S 24th St	Omaha, Nebraska	41.207603	-95.94669	Bing Maps
Our Lady of Guadalupe	Catholic	Mexican	1106 12th ave	Scottsbluff, Nebraska	41.857856	-103.6471581	Bing Maps
Mexican Baptist	Baptist	Mexican	1419 10th Ave	Scottsbluff, Nebraska	41.8610337	-103.6494167	Bing Maps
Mexican Mission House	Catholic	Mexican	214 E 18th St	Scottsbluff, Nebraska	41.864054	-103.659186	Bing Maps
Our Lady of Guadalupe	Catholic	Mexican	905 W 23rd Street	Kansas City, Missouri	39.0856722	-94.5973635	Google Maps
Our Lady of Mt. Carmel	Catholic	Mexican	813 st paul ave	Kansas City, Kansas	39.0843211	-94.6252881	Google Maps
St. Catherine of Alexandria Church	Catholic	Mexican	130 Pine Street	Emporia, Kansas	38.3960861	-96.1957963	Bing Maps
Our Lady of Covadonga	Catholic	Anglo	7100 Virginia Ave	St. Louis, Missouri	38.553337	-90.257598	Bing Maps
St. John the Divine/Mission of Our Lady of Mt. Carmel	Catholic	Mexican	2511 Metropolitan Ave	Kansas City, Kansas	39.073011	-94.658547	Bing Maps
Our Lady of Guadalupe (Basement of St. Mary's Church)	Catholic	Mexican	512 St. John's Avenue	Garden City, Kansas	37.9690225	-100.8845307	Google Maps
Mexican Mission	Catholic	Mexican	123 E Santa Fe Ave	Garden City, Kansas	37.9631957	-100.875741	Google Maps
Mexican Parish at Sacred Heart Church	Catholic	Mexican	1229 Crowell	Atchison, Kansas	39.5481383	-95.124271	Bing Maps
Iglesia Bautista	Protestant	Mexican	801 23rd St	Kansas City, Missouri	39.0855082	-94.6028343	Google Maps
Mexican Christian	Christian	Mexican	1204 W 23rd St	Kansas City, Missouri	39.0860944	-94.5985311	Bing Maps
Mexican Baptist	Baptist	Mexican	2128 Madison Ave	Kansas City, Missouri	39.0866013	-94.5949089	Bing Maps

Cleaning

Standardizing your data is essential to proper representation, analysis, and interpretation.

Common inconsistencies:

- Misspelling
- White space
- Multiple spellings
- Capitalization
- Blank cells
- Formatting

Let’s explore with OpenRefine!

Georeferencing

Source: MapWarper

From image to data

Georeferencing will transform a map from a static image into geospatial data, resulting in a raster that can be used for further analysis or visualization.

Why georeference historical maps?

Create basemaps

Georeferencing allows the creation of basemaps—background map layers over which other thematic layers of data can be overlaid. This enables us to visualize how an area looked in the past or compare changes over time.

Extract historical vector data

Once a map is georeferenced, it can serve as a source for digitizing historical features into vector formats, enabling further spatial analysis and interpretation.

Historical maps

Why are they challenging?

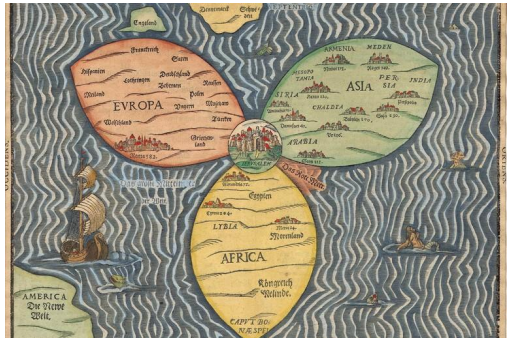
- **Textual** and **visual** elements
- Spatial and cultural representations
- Narratives of **power**, **identity** and **change**
- **Artifacts** with complex biographies of use and reuse
- Diverse in **form**, level of **detail** and **content**
- Full of **interpretative challenges**

Hereford Mappa Mundi, Wikimedia commons

Not all maps are made equal!

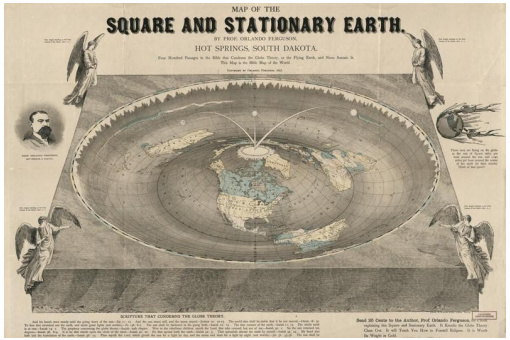
Ebstorf Mappa Mundi (c. 1300)

Wikimedia Commons



Bünting cloverleaf map (1581)

Wikimedia Commons



Map of the square and stationary earth (1893)

Library of Congress

Core concepts

Georeferencing

Assign real-world coordinates to a scanned map or raster image.

Georectification

Geometrically adjust to correct distortions and align with a spatial reference system.

Ground Control Points

Identifiable locations used to align the source image with real-world geographic coordinates. They are used as “anchor” points.

Transformations

Transformation algorithms mathematically adjust the image (by shifting, scaling, rotating, and warping it) so that its GCPs match their corresponding points on a modern map.

Is your map geo-referenceable?

Check if already done

Determine if the map is already georeferenced or georectified (e.g., in Allmaps Explore, MapWarper, OldMapsOnline) and whether it can be exported in the desired format.

Review metadata

Assess whether the map's creation date, creator, or stated purpose points to geographic precision.

Assess image quality

Check for damage that could obstruct analysis. Verify scale, resolution and legibility for Ground Control Point placement.

Assess map type

Determine whether the map is schematic (e.g., symbolic) vs. cartographically precise. Look for distortions caused by historical projection methods or artistic license.

Check for Ground Control Points

Identify recognizable landmarks (e.g., coastlines, rivers, towns) that match modern or historical basemaps.

Will it be perfect?

As historical maps are probably not based on the projection systems used in modern cartography, the process of georeferencing and georectifying them is unlikely to produce a perfectly smooth or seamless result.

Web georeferencing workflow

Geocoding

Getting Coordinates

Latitude and longitude are important additions to your metadata.

Geocoding: a computational process of transforming a description of a location, such as an address or place name, into geographic coordinates

Coordinate format: You will want your coordinates in decimals rather than degrees. Below are examples for Firestone Library:

Decimals: 40.34972638362372, -74.6574238318438

Degrees: 40° 20' 59.013", -74° 39' 26.7264"

Preparing Descriptive Location Information

Are you mapping a city? A state? A building? A river? A park? A historic neighborhood?

Add columns to your spreadsheet that may help with efficient coordinate extraction.

Include state and country if possible.

Be consistent.

Geocoding Tools

Where do you find coordinates?

How can you do it efficiently?

Google Maps

Wikidata

GPS Visualizer

Geocodio

APIs

Geocoding Tools: Challenges

Geocoding tools often require addresses.

Some tools are limited by country.

Historical data often lacks addresses or does not conform to current street organization.