

Geospatial Data Visualization

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Outline

Geospatial
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Visualization

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The History of
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Aspects

The
Challenges of
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Dr Snow's Study of Cholera Spread in 19th Century London

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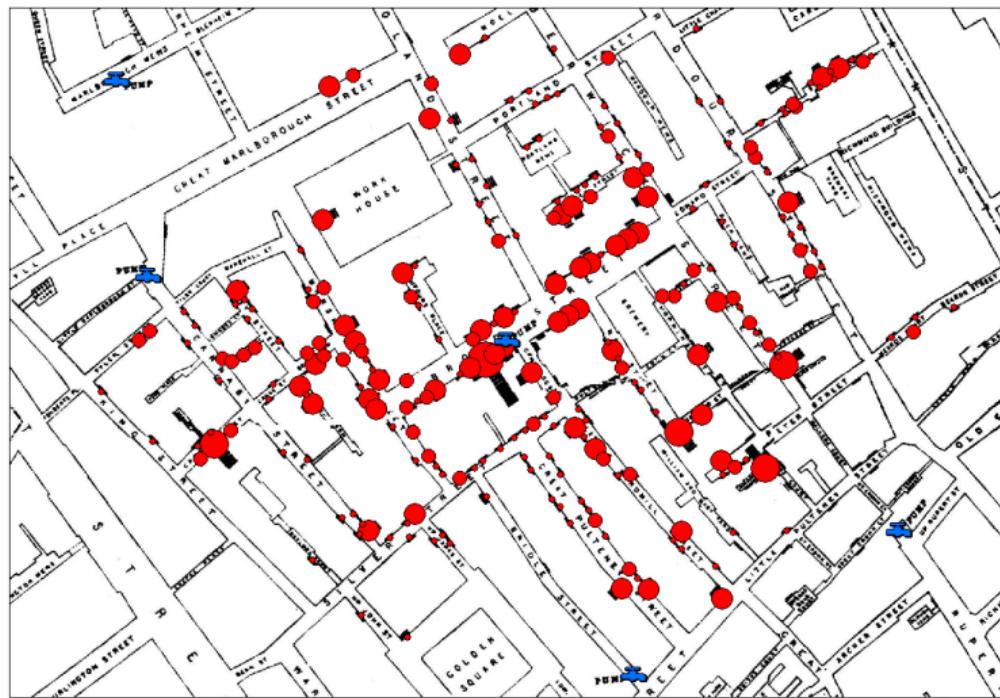
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Go to the video: <https://www.youtube.com/watch?v=lNjrAXGRda4>

A Geospatial Visualization of Water Suppliers' Service Scope

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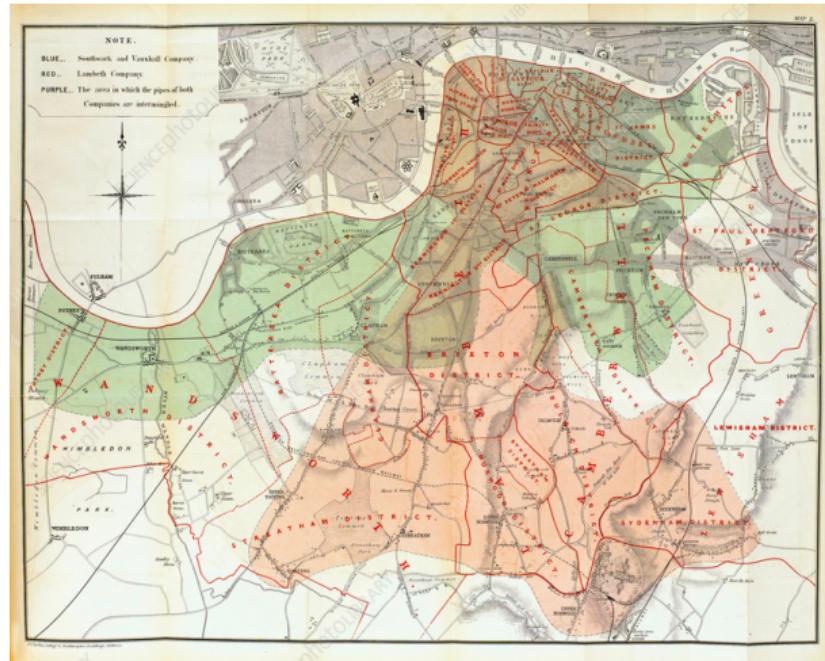
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Source: Snow (1855)

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What Are the Methodological Roots of Geo-Spatial Analyses?

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- Geographic Information Systems (GIS)
- Remote sensing
- Elevation data

GIS

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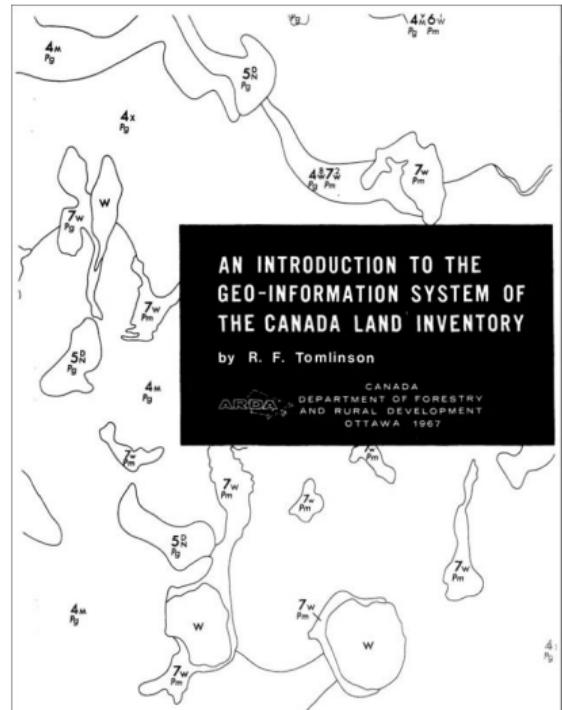
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- Computer mapping evolved with the computer itself in the 1960s
- The term GIS began with the Canadian Department of Forestry and Rural Development
 - Dr. Roger Tomlinson headed a team of 40 developers in an agreement with IBM to build the Canada Geographic Information System (CGIS)
 - The CGIS tracked the natural resources of Canada and allowed the profiling of these features for further analysis
 - The CGIS stored each type of land cover as a different layer



An Example of GIS

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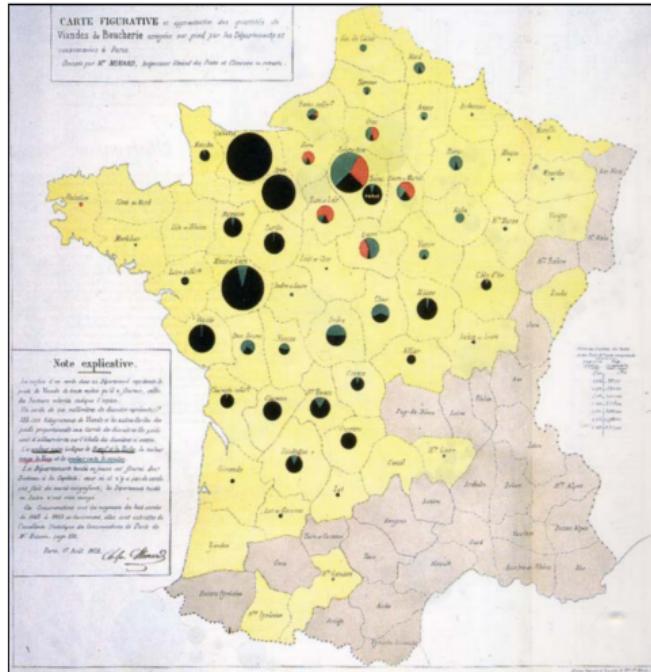
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Source: Minard (early 1900s)

Remote Sensing

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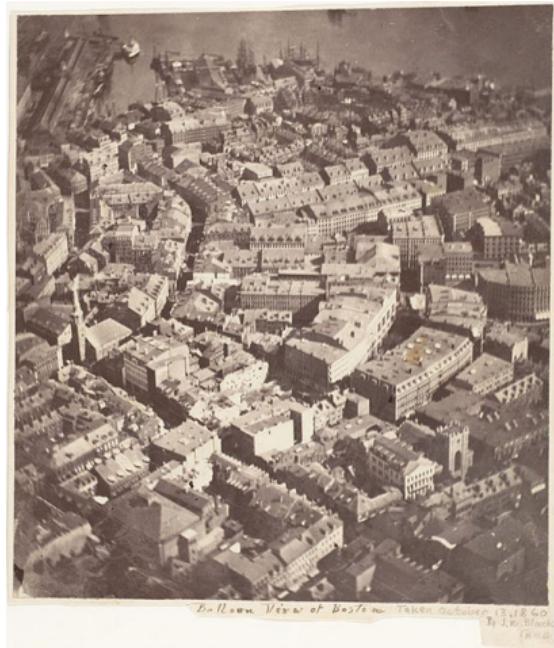
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- **Remote sensing** is the collection of information about an object without making physical contact with that object
- In the context of geospatial analysis, the object is usually the Earth
- By extracting features from images, modern remote sensing technologies have enabled GIS



Boston View at Boston Taken October 1860
By J. W. Nichols
[Signature]

Remote Sensing in the Pre-Computer Vision Era

Leonardo Da Vinci's Map of the City of Imola (1502)

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Elevation Data

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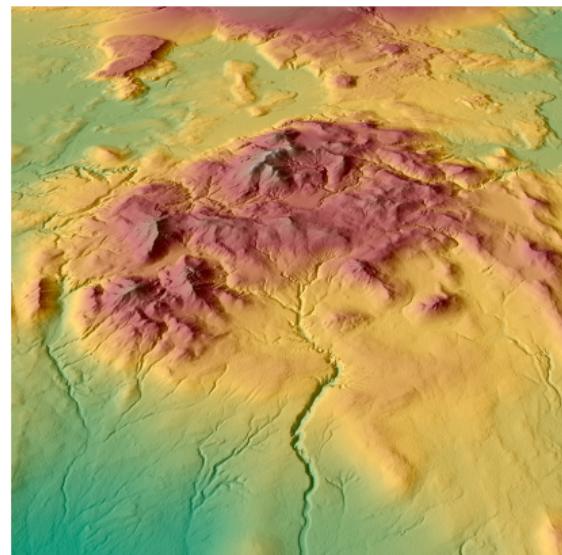
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- A Digital Elevation Model (DEM) is a three-dimensional representation of a planet's terrain (e.g., the Earth)
- Before computers, representations of elevation data were limited to topographic maps created through traditional land surveys
- Technology existed to create three-dimensional models from stereoscopic images or physical models from materials such as clay or wood



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Geographic Vs. Screen Coordinates

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- Geographic data are stored in a coordinate system representing a grid overlaid on the Earth, which is **three-dimensional** and **round**

Geographic Vs. Screen Coordinates

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- Geographic data are stored in a coordinate system representing a grid overlaid on the Earth, which is **three-dimensional** and **round**
- Screen coordinates, also known as pixel coordinates, represent a grid of pixels on a **two-dimensional** and **flat** computer screen

Geographic Vs. Screen Coordinates

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- Mapping x and y world coordinates to pixel coordinates is fairly straightforward and involves a simple scaling algorithm

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- Screen coordinates, also known as pixel coordinates, represent a grid of pixels on a **two-dimensional** and **flat** computer screen
- Mapping x and y world coordinates to pixel coordinates is fairly straightforward and involves a simple scaling algorithm
- However, if a z coordinate exists, then a more complicated transform must be performed to map coordinates from three-dimensional space to a two-dimensional plane

Geographic Vs. Screen Coordinates

How to build a stripped down version of a GIS

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- 1 Data model setup**
- 2 Fix map size**
- 3 Scaling the map**
- 4 Sample GIS function**
- 5 Render the map**

How to Build a Stripped Down Version of a GIS

Step 1: data model setup

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Let us set up the data for a sample USA state (Colorado) as a list with name, polygon points, and population



How to Build a Stripped Down Version of a GIS

Steps 2 - 5

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See [tutorials/geospatial/gis.qmd](#)

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The Python Geospatial Viz Ecosystem is VERY Rich!

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Please refer to the Jupyter Notebook file
`python_modules.ipynb`