Data Representations and Visualisations

by

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Data

- Things known or assumed as facts which become the basis of reasoning or calculation.
- Is a set of values of subjects with respect to qualitative or quantitative variables.
- Data only becomes information when it is viewed in context or in post-analysis.
- Spatial data also known as geospatial data or geographic information is the data or information that identifies the geographic location of features on Earth.
- Spatial data is usually stored as coordinates and topology, and is data that can be mapped.
- Spatial data contains more than just location information on the Earth’s surface.
- It also contains non-spatial data, attribute data, that describes a feature.
- Data is therefore a core component of Geographic Information Systems

Representations

- Data consist of symbols that represent measurements.
- Digital geographic data are encoded as alphanumeric symbols that represent locations and attributes of locations measured at or near Earth's surface.
- No geographic data set represents every possible location of the Earth .
- Geographic data are constructed by measuring carefully chosen representative samples of locations.
- Vector and raster data are the basic two distinct sampling strategies of geographic data.
- The vector data model represents geography as collections of points, lines, and polygons.
- The raster data model represent geography as cell matrices that store numeric values.
- The TIN data model represents geography as sets of contiguous, non-overlapping triangles.
- Of course the most common representation is a map scaled or not.

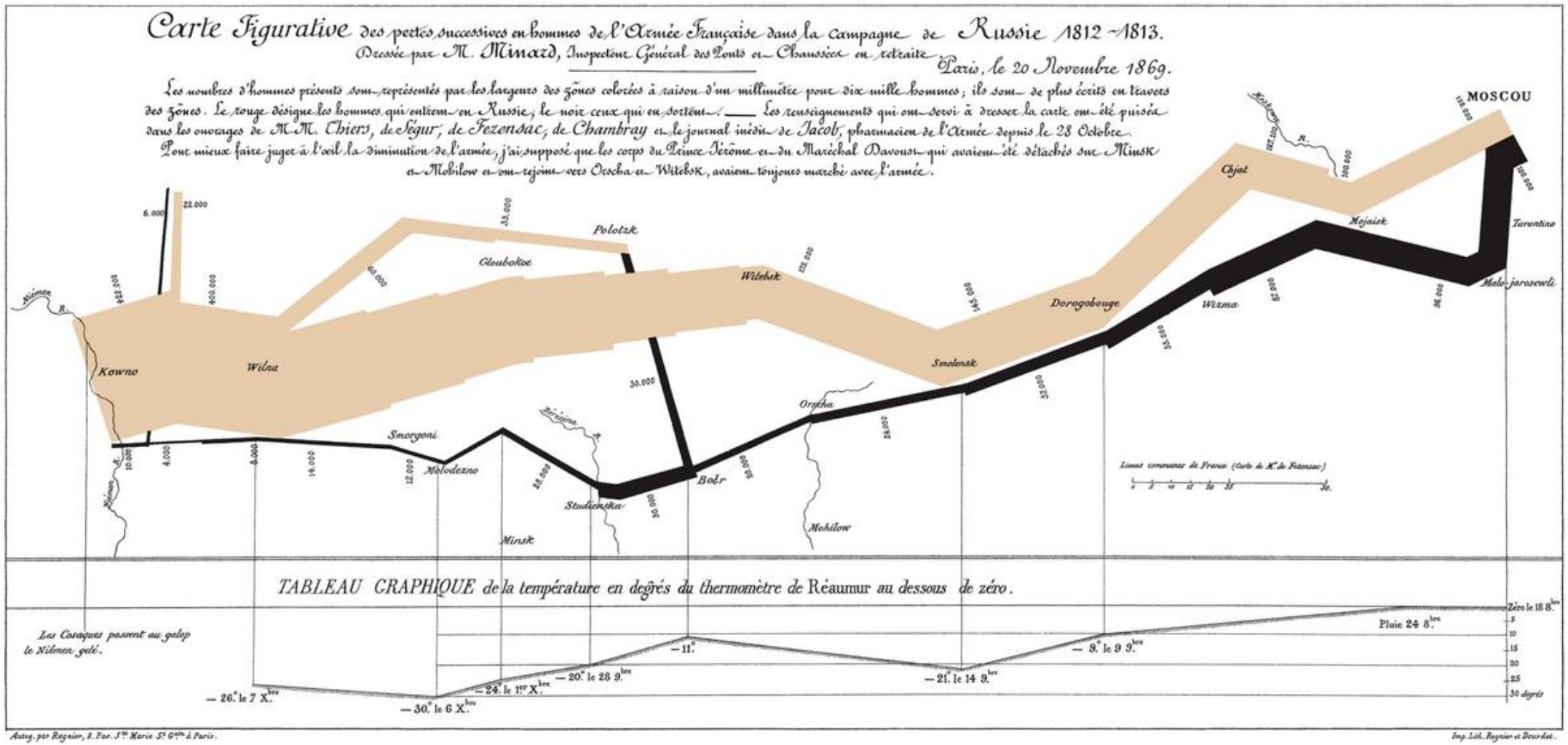
Visualisation

- Visualisation is any technique for creating images, diagrams, or animations to communicate a message.
- Visualization through visual imagery has been an effective way to communicate both abstract and concrete ideas since the dawn of humanity.
- Historically, cave paintings, Egyptian hieroglyphs, Greek geometry, and Leonardo da Vinci's revolutionary methods of technical drawing for engineering and scientific purposes are examples.
- It has been used in maps, scientific drawings, and data plots for over a thousand years.
- Examples from cartography include Ptolemy's Geographia (2nd Century AD), a map of China (1137 AD), and Minard's map (1861) of Napoleon's invasion of Russia.

Ptolemy's World Map

The Oldest Surviving Chinese World Map

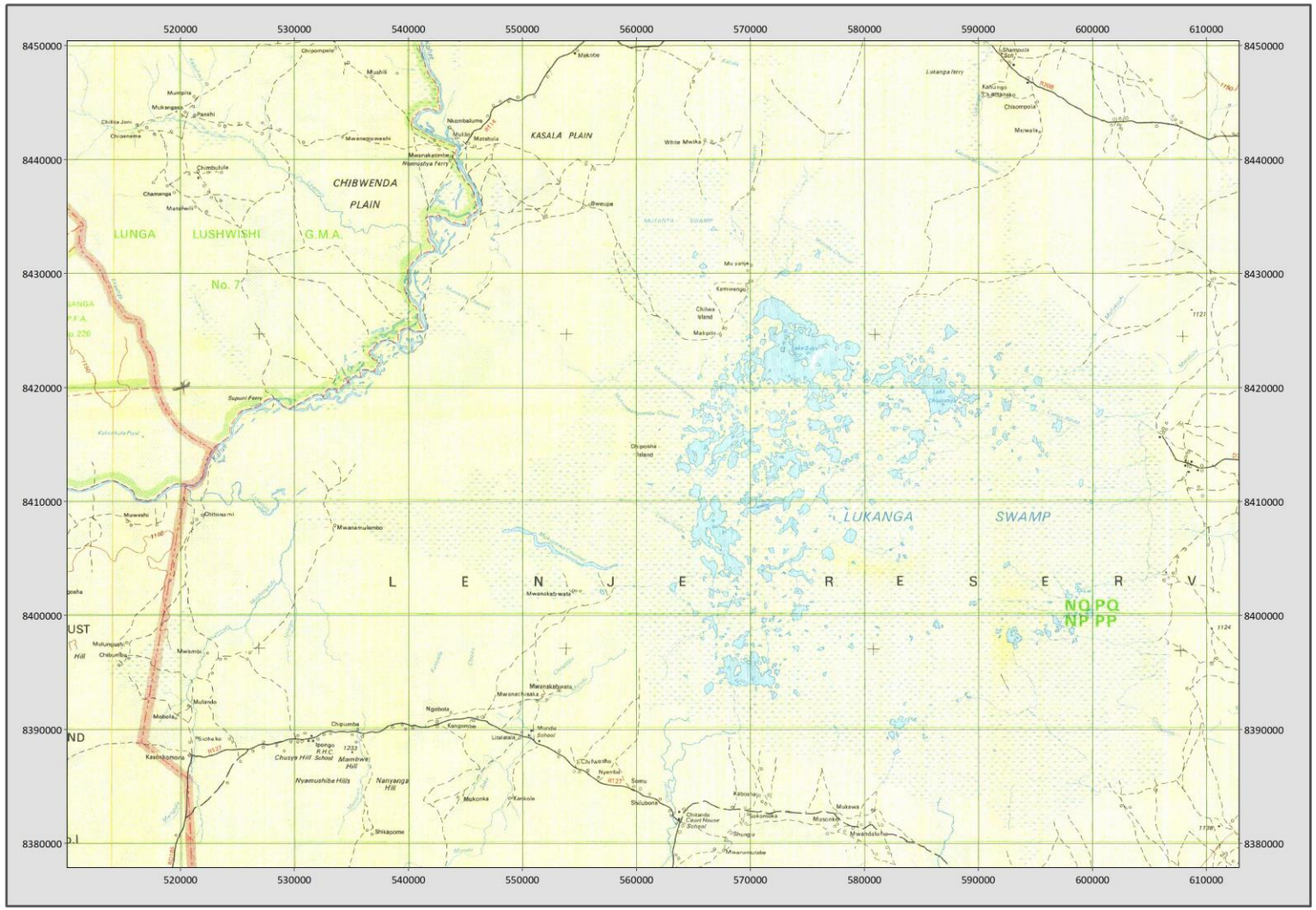
Minard's Map of 1869



2D or 3D Data Visualization

- 2D models are basically planar, i.e., in (x, y); e.g. map on paper
- 3D models are 2D modes + height, i.e., in (x, y, z); e.g. a DTM
- 4D models are 3D models + time, i.e., in (x, y, z + time); e.g. Minard's map
- Whether to use 2D or 3D for data visualization depends on various perceptual and technical aspects such as occlusion, clutter, distortion, or scalability upon which their advantages and disadvantages relate.

2D Model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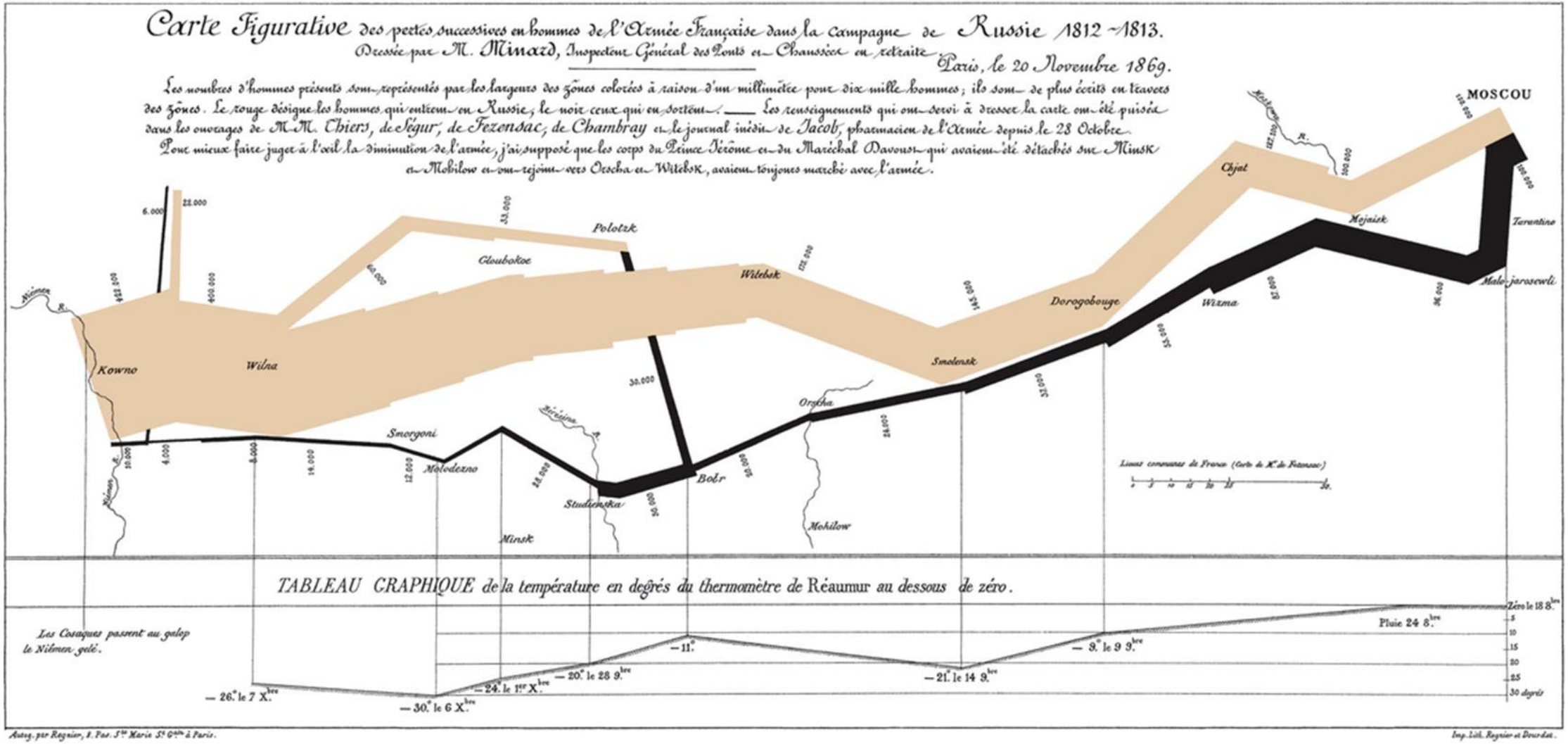
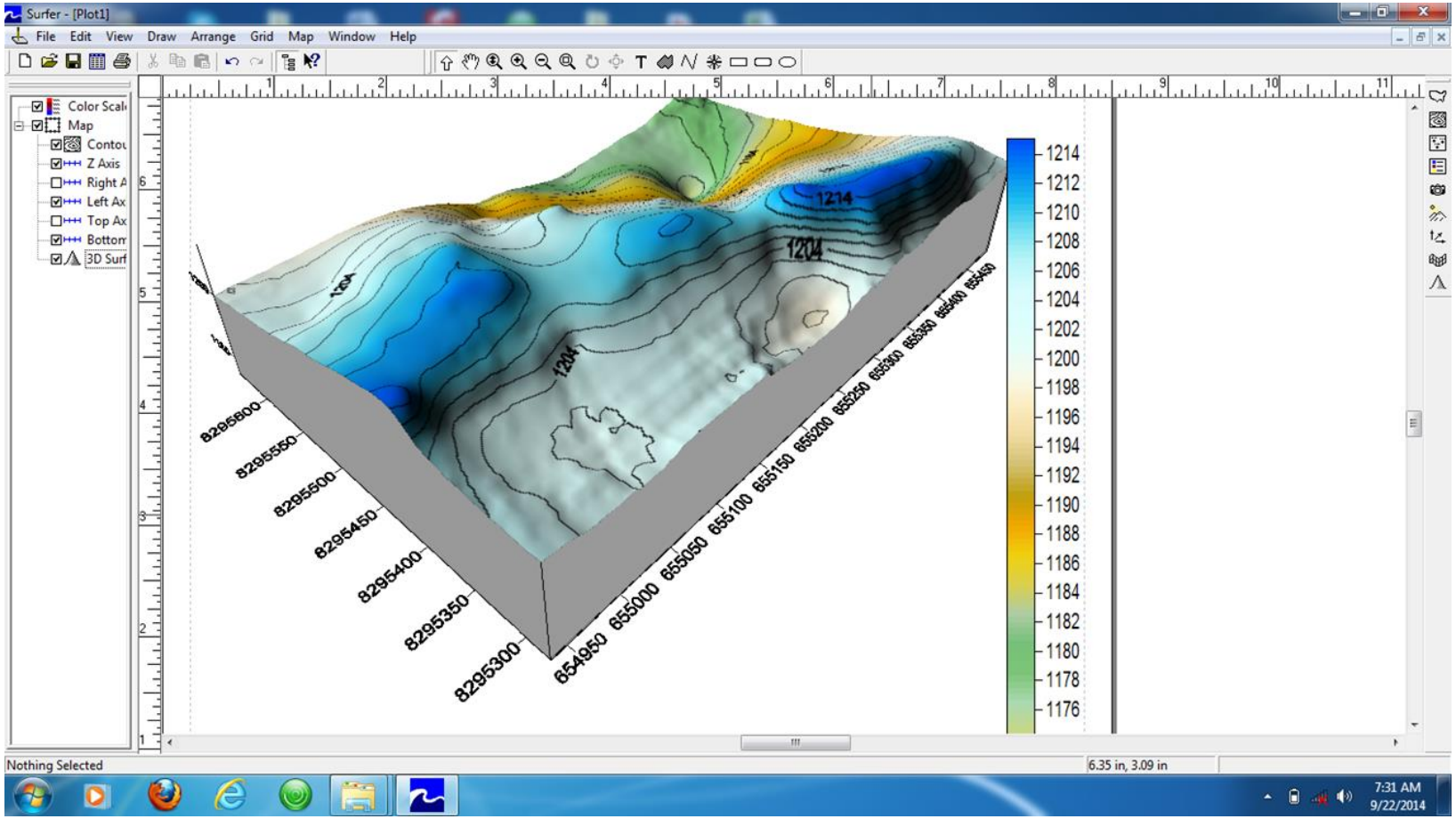
4D model: Minard's Map of 1869



3D Model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Data Visualisation

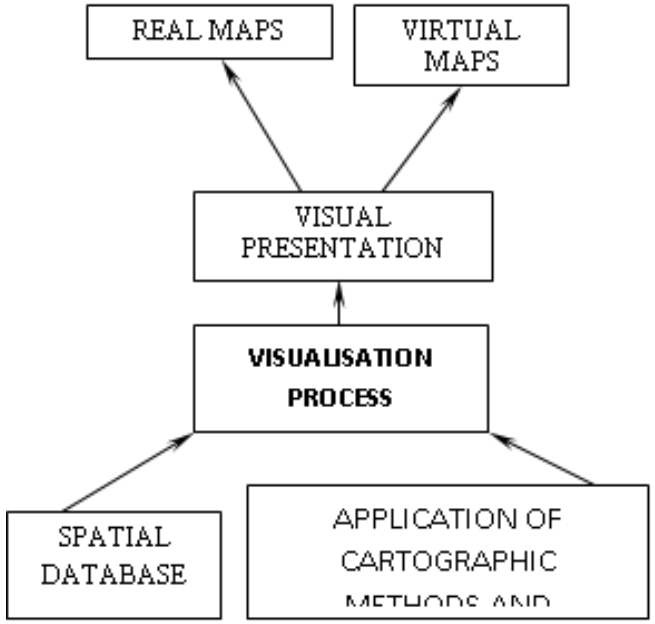
- Is some form of visual communication.
- It involves creation and study of visual representation of data.
- It uses statistical graphics, plots, information graphics and other tools where numerical data is encoded using dots, lines, or bars, to visually communicate a quantitative message.
- It helps analyze and reason about data more precisely making complex data more accessible, revealing, understandable and usable.
- Its main goal is to communicate information clearly, efficiently and effectively through graphical means (Friedman, 2008).

Cartographic Visualisation

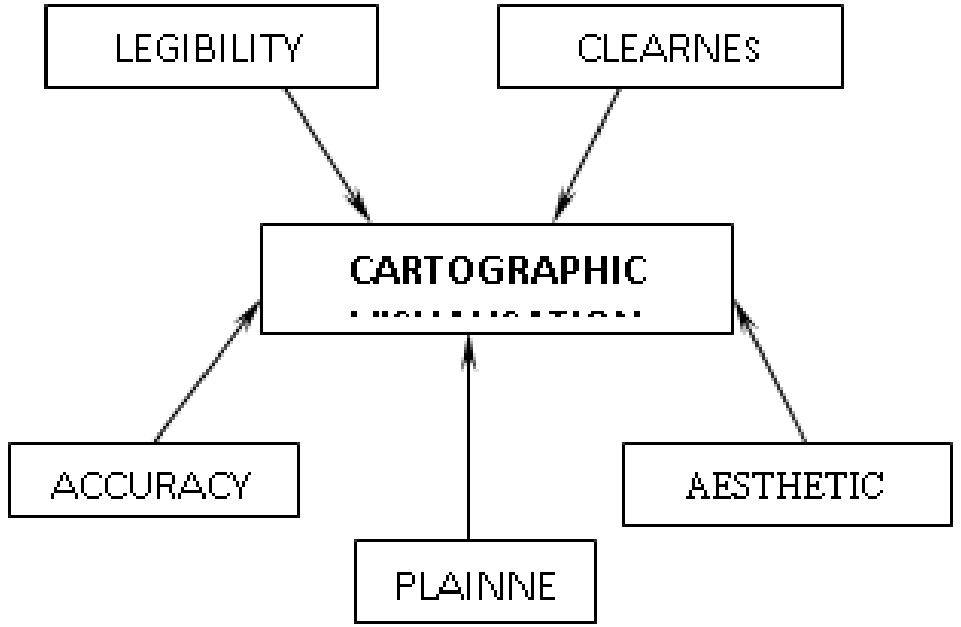
- Up until a few decades ago a map had two important functions:
  - it was a medium for storing information about space and
  - it was the image of the world or part of it that helped people to learn about the complexity of its environment.
- Spatially cartographic visualisation is considered a translation or transformation of spatial data from the database into a drawing using cartographic methods and techniques.
- Cartographic visualisation is a kind of grammar allowing optimal creation, production and usage of maps, depending on their application.

Cartographic Visualisation

Cartographic Visualisation Process



Demands on Cartographic Visualisation



Cartographic Visualisation

Cartographic Visualisation Conditions