

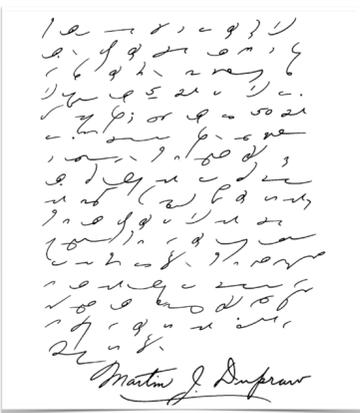
What: Data

Stenomaps: Shorthand for shapes

Arthur van Goethem, Andreas Reimer, Bettina Speckmann, and Jo Wood

Stenomaps

Analogy with Stenography



What: Derived

Area-to-line Transformation for Geometric Abstraction

Geometric Abstraction



Generalized Boundaries



Medial Axis



Stenomaps Glyph



France

Why: Task

Why Abstraction?

Free up graphical space and distinct visual variables

Direct attention to main data



Use Cases of Stenomaps

How: Encode

Cartographic Lines

Variation in Pattern and Width

Not as limited as boundary lines



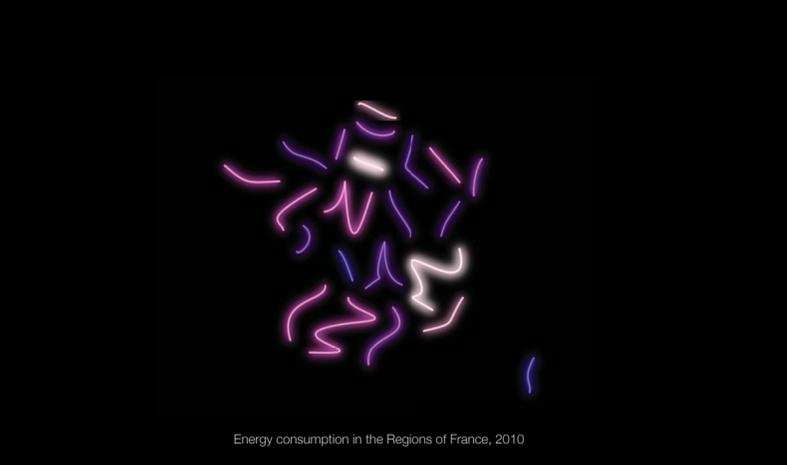
Multi-band line symbolisation



Isotype icons as line replacement



Labels as line replacement



Energy consumption in the Regions of France, 2010

Spatial Uncertainty

Selective Perception
Highlight main data by reduce geography
Illusion of Accuracy
Prevent inferences of exact location



Cross-boundary Data

Continuous Natural Phenomena
Not tied to political boundaries
Erroneous Perception
Colour interpreted as uniform within each polygon
Stenomaps: less intrusive
Maintain continuity
Give reference to location
Allow comparison between maps



Solar potential in Europe

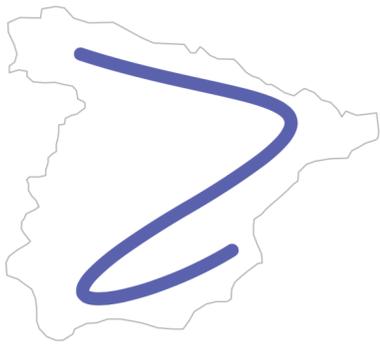
Design Choices

- C¹-continuous**
Hand-drawn appearance
- Few curves**
Low complexity
- Area vs Boundary**
A trade-off



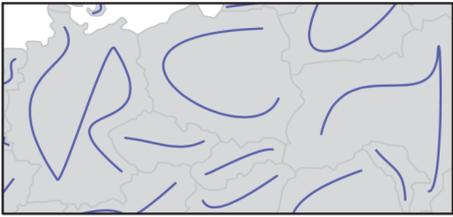
4-step Algorithm

- Find **feature points**
- Obtain **glyph region**
- Find **backbone**
- Create **glyph**



Glyph Types

- Simple**
- Locally intersecting
- Tree-based



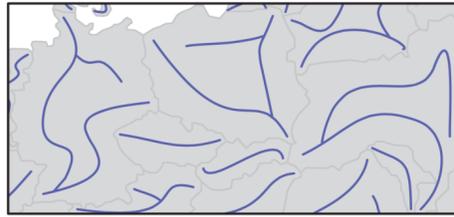
Glyph Types

- Simple
- Locally intersecting**
- Tree-based

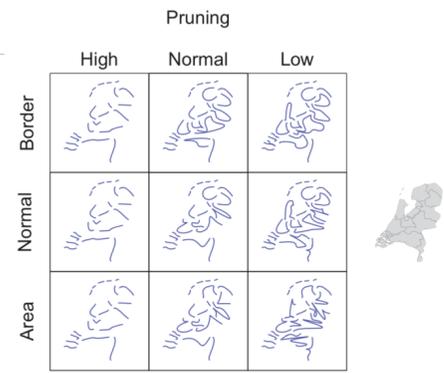


Glyph Types

- Simple
- Locally intersecting
- Tree-based**



Parameter Space



Strengths and Weaknesses



- Simple, smooth
- Efficient abstraction
- Represent both area and boundary
- Opportunities to expand the cartographic design space
- Recognizability
- Users must be familiar with the original geography
- Inconsistency in the large parameter space
- No user study

Constraint: Only intended for tasks where exact boundaries are not needed

Scalability

- If a map with borders looks reasonable, its **second-level boundaries** can likely be transformed with stenomaps.
- Map of a continent: one stenomap for each country.
- Map of a country: one stenomap for each province/state/region.
- Generally, it is equivalent to **up to 100 stenomaps** per map.
- Algorithm can adapt to produce the desired level of details in stenomaps.

Summary

System	Stenomaps
What: Data	Geometry: 2D borders in maps
What: Derived	Area to line transformation, which converts a border to a line that represents both the boundary and the area features.
Why: Task	Present and enjoy the maps with less intrusive borders and without inferences of exact location.
How: Encode	Geotagged data can be encoded into the line as its width or colour, or the data can replace the line by icons or text.
How: Reduce	Dimensionality reduction (area to line).
Scale	100 stenomaps per map (generally equivalent to second-level boundaries).

Questions?

Thank you.