

# The State-of-the-Art in Map-like Visualization

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**ETH** zürich

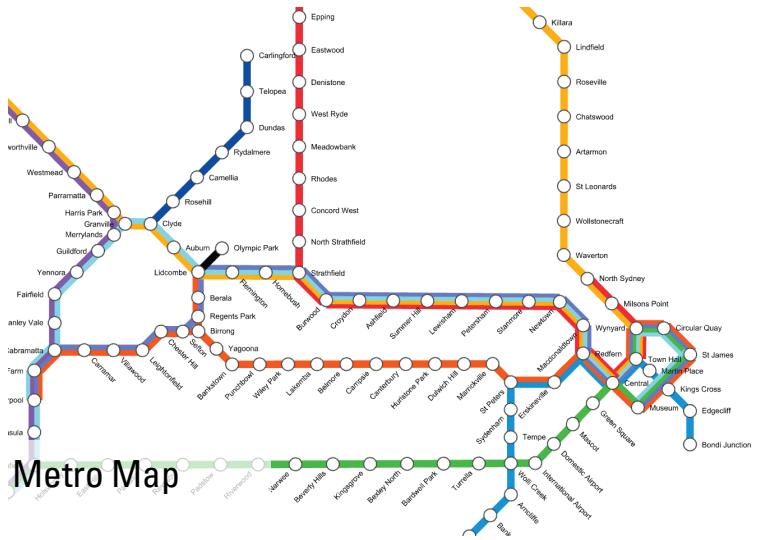
# What is map-like visualization?



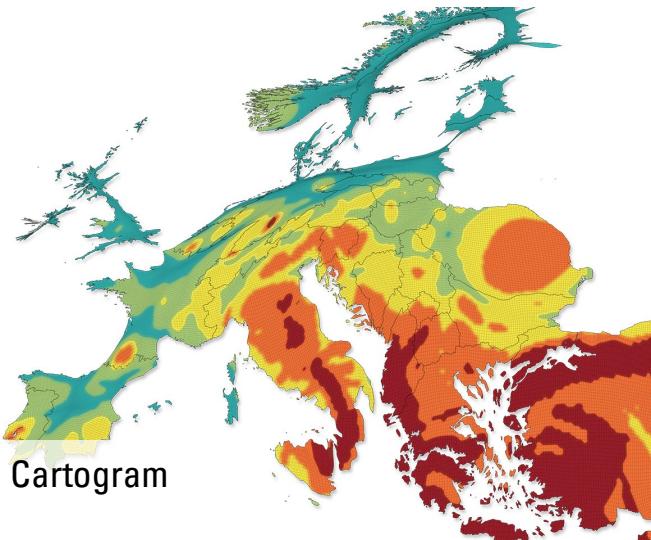
# What are maps?



Satellite image



Metro Map



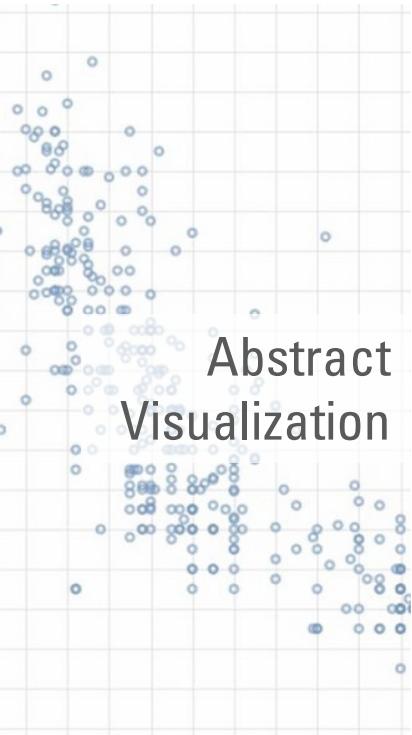
Cartogram

# Contributions

- **Definition** of the term map-like visualization
- **Classification** of map-like visualization techniques
- **Literature Overview** of existing map-like techniques

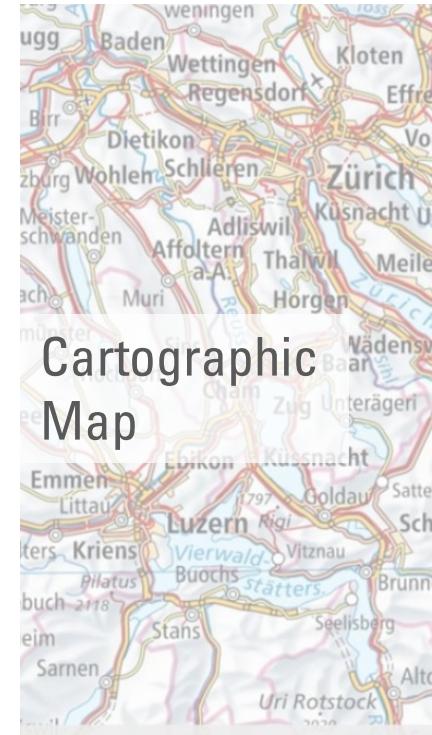
# Defining Map-like Visualization

# What is ...



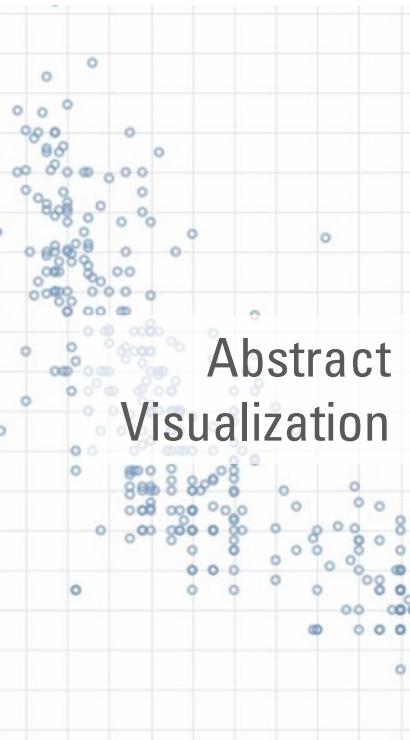
Abstract  
Visualization

Map-like  
Visualization



Cartographic  
Map

# Perspectives



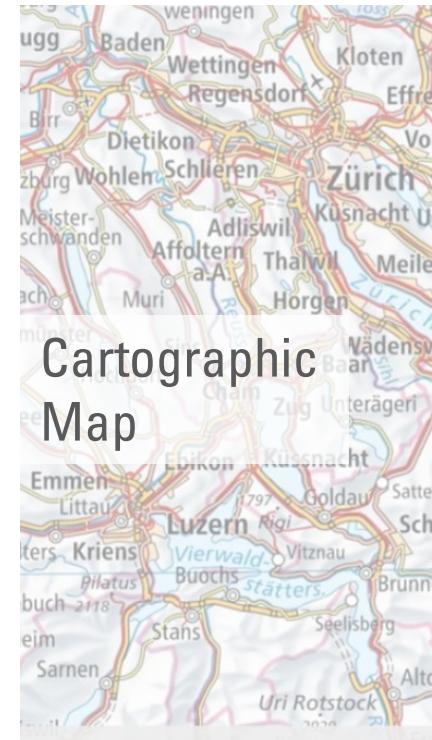
Abstract  
Visualization

Imitation



Map-like  
Visualization

Schematization



Cartographic  
Map

# Definition

A visualization is map-like, if it either **imitates** or **schematizes** a cartographic map

# Classifying Map-like Visualization

# Map Elements

Point



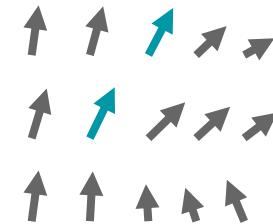
Line



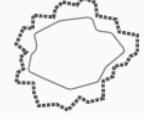
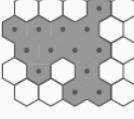
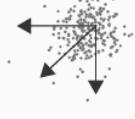
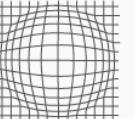
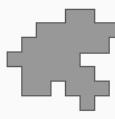
Area



Field



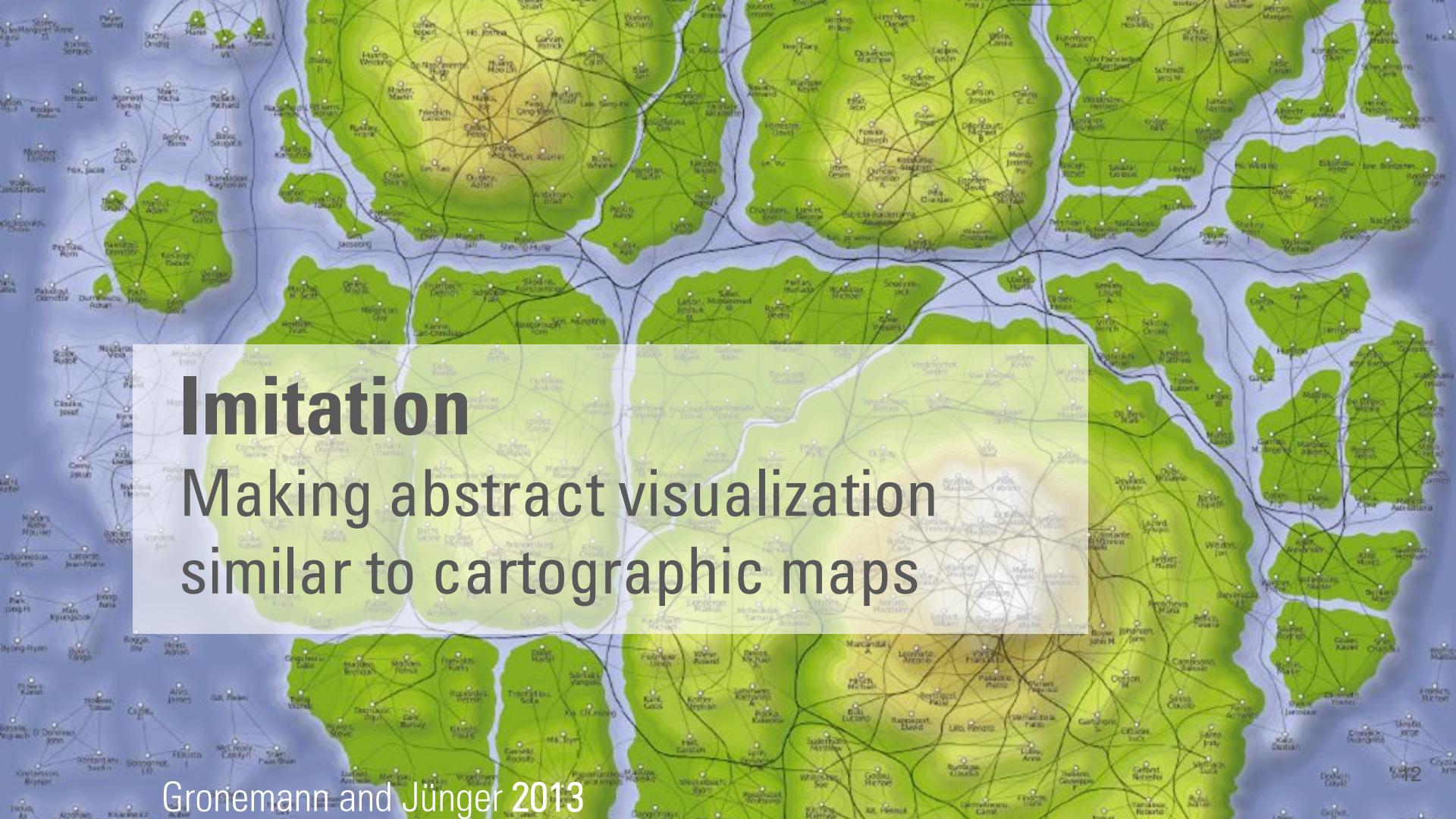
## Map-like Visualization

| Perspective | Imitation   |   |  |   | Schematization  |  |  |  |
|-------------|---|---|--|---|---|--|--|--|
| Category    | Point   | Line  | Area   | Field   | Point   | Line   | Area   | Field  |
| Technique   | Importance labeling<br><br>Map Icons | Outline-centered<br> | Grid-based<br>  | Coloring<br>   | Reposition Data Points<br> | Border-centered<br> | Shape Deforming<br> | Stretching<br>    |
|             |   | Edge-centered<br>    | Geometric Tessellation<br><br> | Contouring<br> | Reposition Nodes<br>       | Path-centered<br>   | Graphical<br>       | Density-based<br> |
|             |   |   |  |   |   |  | Cellular<br>        |  |

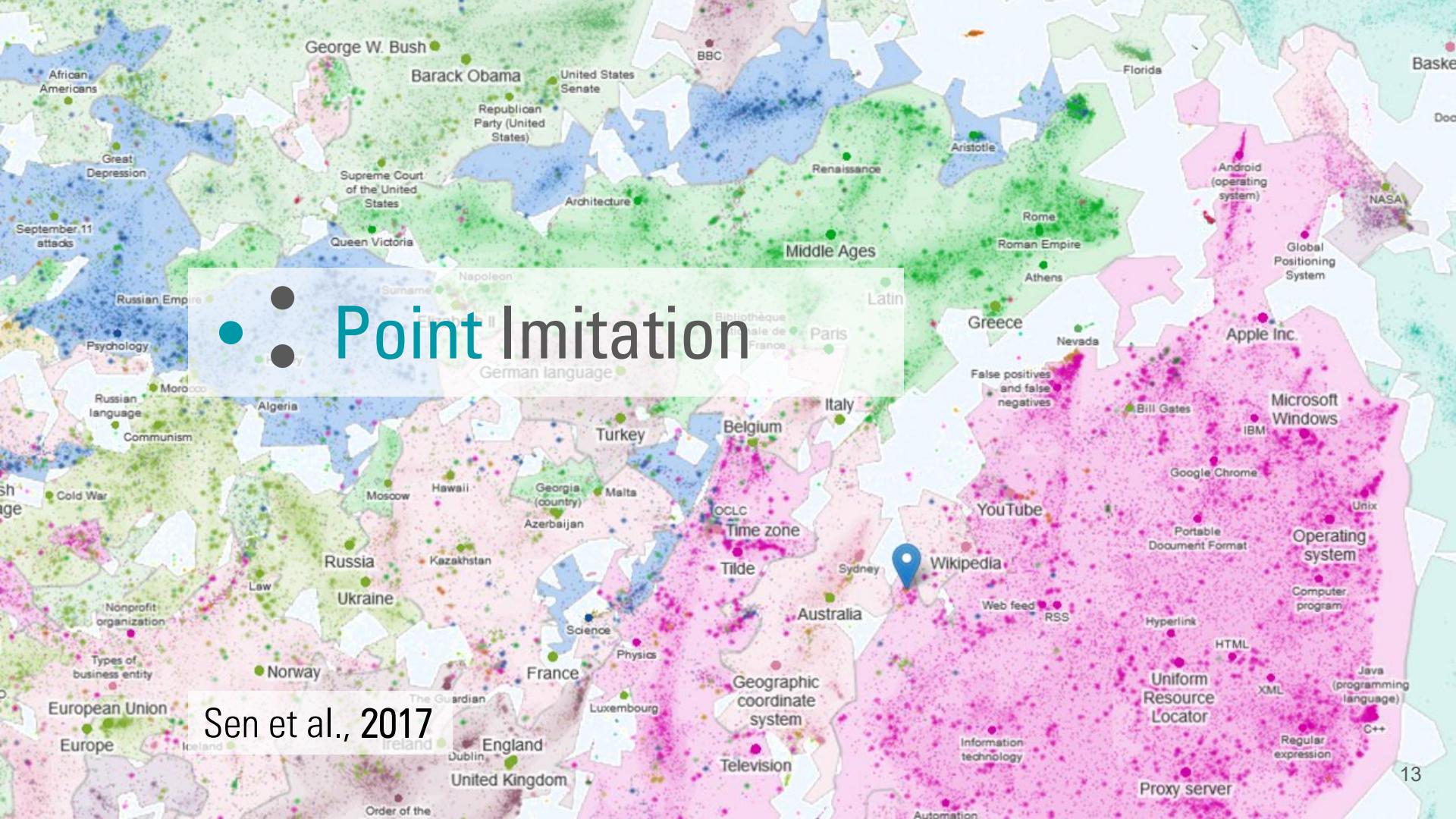
# Perspectives $\times$ Categories

# Imitation

## Making abstract visualization similar to cartographic maps



Gronemann and Jünger 2013

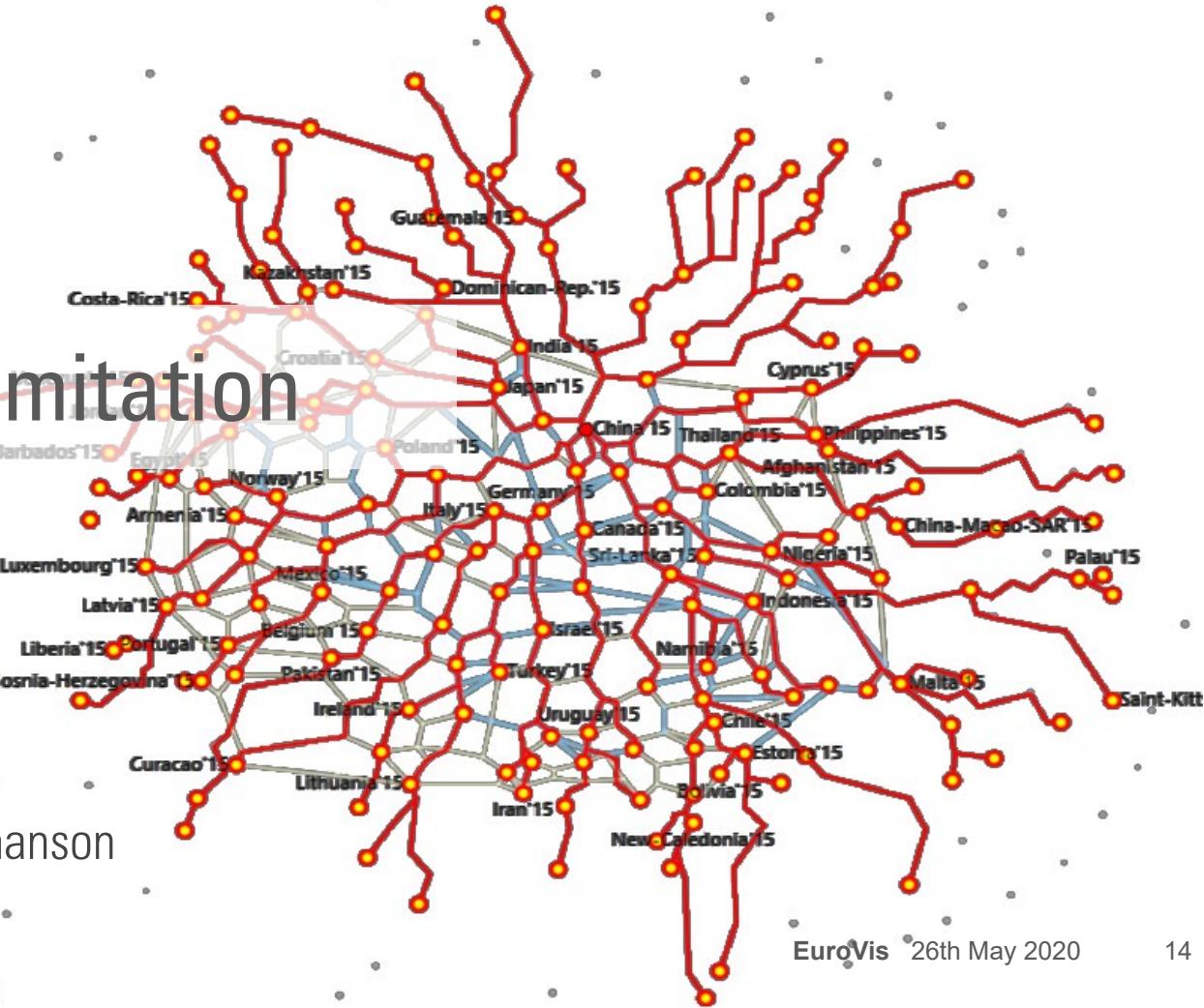


# Point Imitation

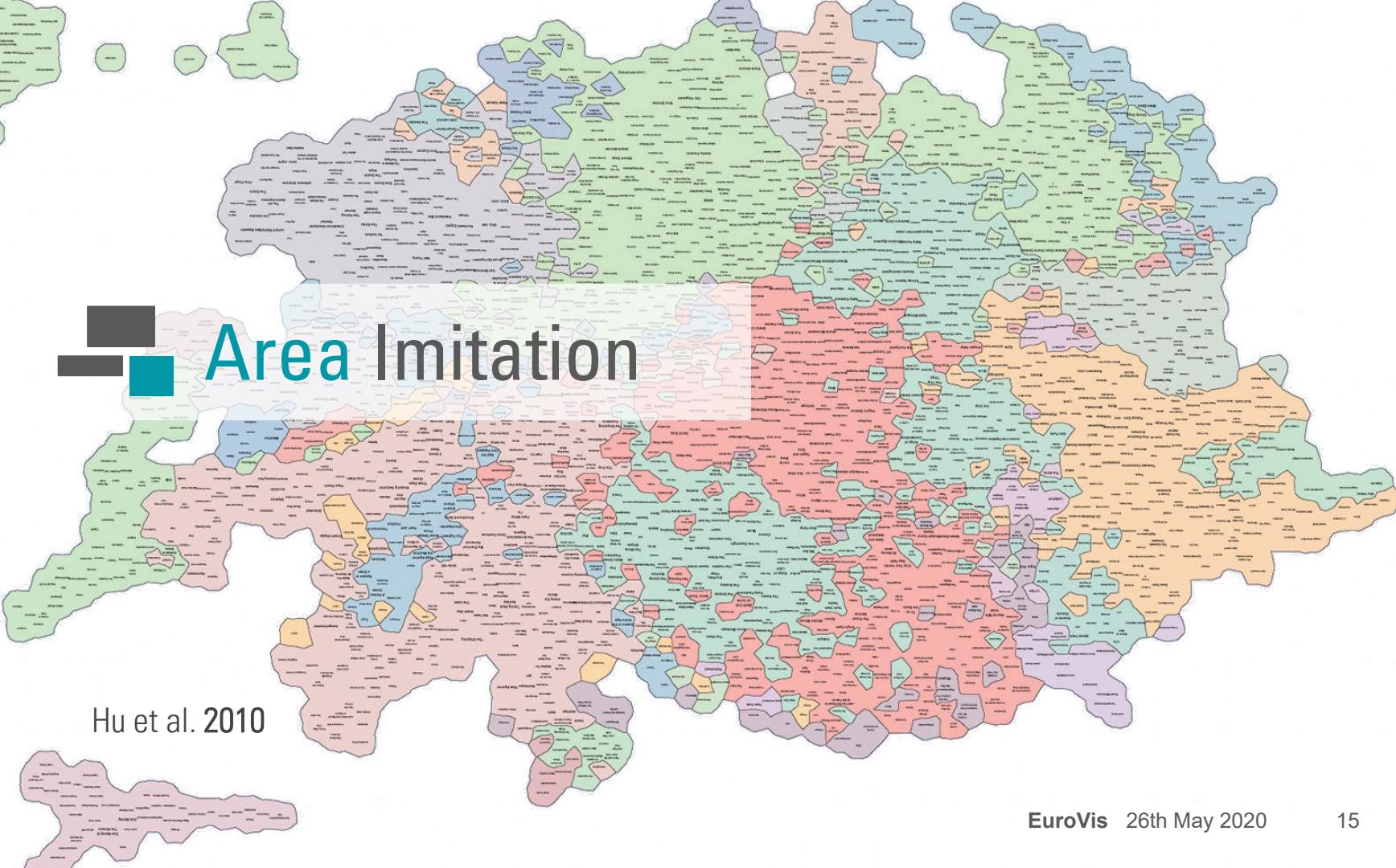
Sen et al., 2017



# Line Imitation



Mondal and Nachmanson  
2018





## Map-like Visualization

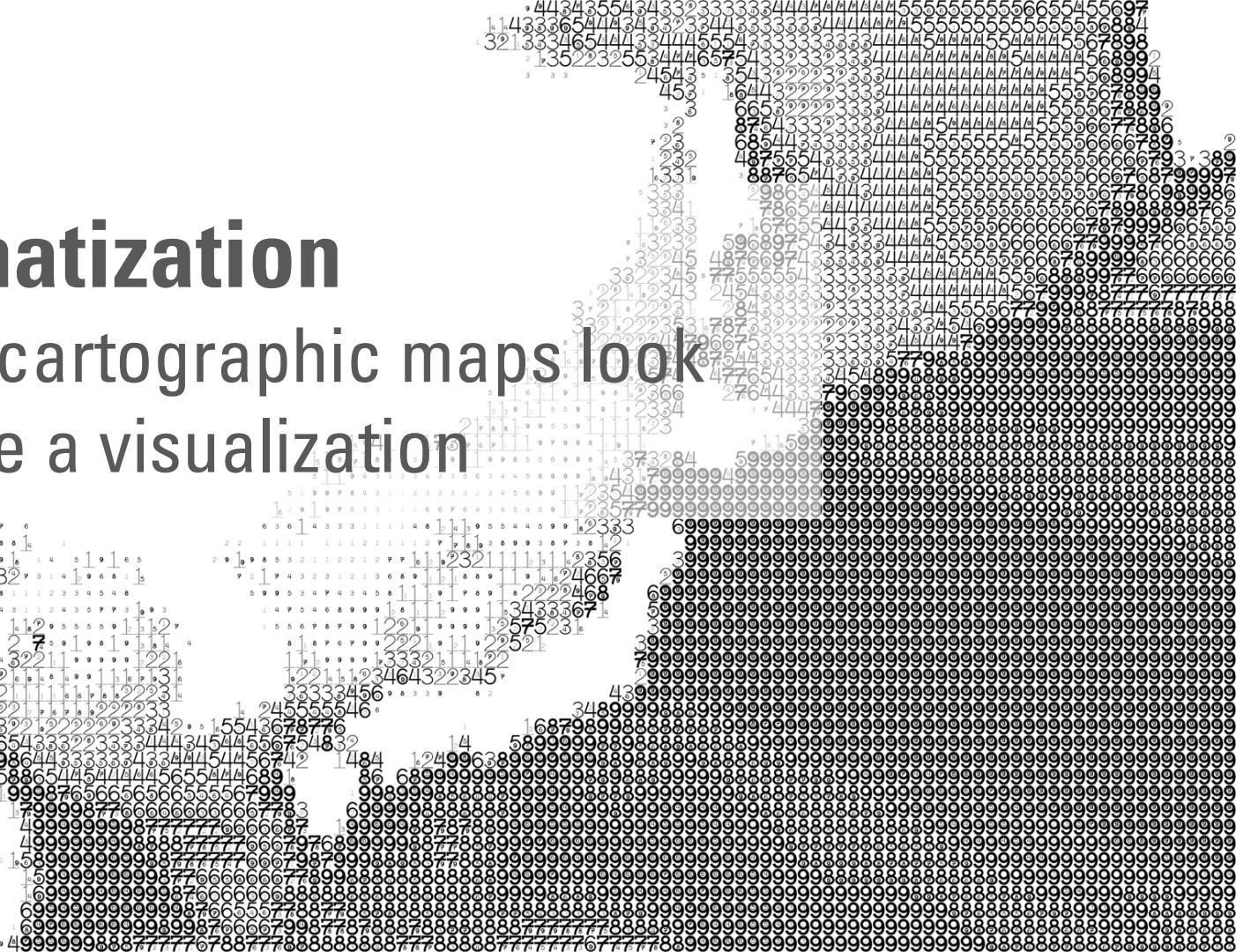
|             |                     | Imitation        |                        |            |                        | Schematization  |                 |               |       |
|-------------|---------------------|------------------|------------------------|------------|------------------------|-----------------|-----------------|---------------|-------|
| Perspective |                     | Point            | Line                   | Area       | Field                  | Point           | Line            | Area          | Field |
| Category    |                     |                  |                        |            |                        |                 |                 |               |       |
| Technique   | Importance labeling | Outline-centered | Grid-based             | Coloring   | Reposition Data Points | Border-centered | Shape Deforming | Stretching    |       |
|             |                     |                  |                        |            |                        |                 |                 |               |       |
|             | Map Icons           | Edge-centered    | Geometric Tessellation | Contouring | Reposition Nodes       | Path-centered   | Graphical       | Density-based |       |
|             |                     |                  |                        |            |                        |                 |                 |               |       |

# Literature Overview

# Schematization

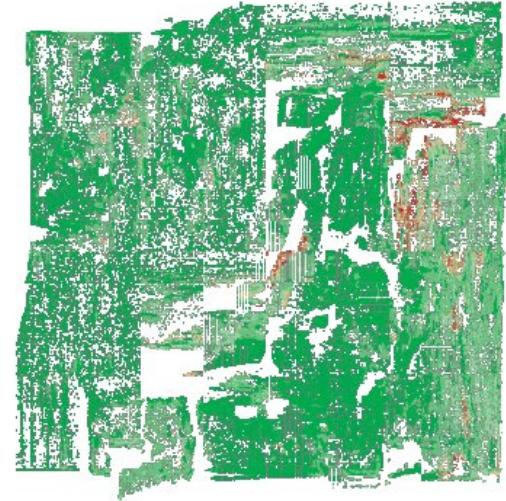
## Making cartographic maps look more like a visualization

Nacenta et al.  
2017

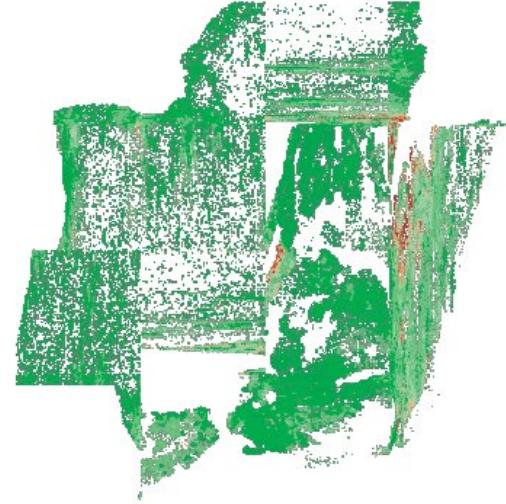
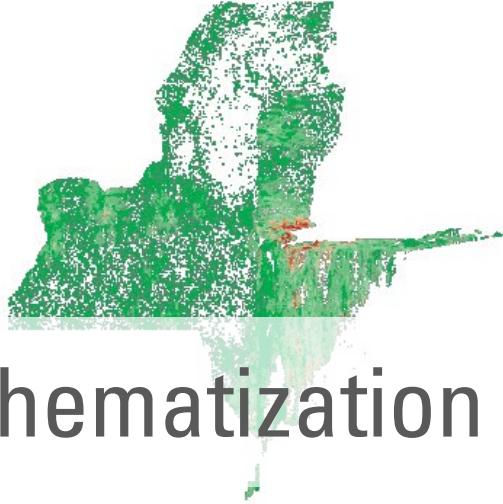
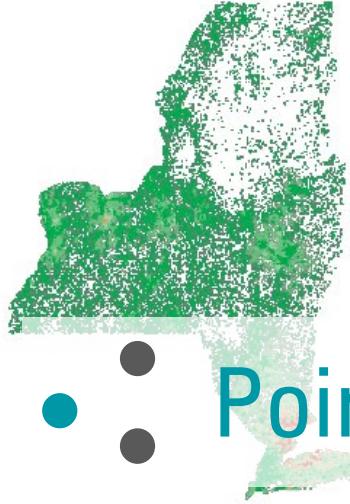




## Point Schematization



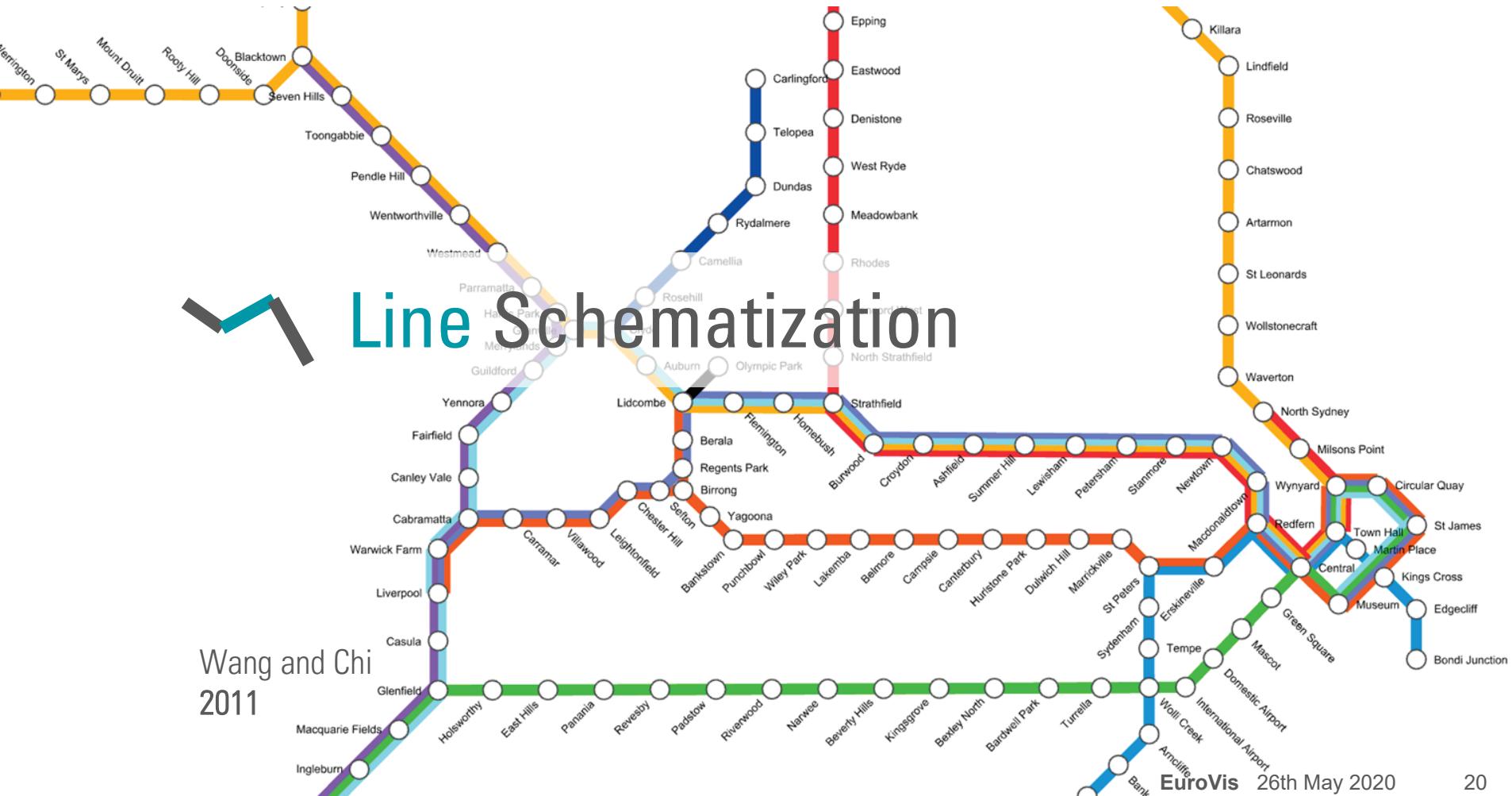
Keim et al.  
2003

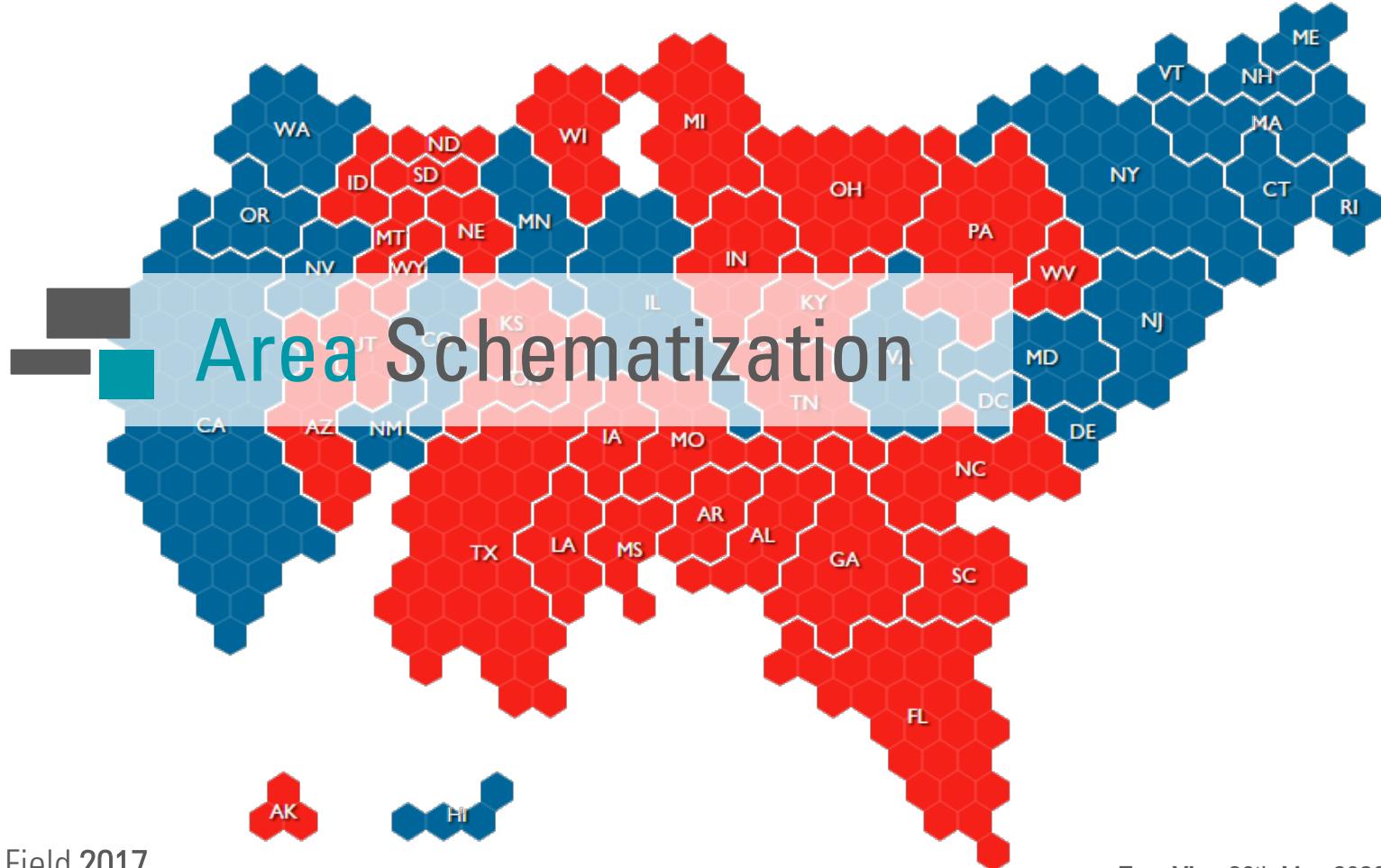


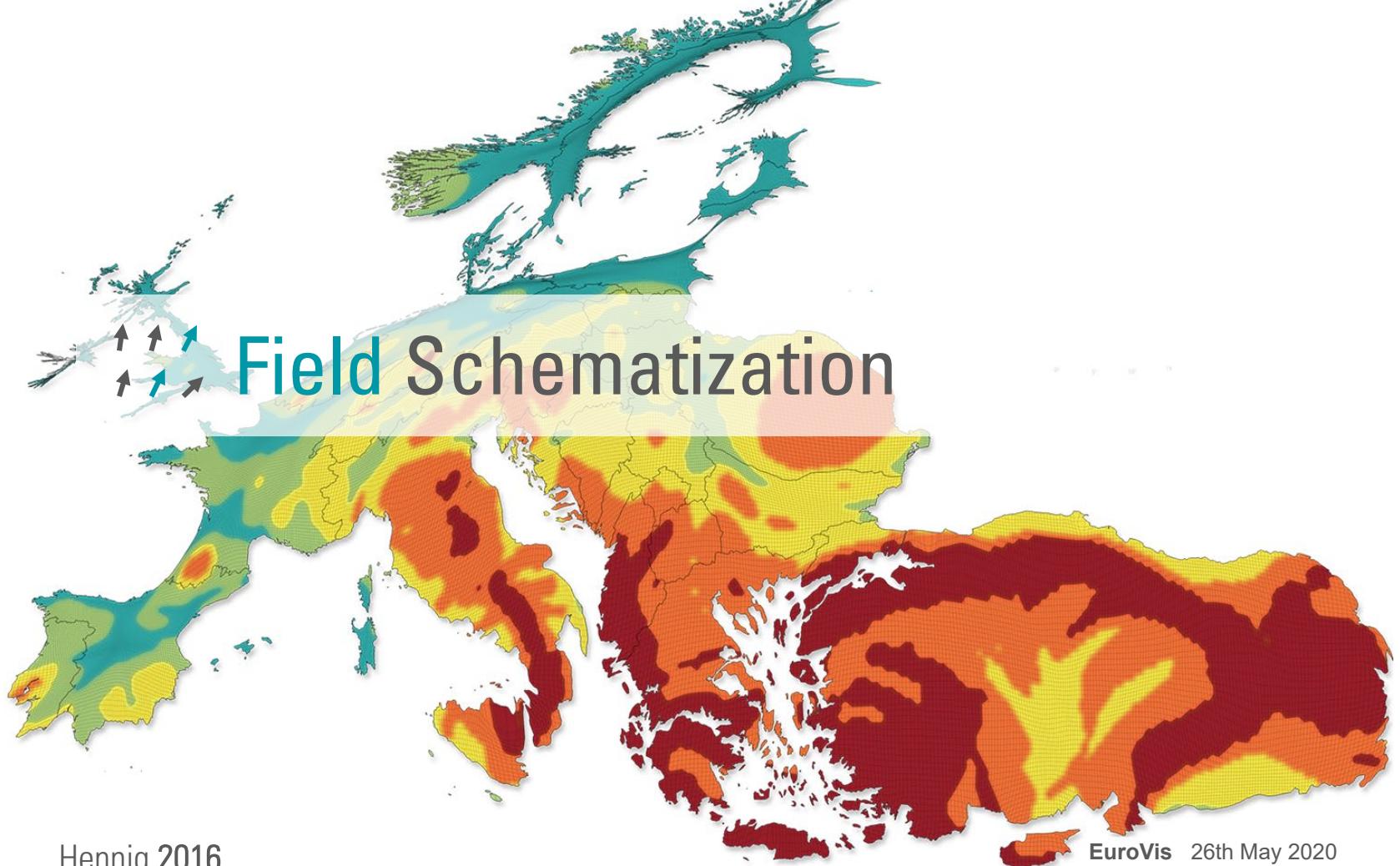
Wang and Chi  
2011



# Line Schematization

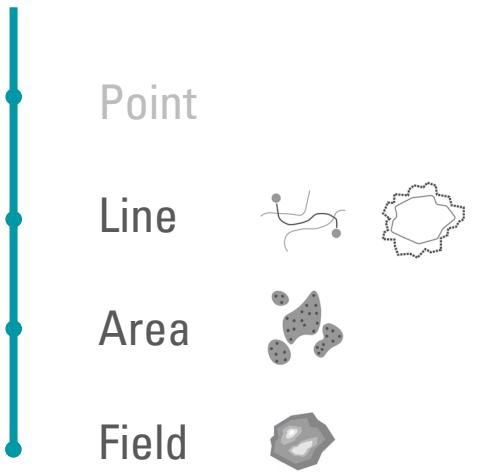






# Applying Map-like Visualization

# Imitation



# Schematization



# Imitation

Point

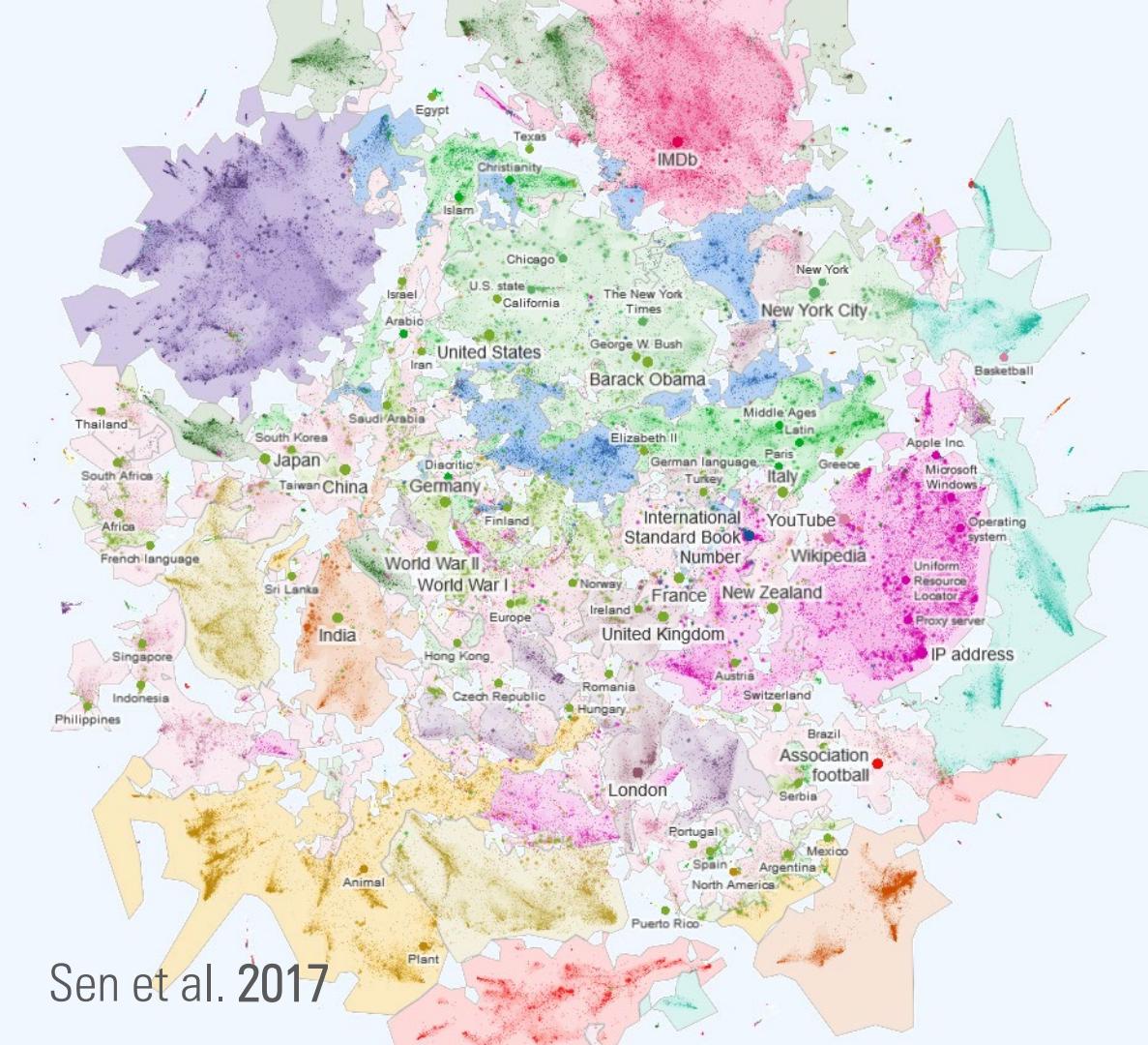
Line

Area

Field



Schematization



# Using Map-like Visualization

Identify Location

Retrieve Value

Assess Distance

Trace Path

# Identify Location



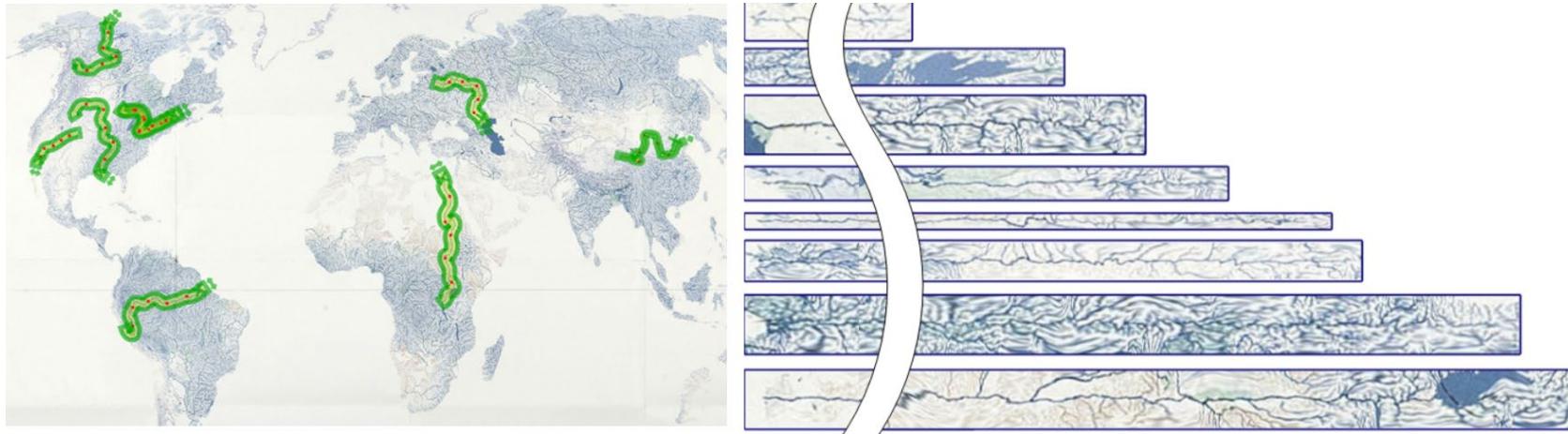
Sen et al. 2017

# Retrieve Value



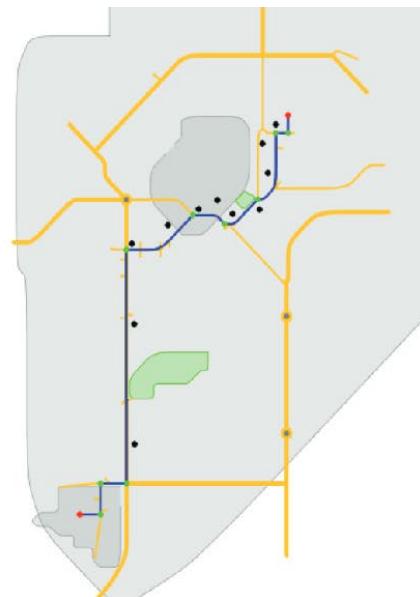
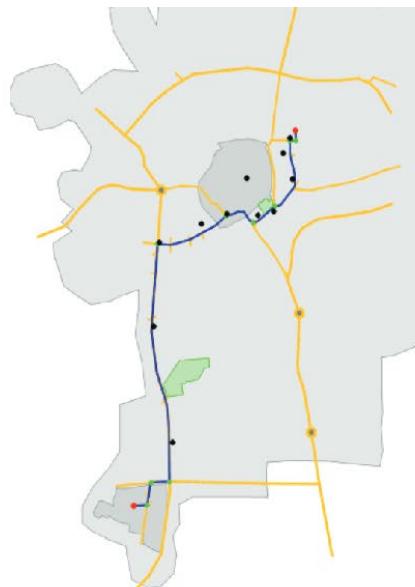
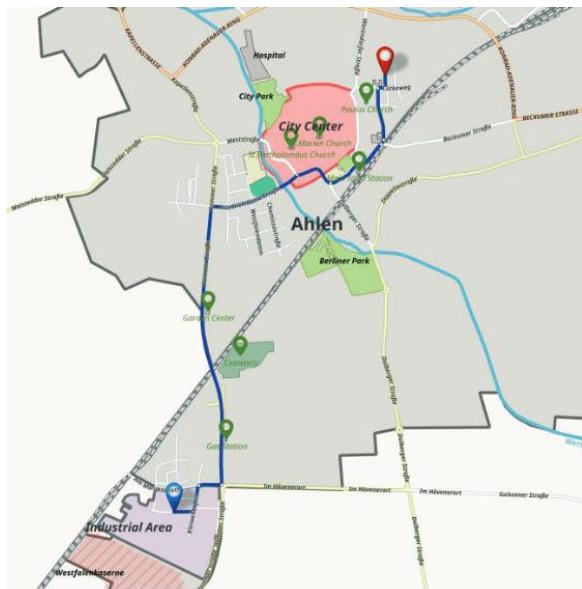
BigKnowledge 2020

# Assess Distance



Brosz et al. 2013

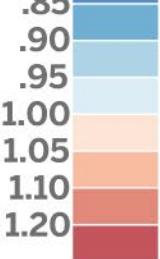
# Trace Path



Schwering et al. 2019

# Expanding Map-like Visualization

# Beyond Geospatial Data



**UNDER 0.85**

**0.85 - 0.90**

**UNDER 0.85**

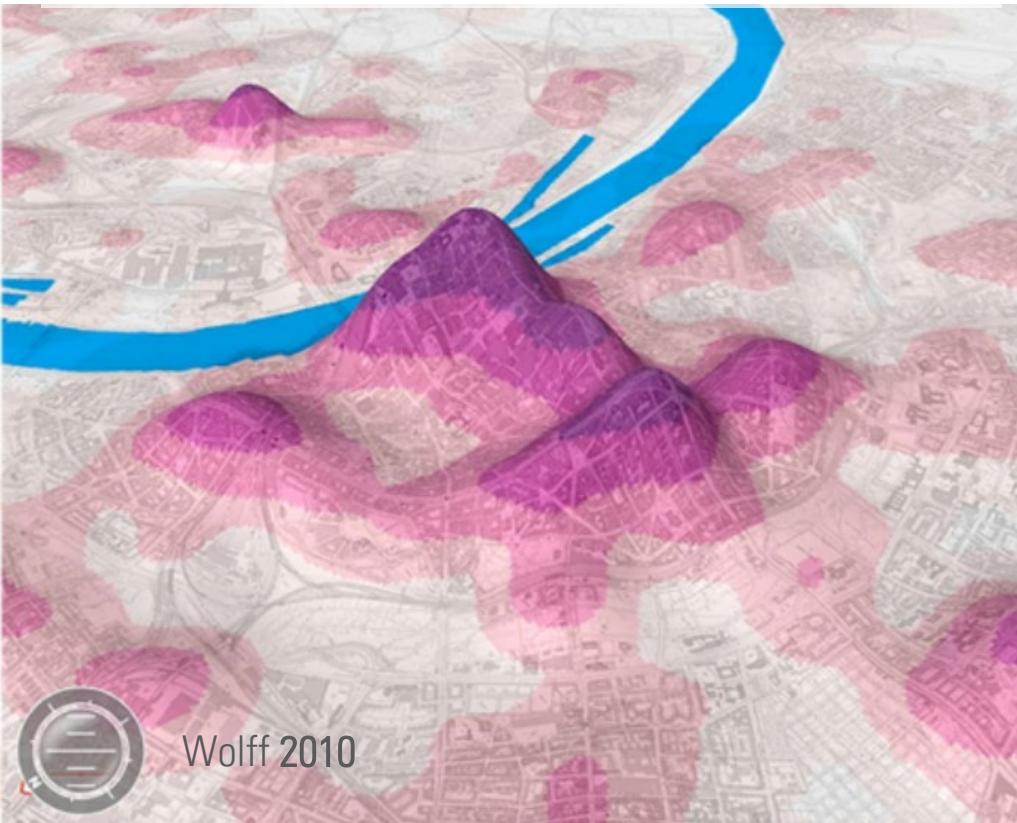
**1.2+**

**1.1 - 1.2**

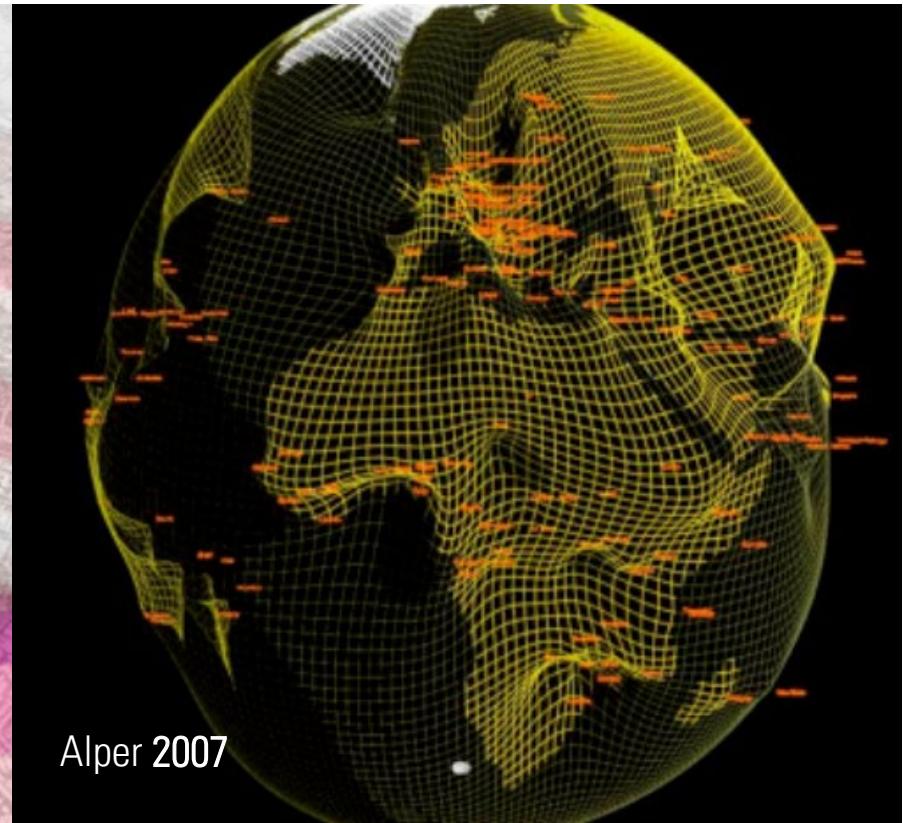
Goldsberry 2010

**1.1 - 1.2**

# Beyond Maps



Wolff 2010



Alper 2007

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