

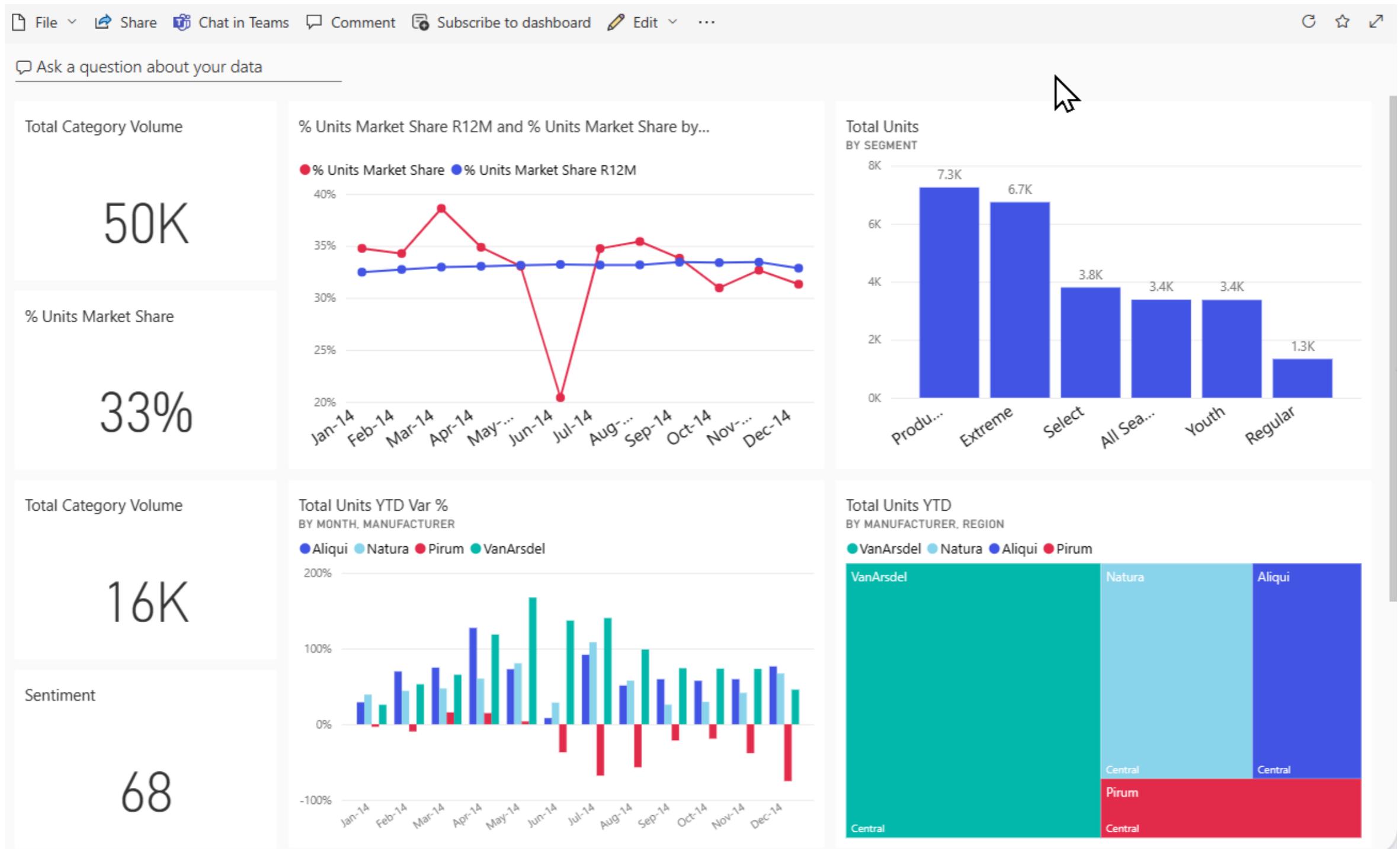
Facet into Multiple Views & Interaction

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University of Vienna

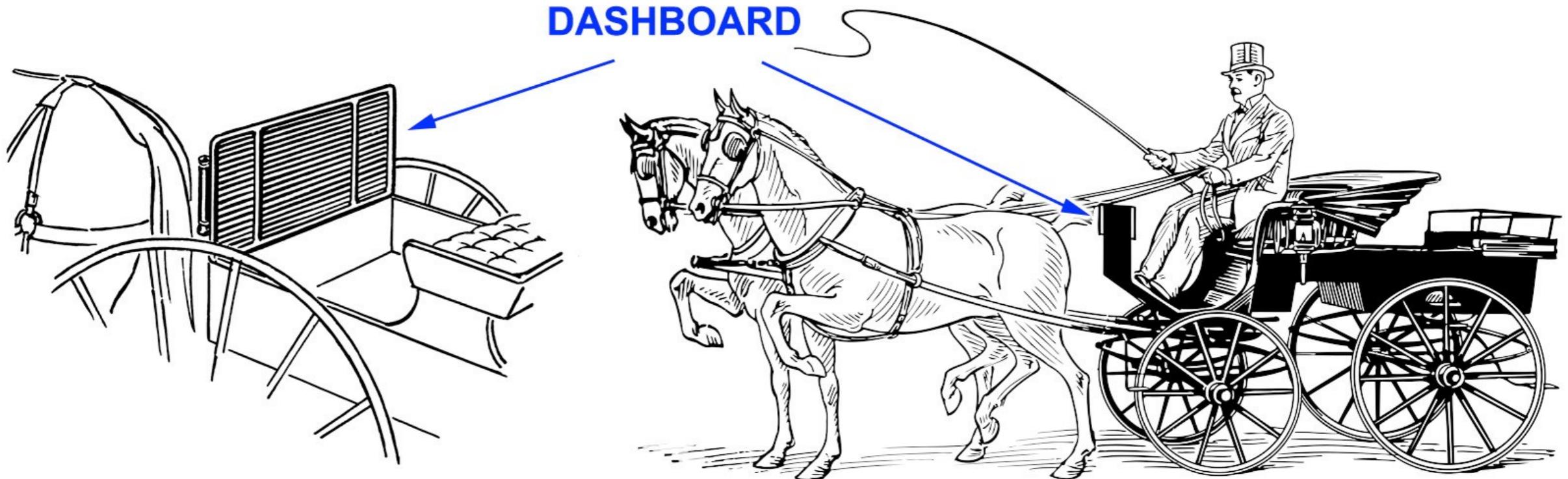
Slides: Torsten Möller, Asil Çetin-Aufricht

Agenda

1. What is Faceting?
2. Juxtapose and Coordinate Views
 - 2.1. Linked Highlighting
 - 2.2. Overview-Detail
 - 2.3. Combinations
3. Partitions & Groups
4. Superimpose Layers



Dashboard: a graphical user interface that displays and monitors key data and metrics, commonly used in information visualization and business analytics.



<https://www.linkedin.com/pulse/history-dashboard-joe-kilrain/>



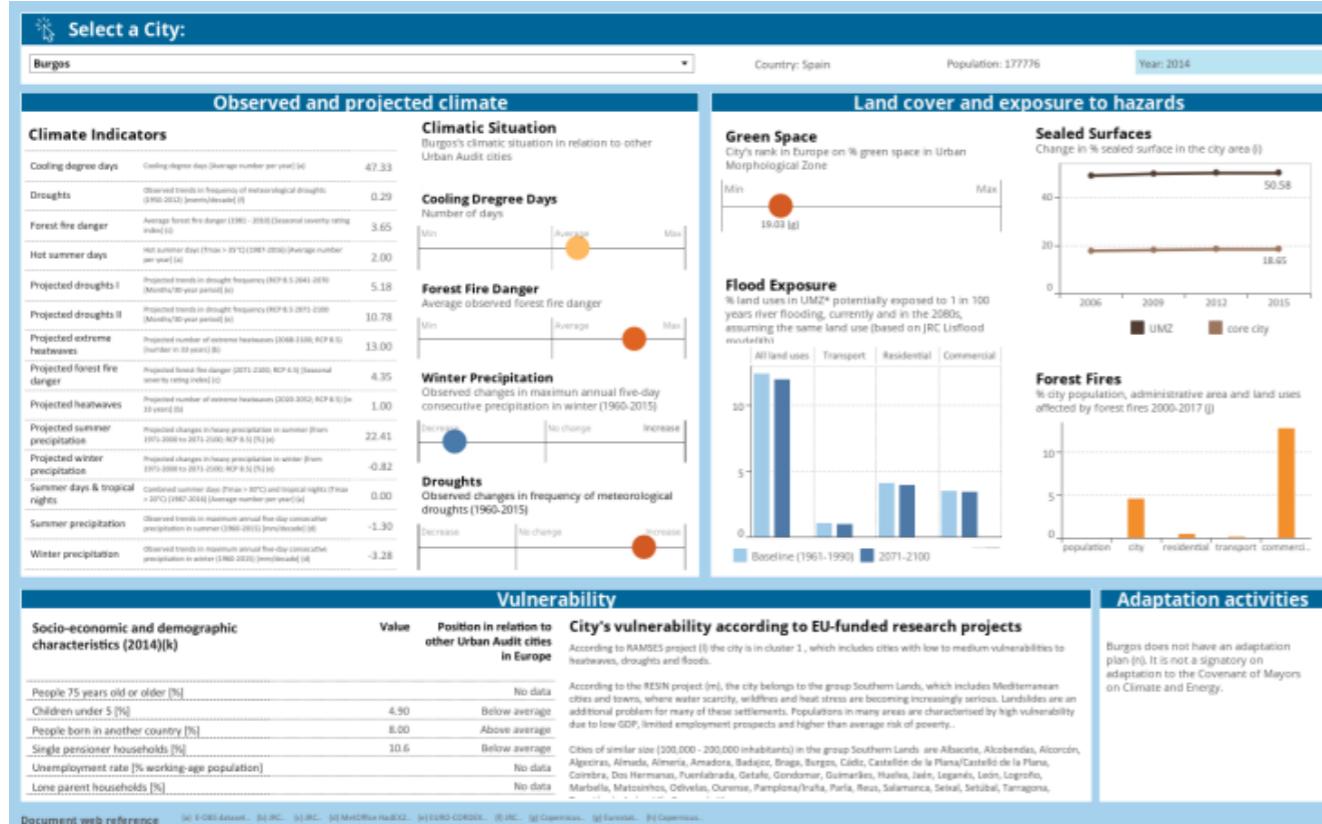
https://en.wikipedia.org/wiki/Dashboard#/media/File:Bentley_Continental_GTC_011.JPG



https://upload.wikimedia.org/wikipedia/commons/0/00/S-Klasse_S63_AMG_%28211211022494%29.jpg



<https://upload.wikimedia.org/wikipedia/commons/6/66/JRE-E531-cab.jpg>



<https://www.tableau.com/dashboard-examples>



<https://learn.microsoft.com/de-de/power-bi/create-reports/service-dashboards>

1. What is Faceting?

- to facet (verb): to split
- one of the five major approaches to handling visual complexity. They are:
 - **juxtaposing coordinated views side by side**
 - deriving new data and including it in the view
 - changing single view over time
 - reducing amount of data shown in a view
 - embedding focus and context within the same view

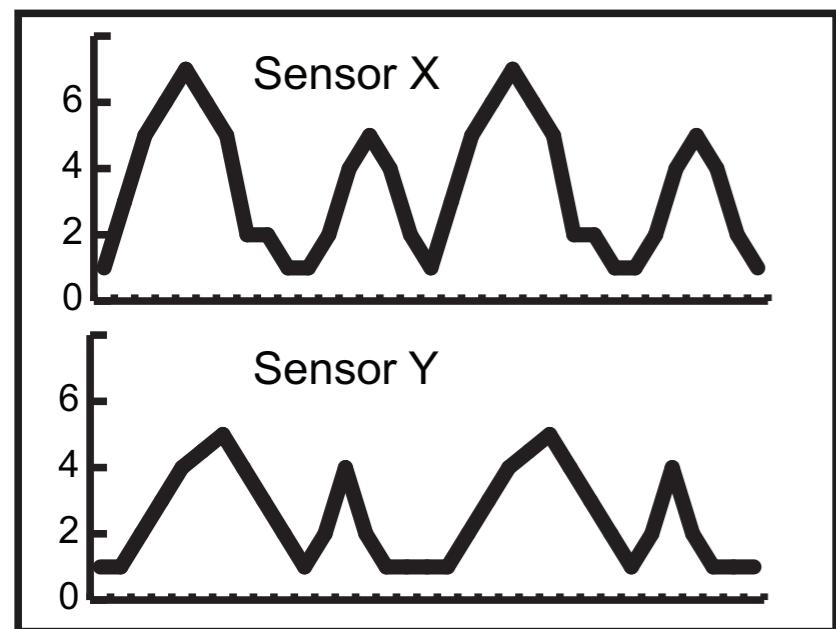
Combining views

- often information too complex for a single view
- show multiple views side by side
- **Eyes Over Memory:** two simultaneous views have lower cognitive load than remembering previous view
- real-estate trade-off: popup view vs. static side-by-side
- OR - single view that is changed through interaction (filtering, aggregation, navigation)

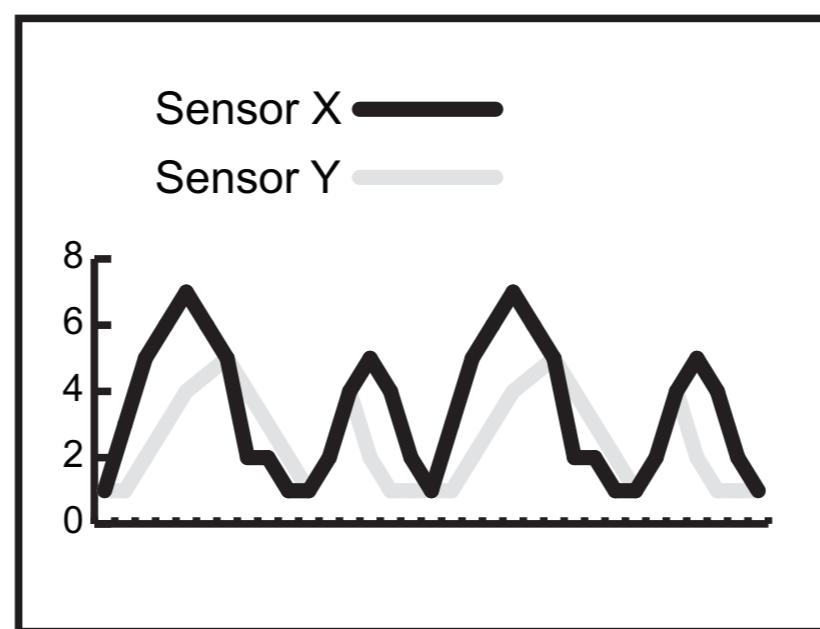
2. Juxtapose and Coordinate Views

- juxtapose: place or deal with close together for contrasting effect
- Linked views, multiple views, coordinated views, coordinated multiple views, and coupled views: synonyms for the same fundamental idea

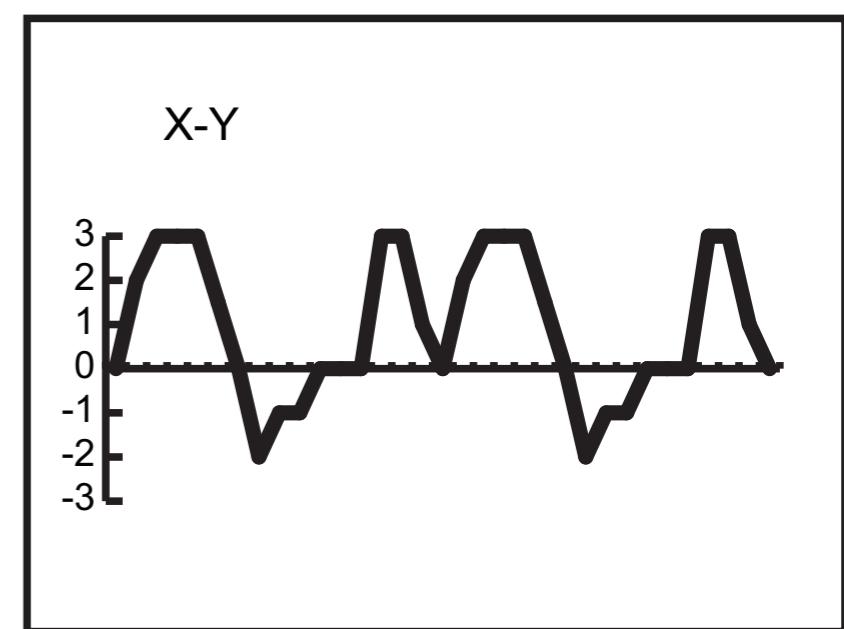
How to show multiple views



a) Juxtaposition



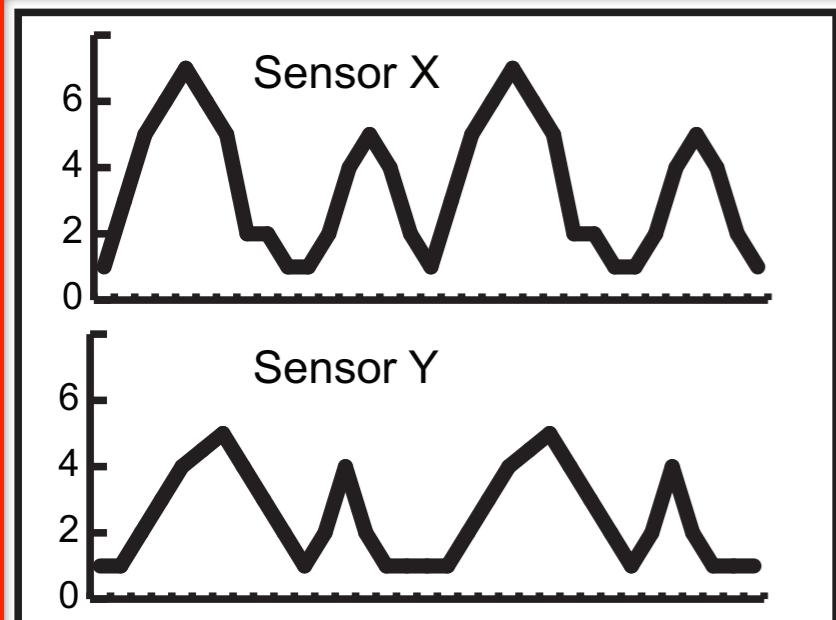
b) Superposition



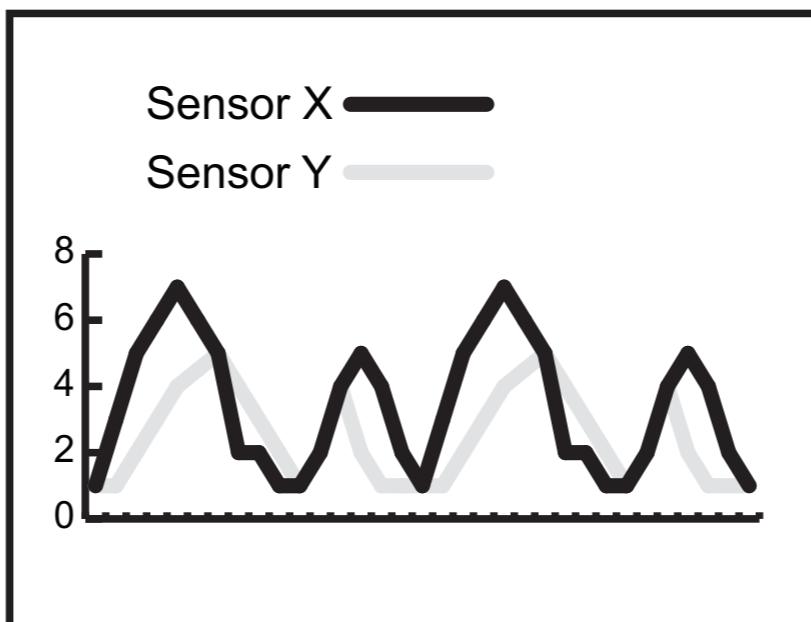
c) Explicit Encoding:
Difference

Visual Comparison for Information Visualization , Gleicher et al. 2011

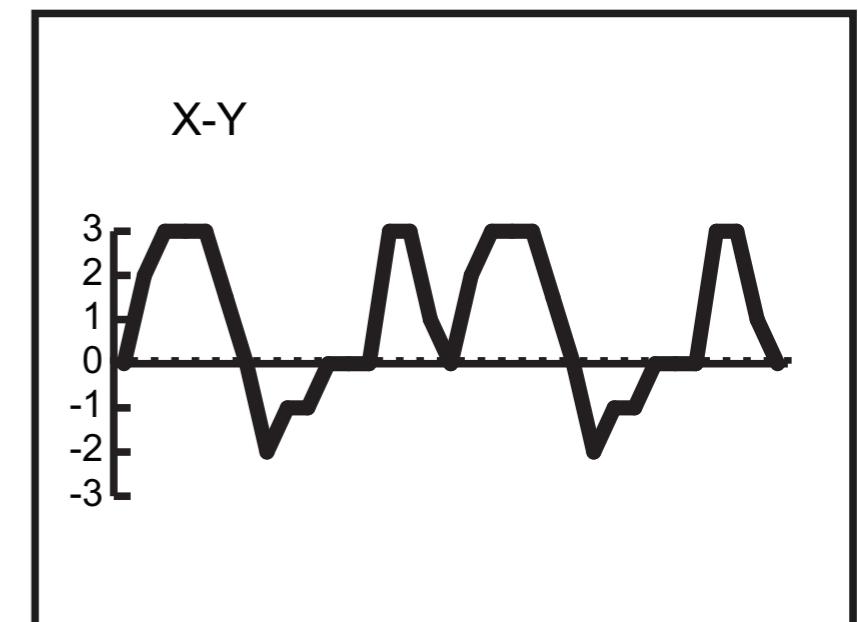
Partitioning



a) Juxtaposition

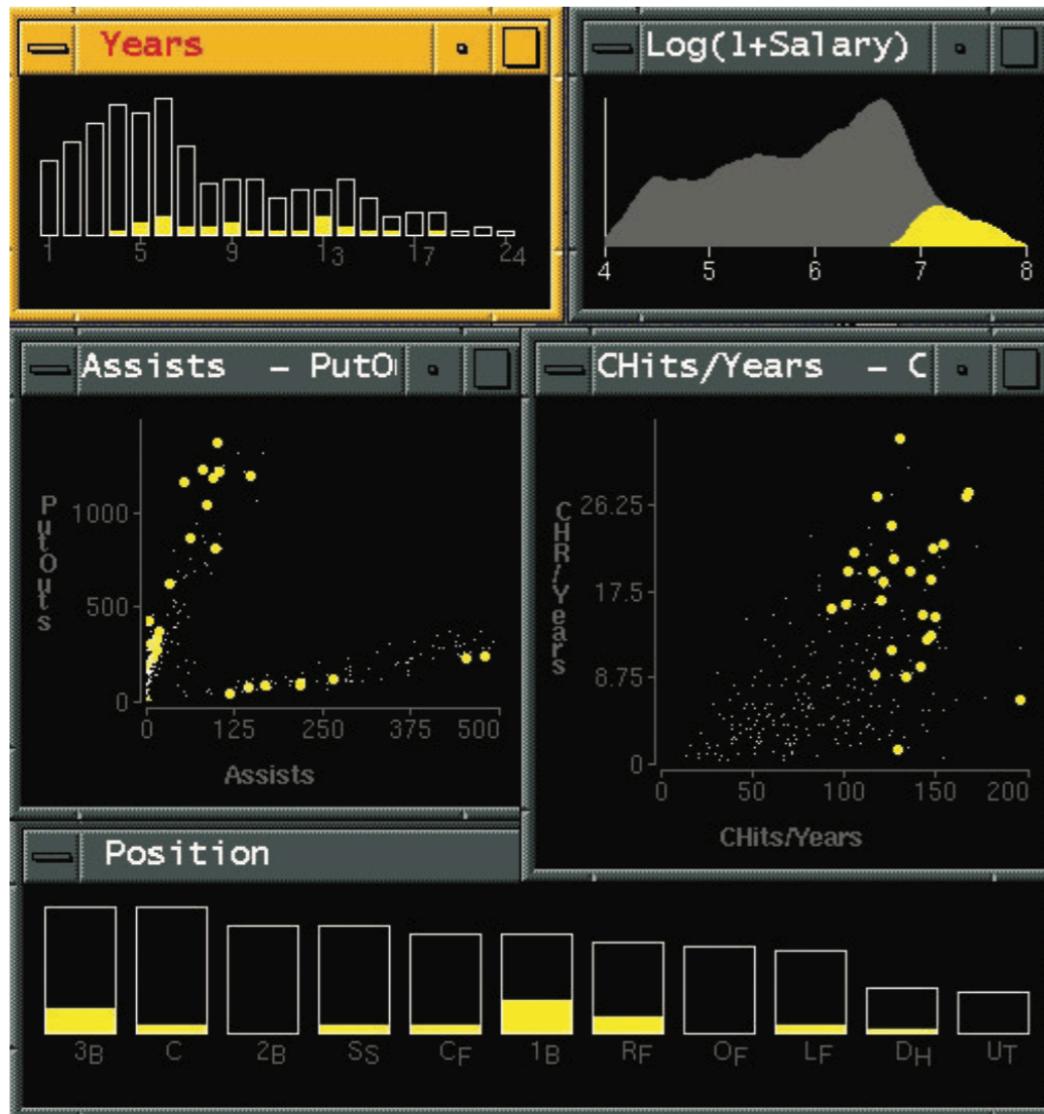


b) Superposition

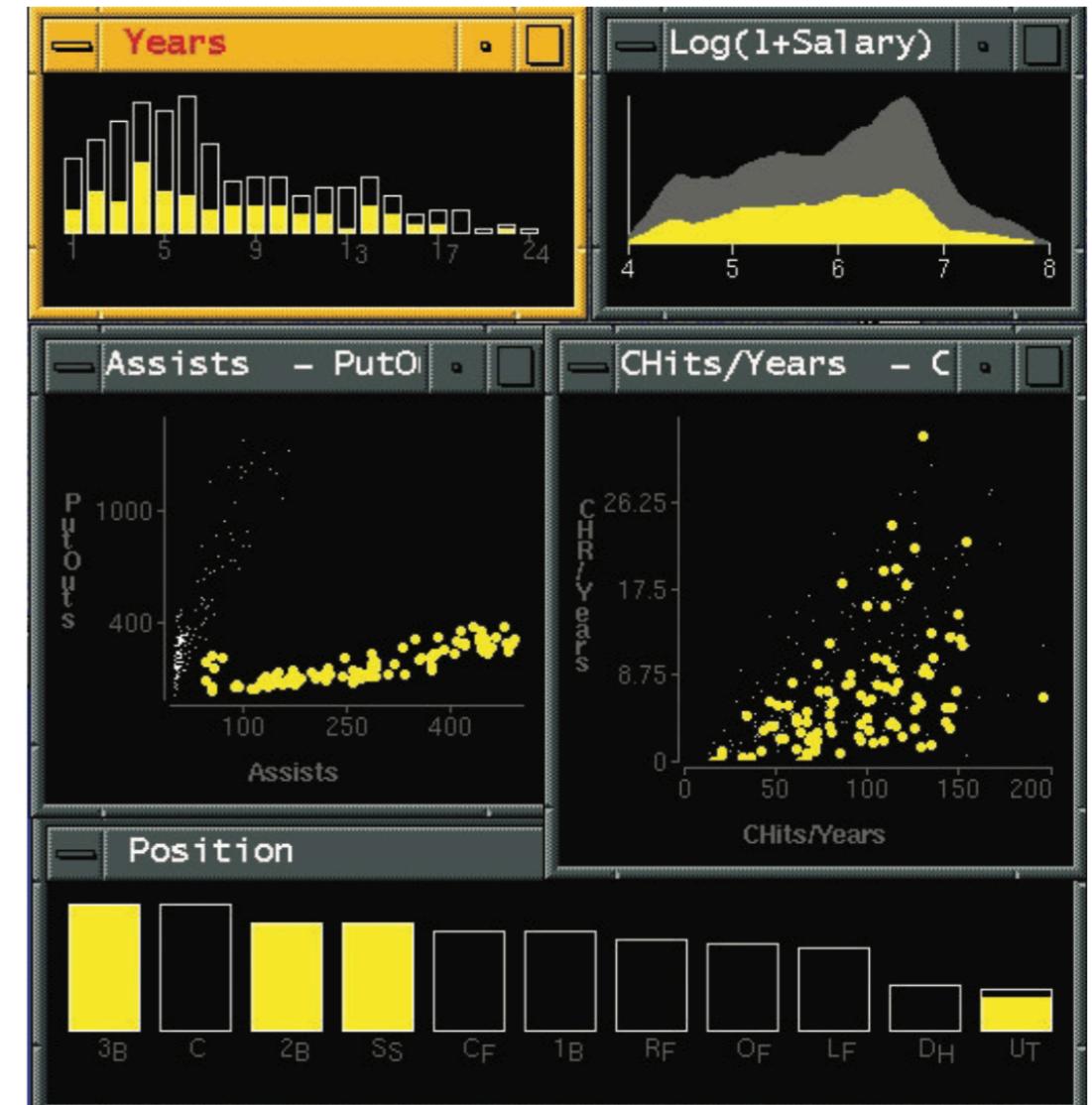


c) Explicit Encoding:
Difference

2.1. Linked Highlighting



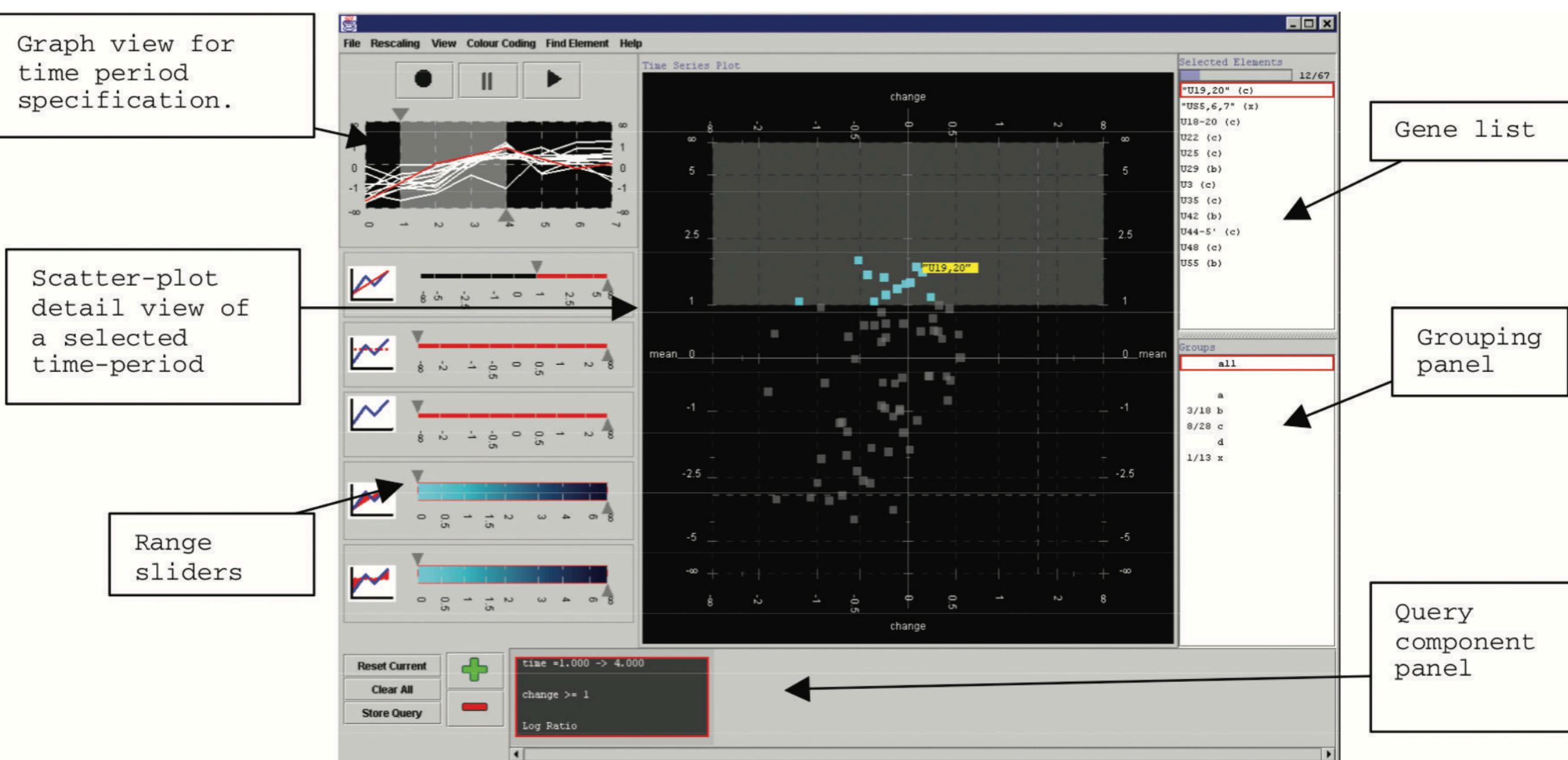
(a)



(b)

Exploratory Data Visualizer (EDV), Wills. 1995

2.2. Overview-Detail



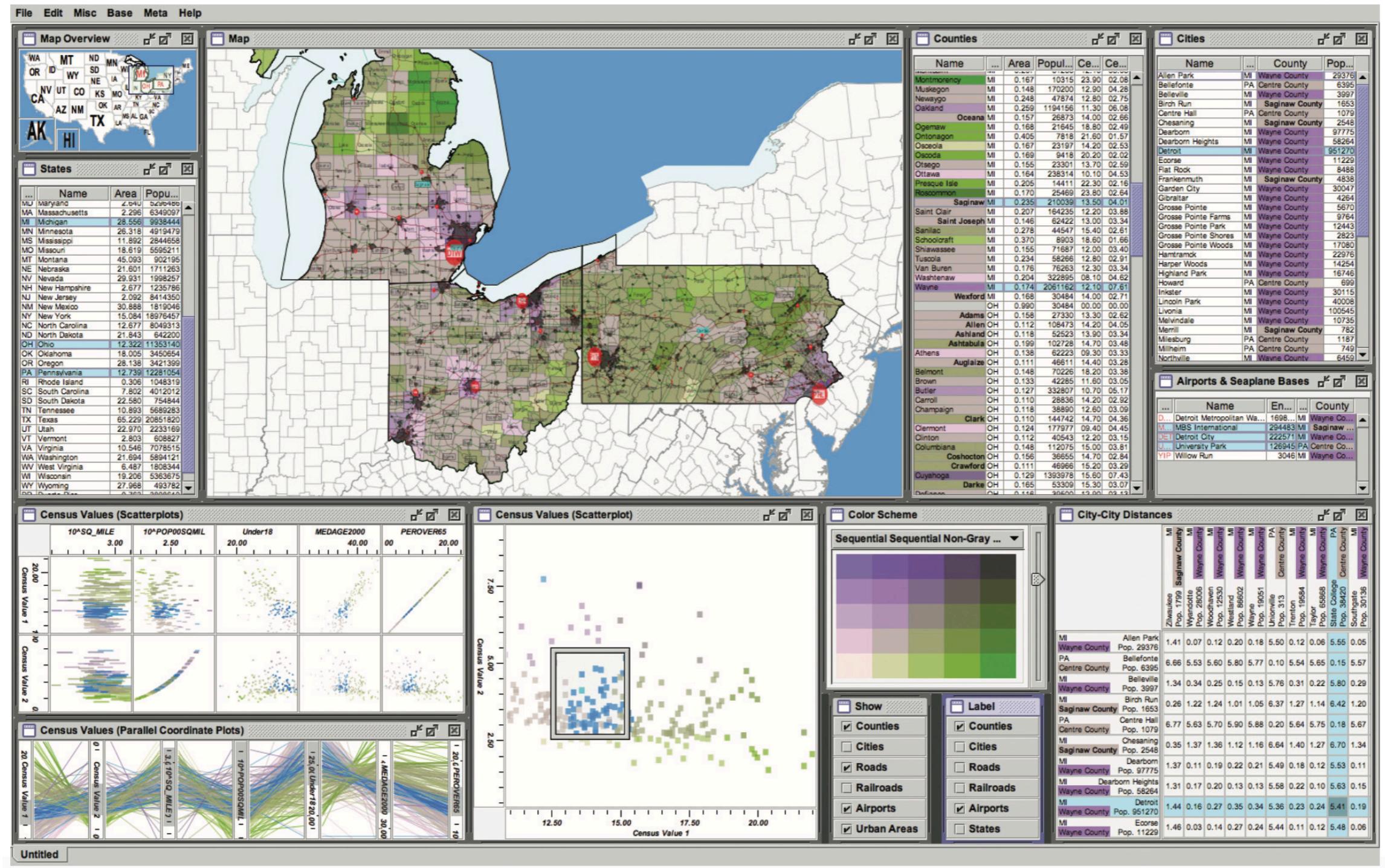
Coordinated Graph and Scatter-Plot Views for the Visual Exploration of Microarray Time-Series Data,
Craig and Kennedy. 2003

Overview-and-detail

- Example: tooltips -- show details about a data item on demand (*detail-on-demand*)
- Example: Geographic birdseye



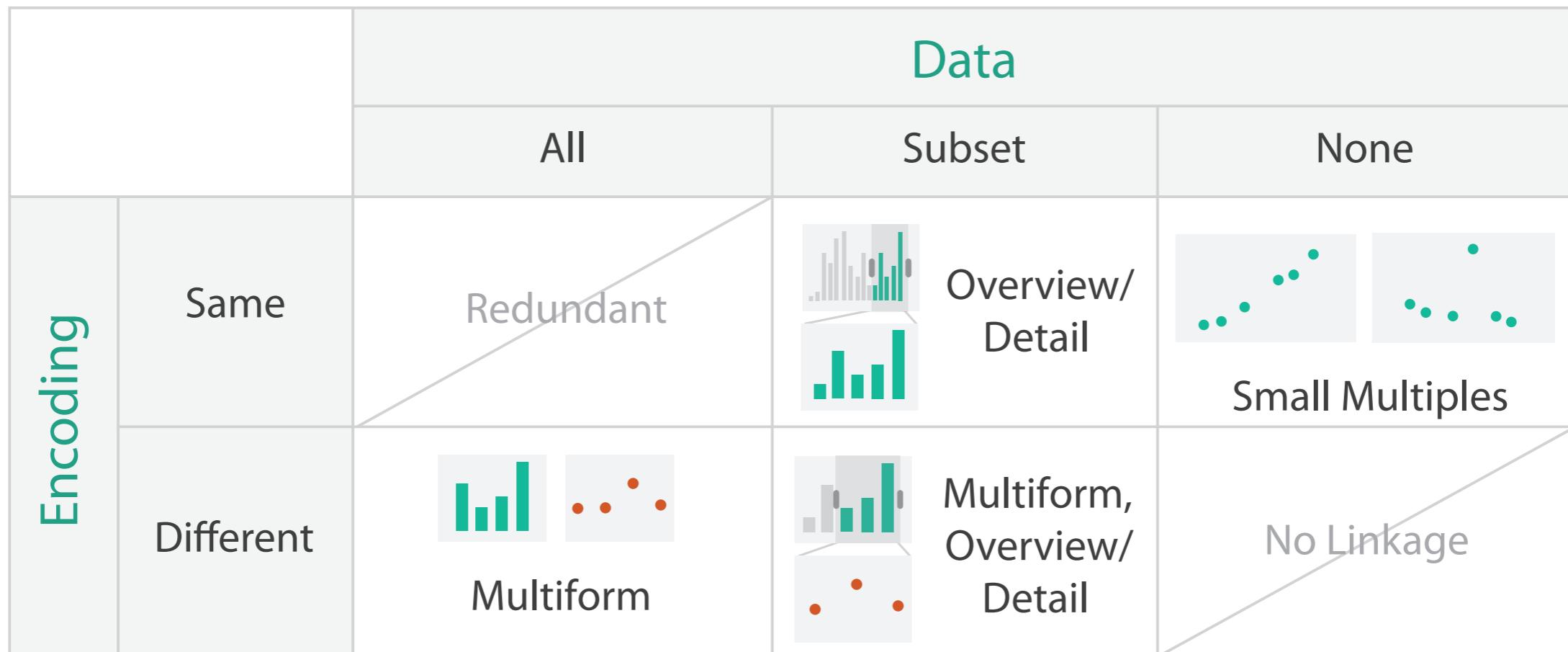
2.3. Combinations



The Improvise toolkit, Weaver. 2004

Multiple side-by-side views

- visual encoding, data, subsets
- navigation synchronized
- linked by explicit marks



Small multiple

- shared encoding, different partition
- views have a common reference frame
- facilitates comparison
- often used as a better alternative to animation
- drawback -- screen real-estate

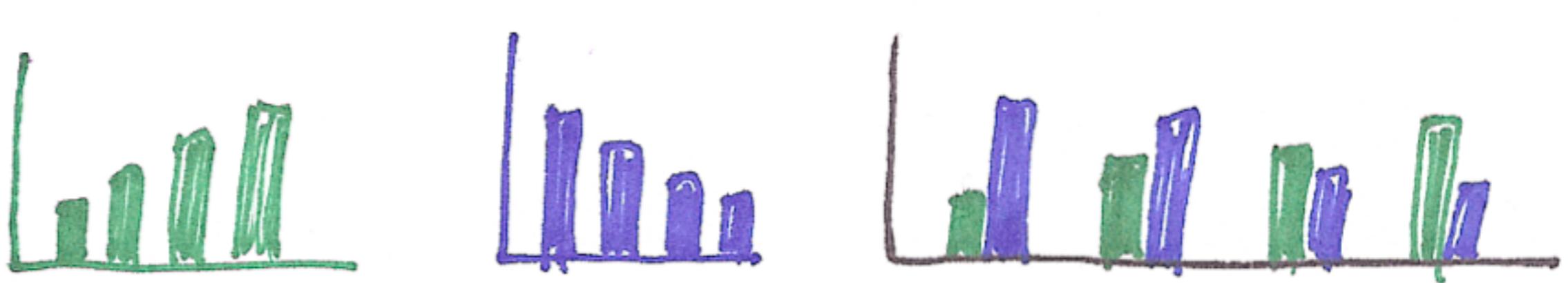
Animation vs. Small Multiples

- Tversky argument: intuition that animation helps is wrong
 - meta-review of previous studies
 - often more info shown in animation view so not a fair comparison
 - carefully chosen segmentation into small multiples better than animation if equivalent information shown

[Animation: Can It Facilitate? Barbara Tversky, Julie Morrison, Mireille Betrancourt. International Journal of Human Computer Studies 57:4, pp 247-262, 2002.]

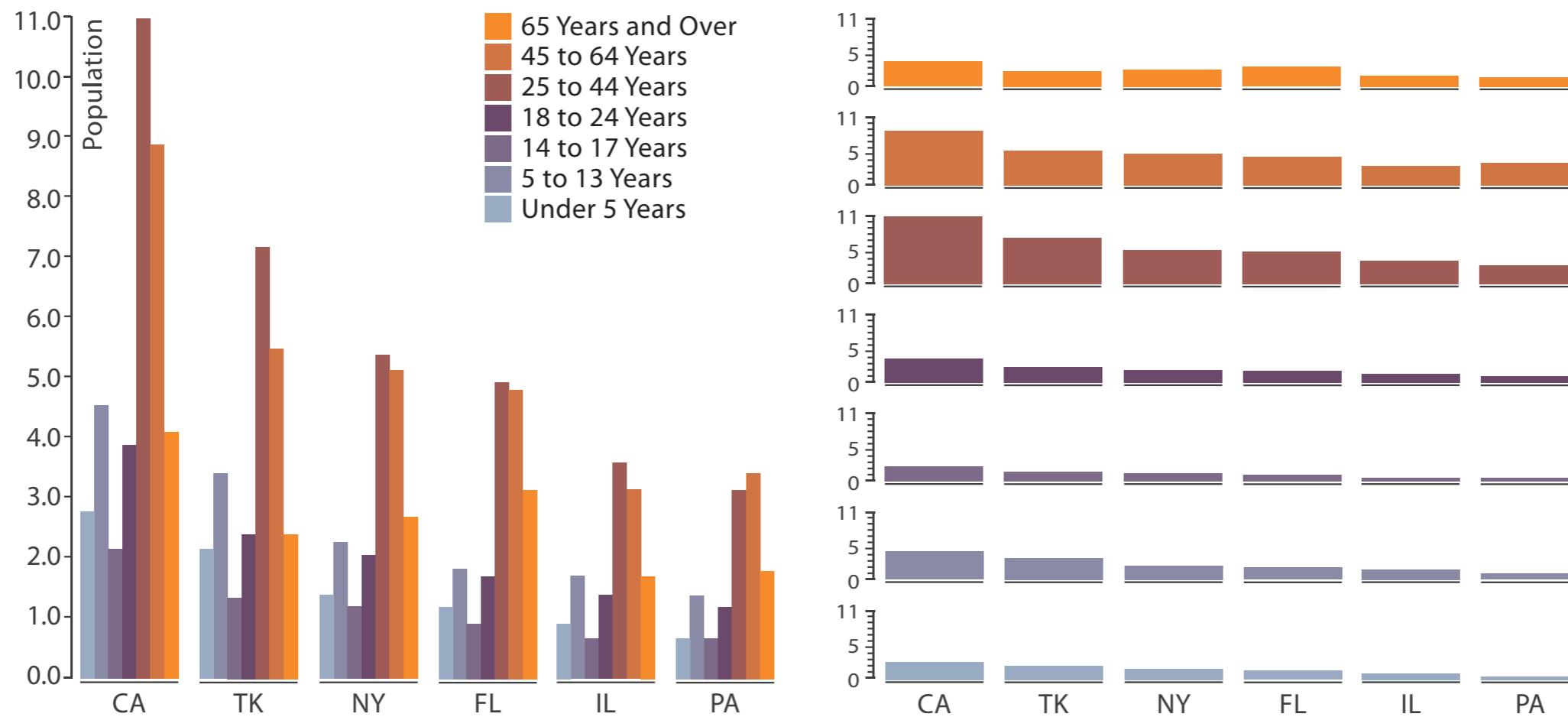
3. Partitions & Groups

- e.g. 2 keys
 - use two perpendicular axis OR
 - use alignment on one axis
 - separate by A first and then by B (left)
 - separate by B first and then by A (right)
- also known as dimensional stacking



Partitioning – Multiple keys

- we have a choice of order of stacking
- typically should be based on some order



Partitioning – Trellis diagrams

- What you see depends on the order
- Alphabetical or mean value?

Alphabetical



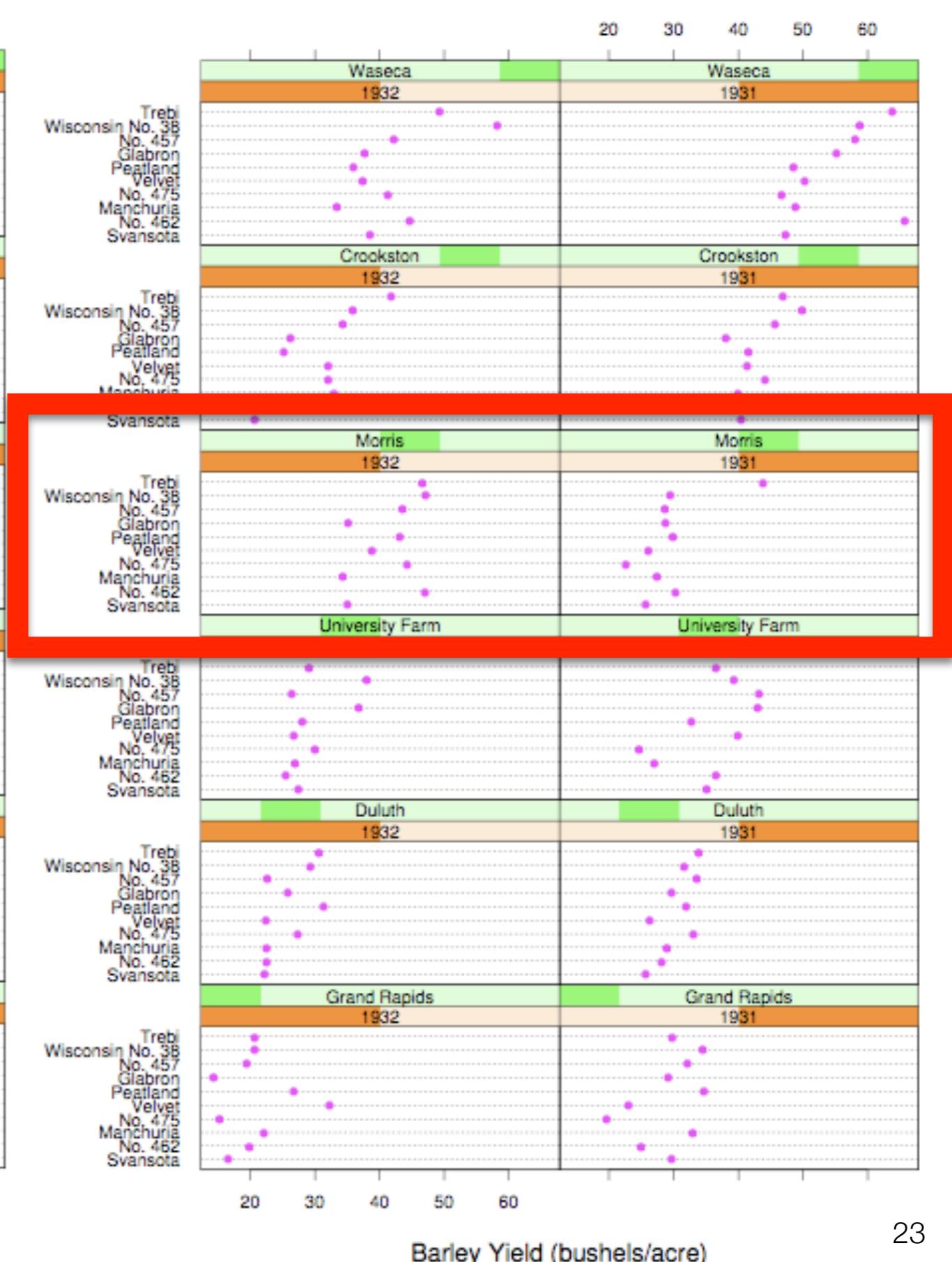
Median value



Alphabetical



Median value

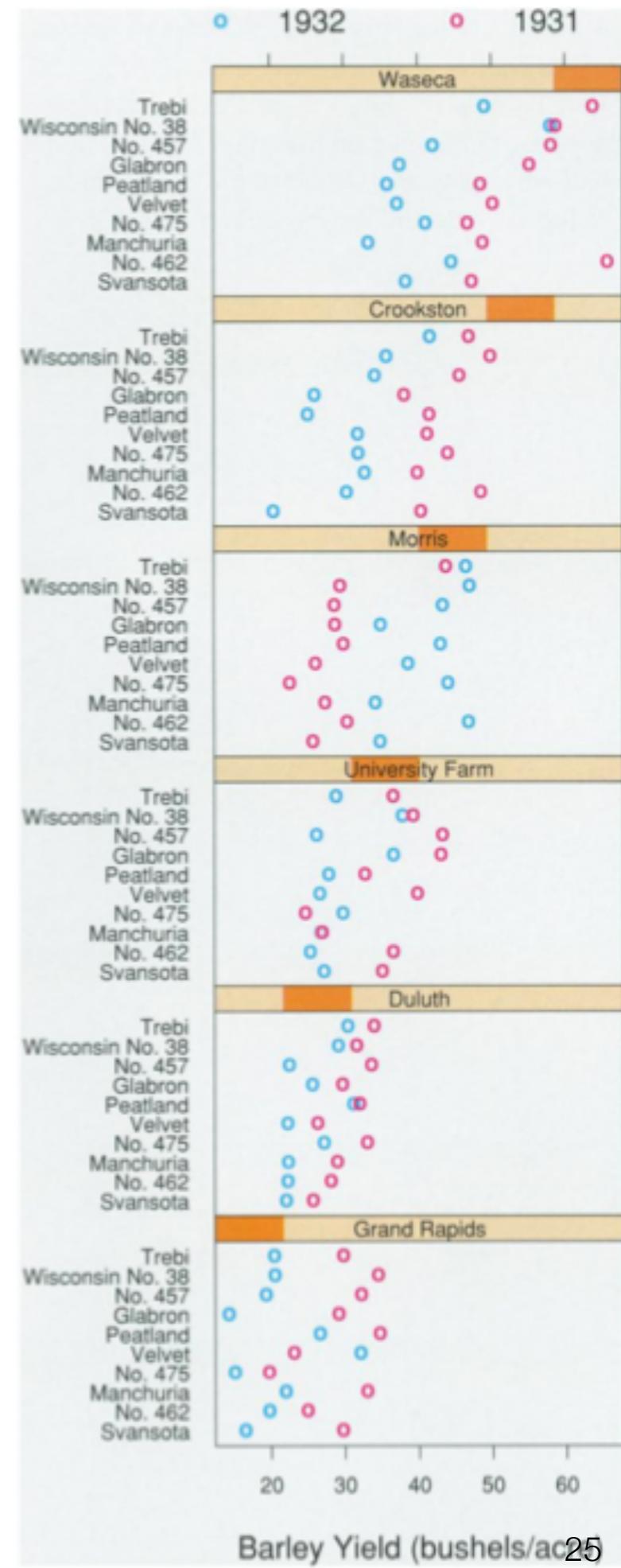


Trellis structure

- conditioning/trellising: choose structure
 - pick how to subdivide into panels
 - pick x/y axes for indiv panels
 - explore space with different choices
 - multiple conditioning
- ordering
 - large-scale: between panels
 - small-scale: within panels
 - main-effects: sort by group median
 - derived space, from categorical to ordered

confirming hypothesis

- dataset error with Morris switched?
- old trellis: yield against variety given year/site
- new trellis: yield against site and year given variety
 - exploration suggested by previous main-effects ordering



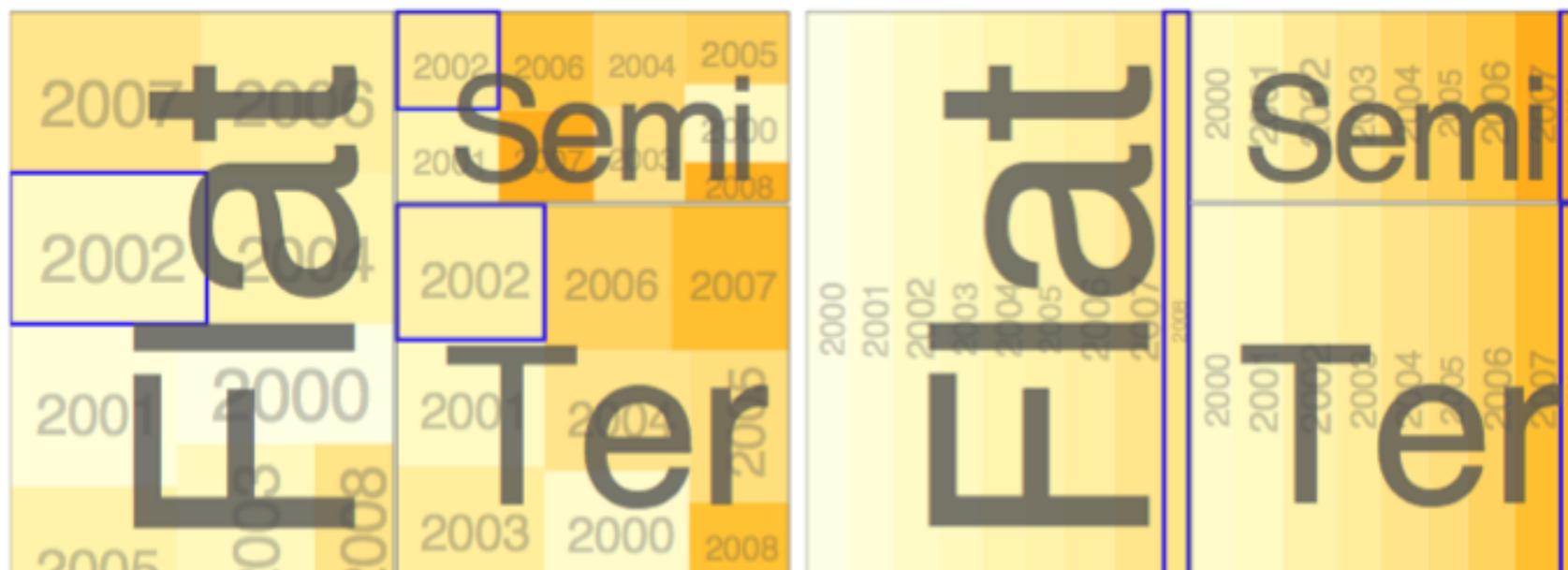
HiVE

- London property transactions
 - first split into subsets by house type (left)
 - first split by neighborhood (right)



HIVE: conditioning

- reconfigure conditioning hierarchies to explore data space
- treemaps as spacefilling rectangular layouts
 - each rectangle is conditioned subset of data
 - nested graphical summaries
 - size, shape, color used to show subset properties
 - ordered by conditioning variable
- dimensional stacking:
 - discretization and recursive embedding of dimensions



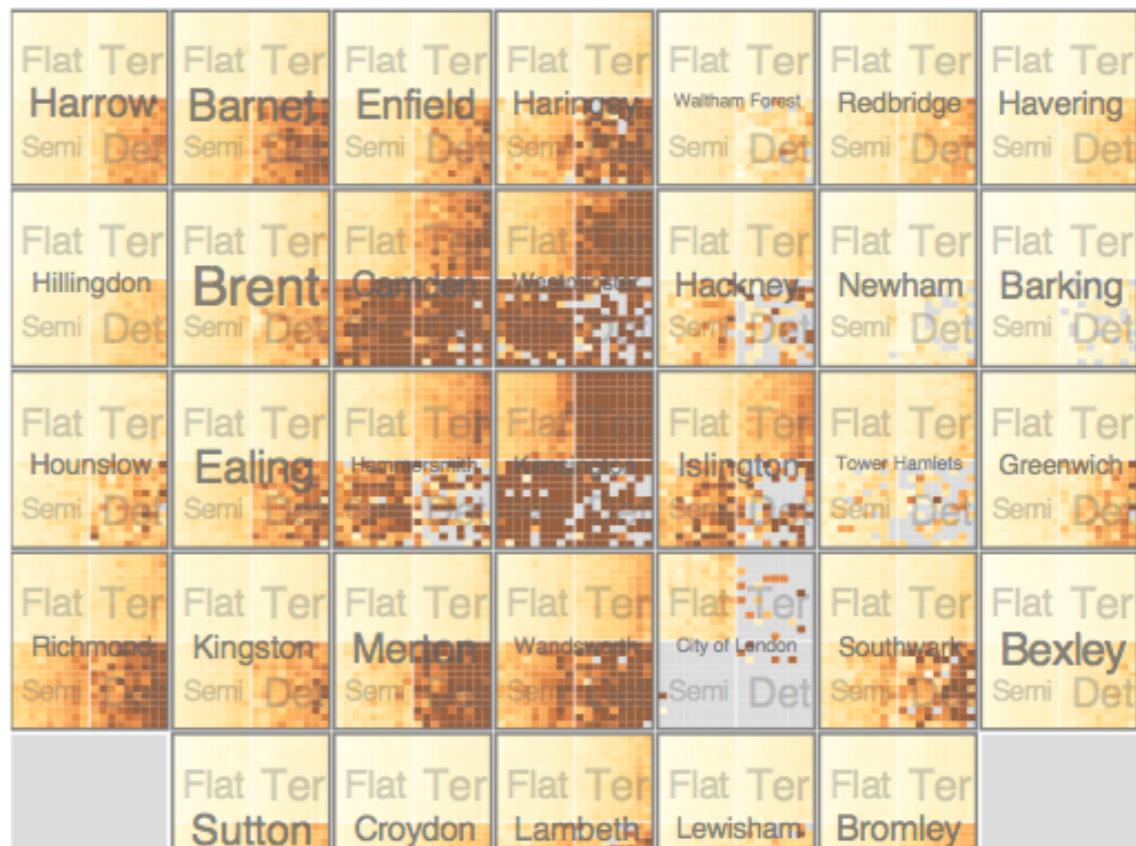
HIVE Example: London Property

- top split: house type. next: neighborhood. next: time
 - color: price variance. size: number of sales
 - resulting patterns:
 - between neighborhoods have different house distribution
 - within neighborhoods have similar prices

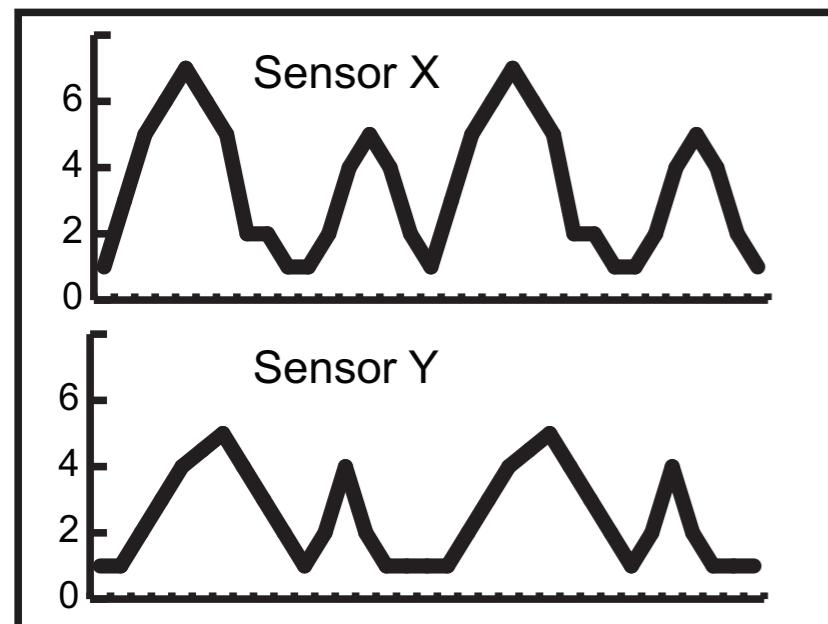


HiVE Example: London Property

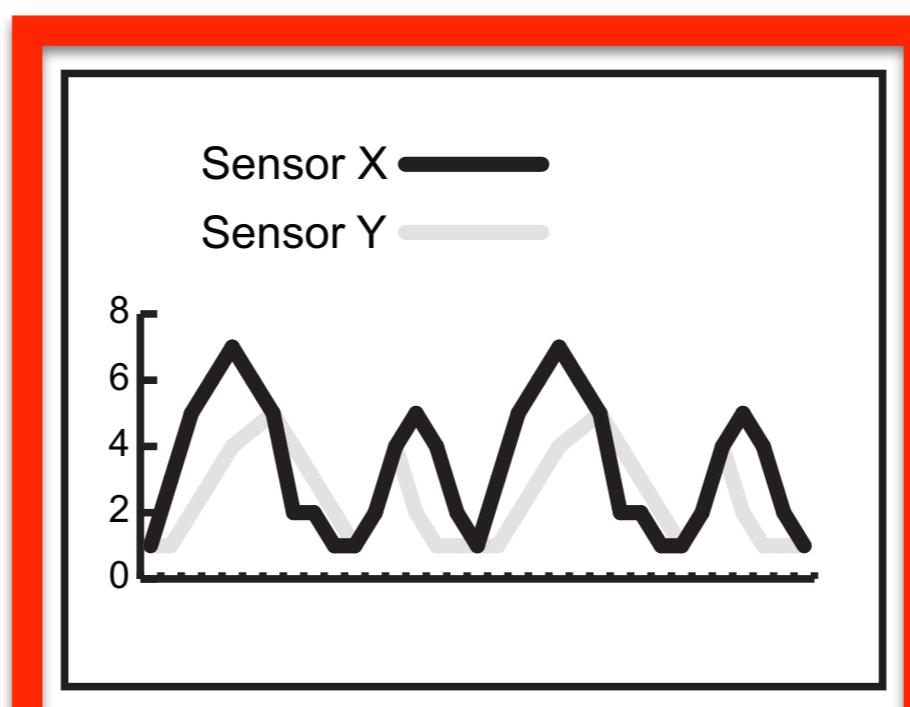
- top split: neighborhood. next: house type. next: sale time (year). next: sale time (month)
- color: average price. size: fixed
- resulting patterns:
 - expensive neighborhoods near center



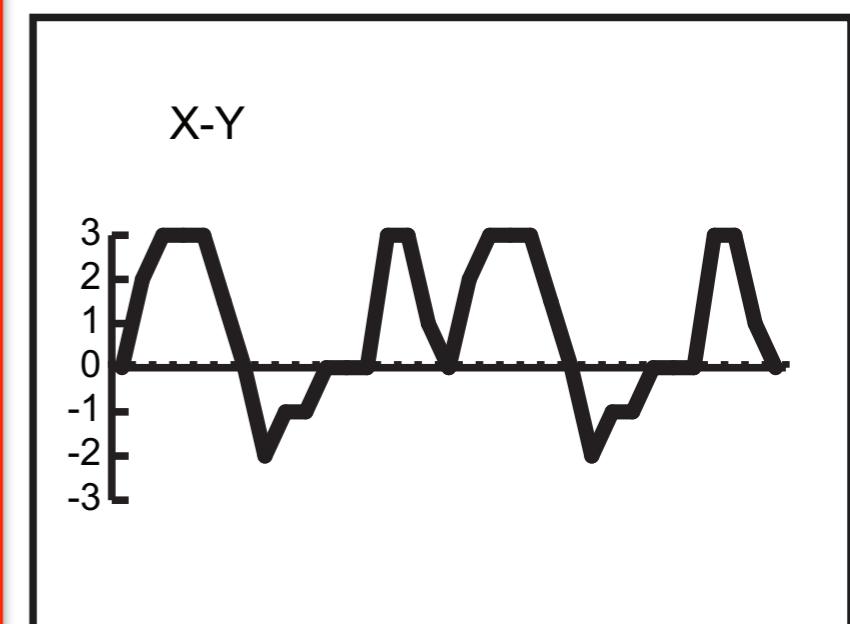
4. Superimpose Layers



a) Juxtaposition

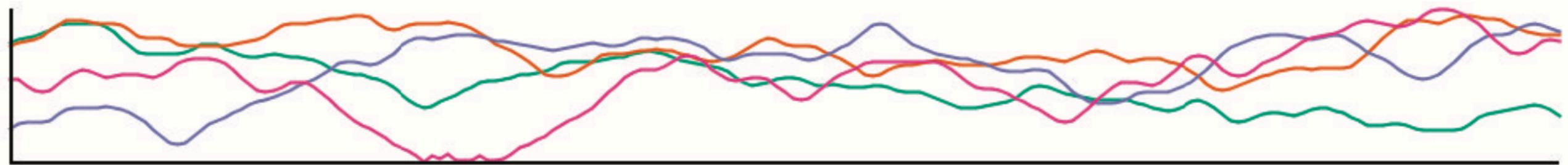


b) Superposition

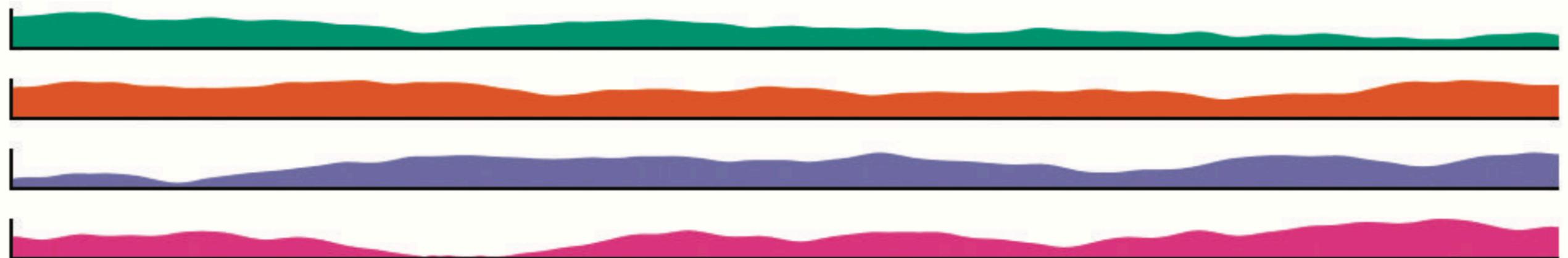


c) Explicit Encoding:
Difference

Superimpose Layers



(a)



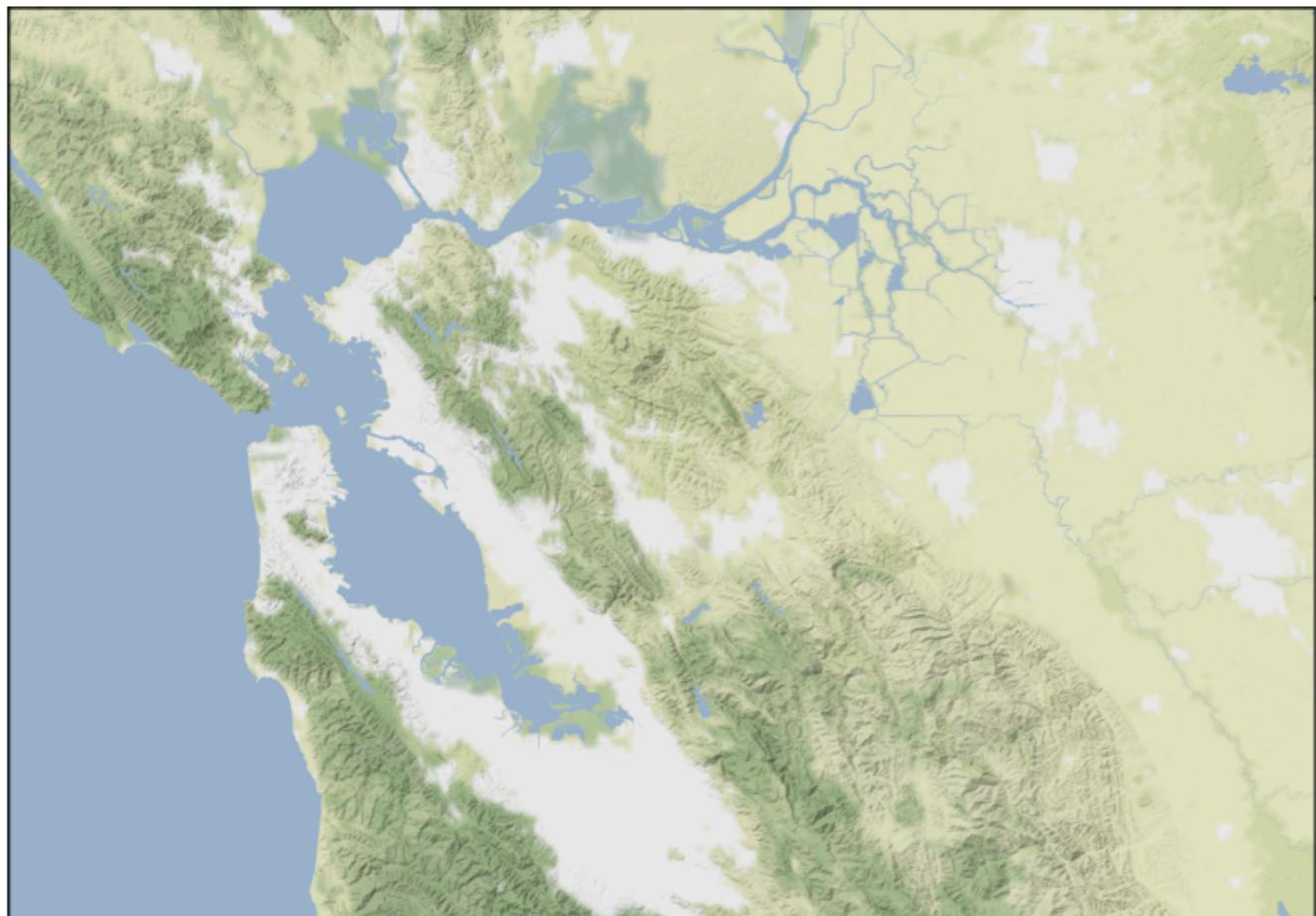
(b)

Graphical Perception of Multiple Time Series, Javed et al., 2010

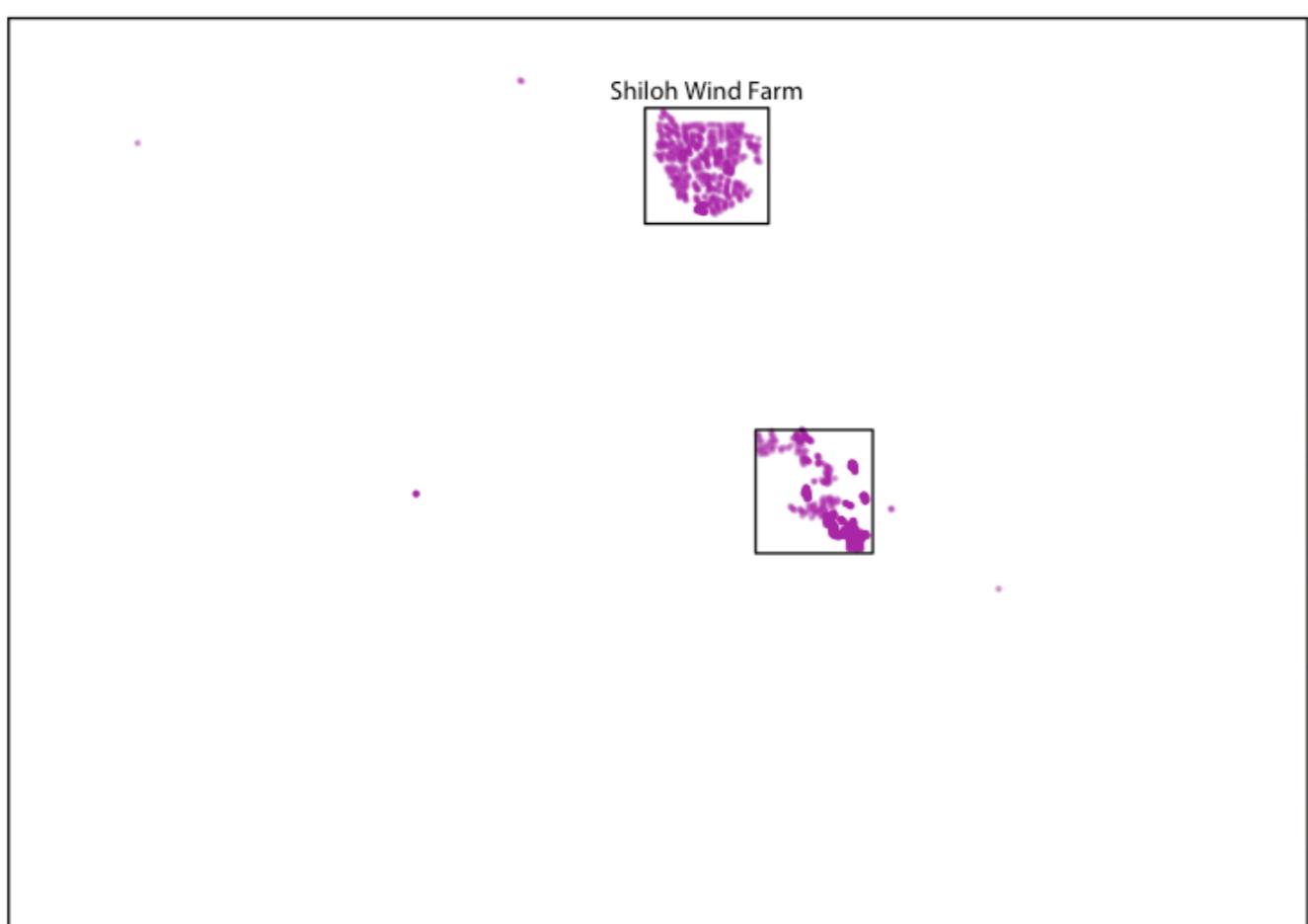
Visual layering

- beyond simple use of visual channels
 - method variants
 - global compositing: everything superimposed
 - item-level stacking
 - major consideration
 - static layers: disjoint ranges in channels safest
 - dynamic/interactive layers: more freedom
-

terrain



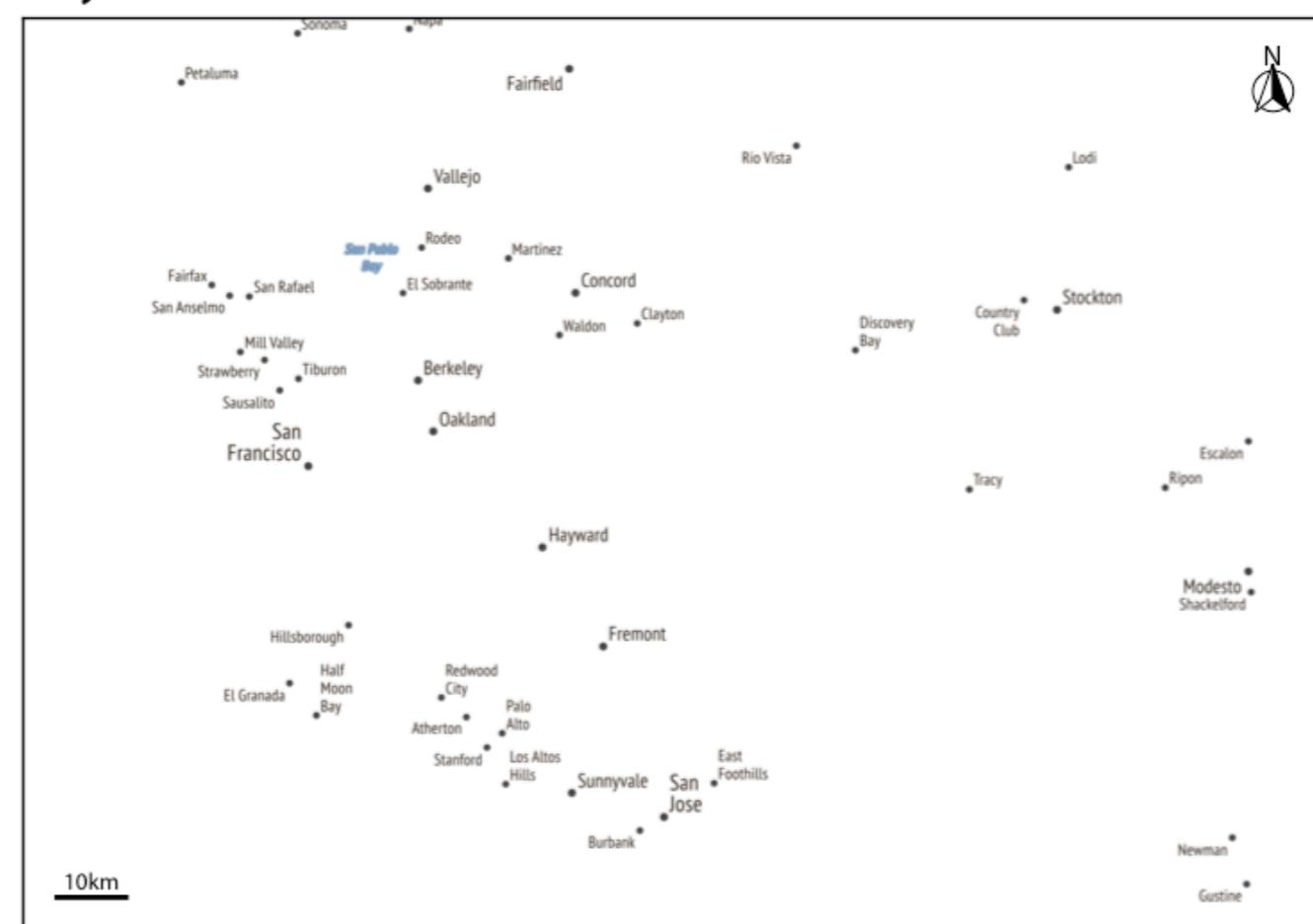
wind turbines

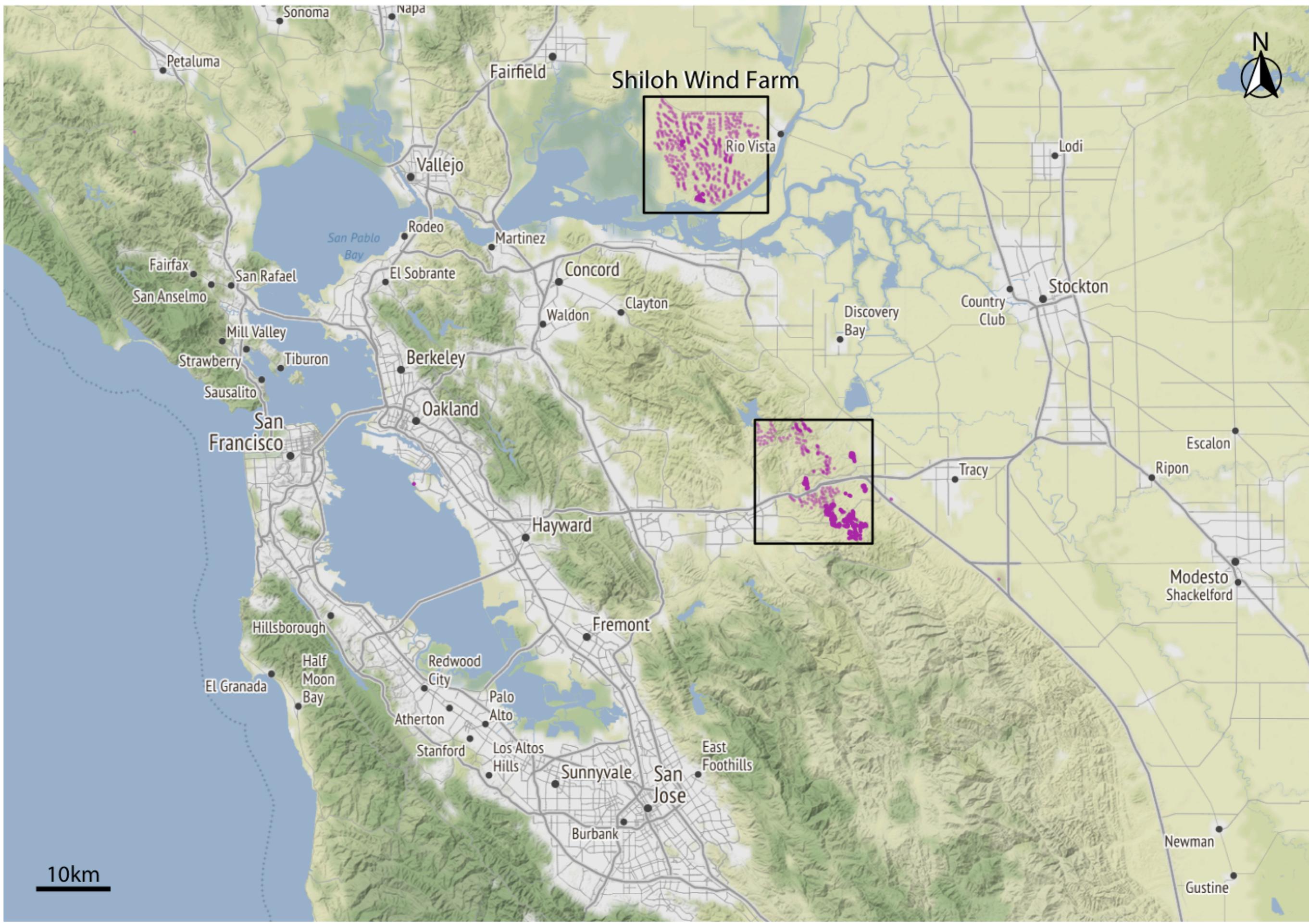


roads

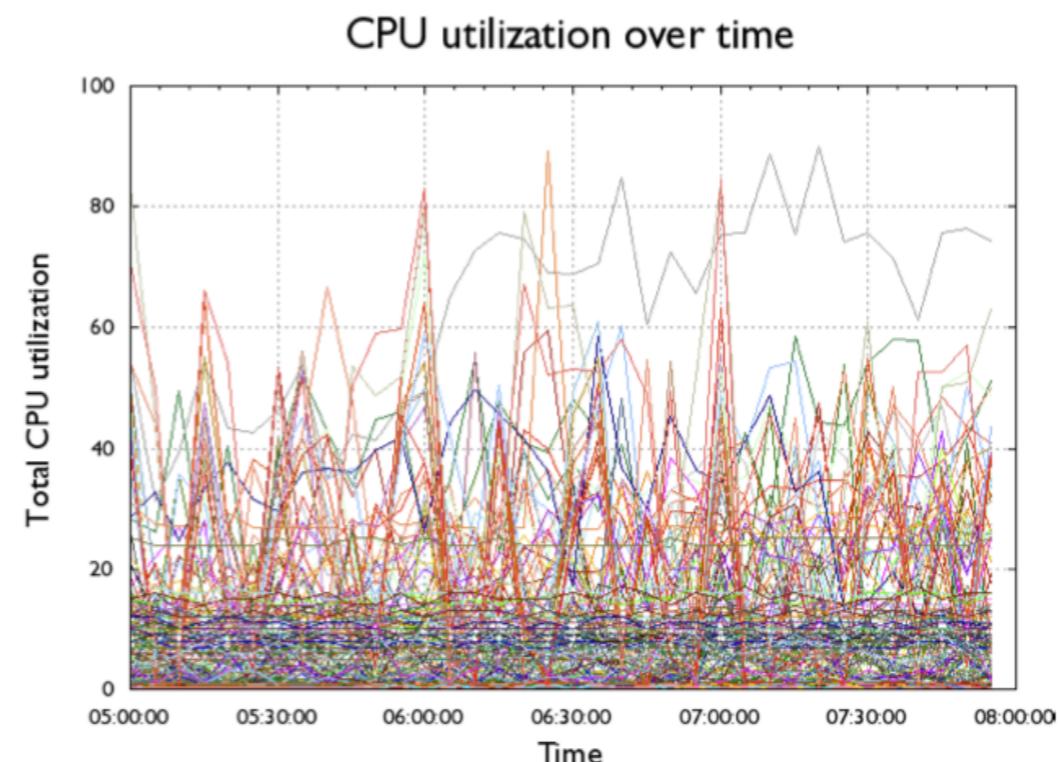
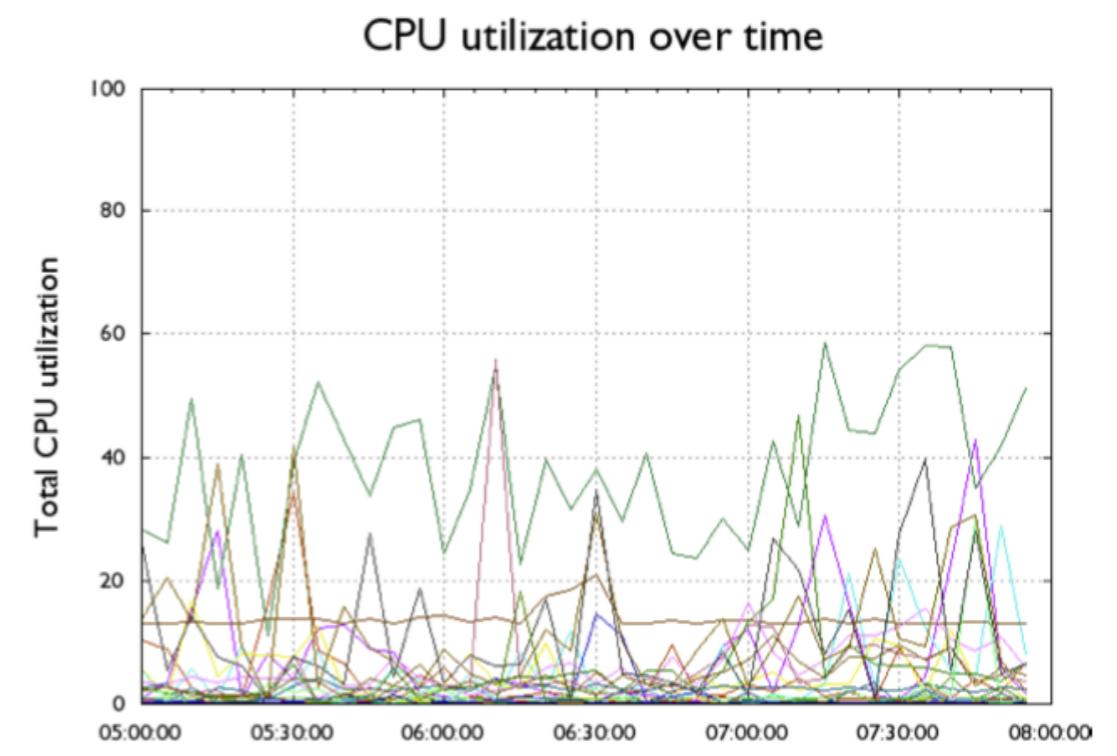
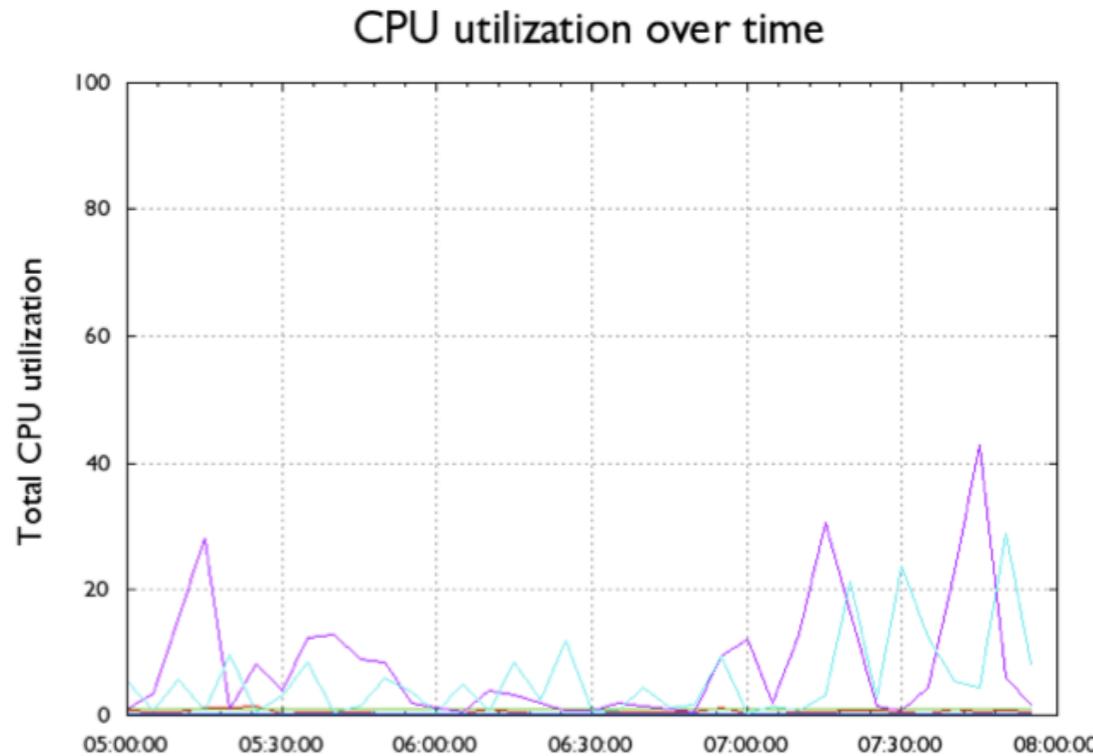


city labels, scale bar

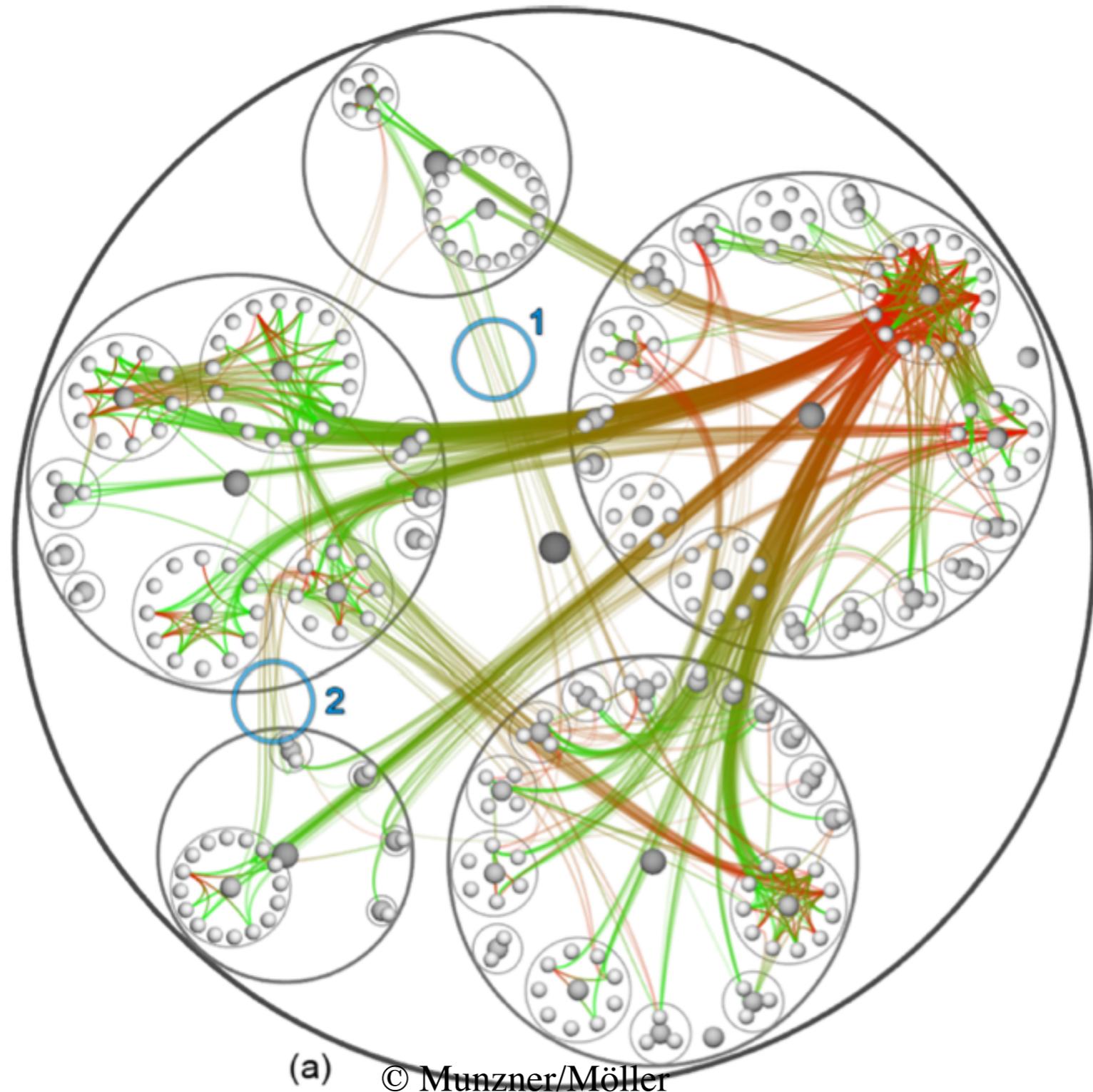




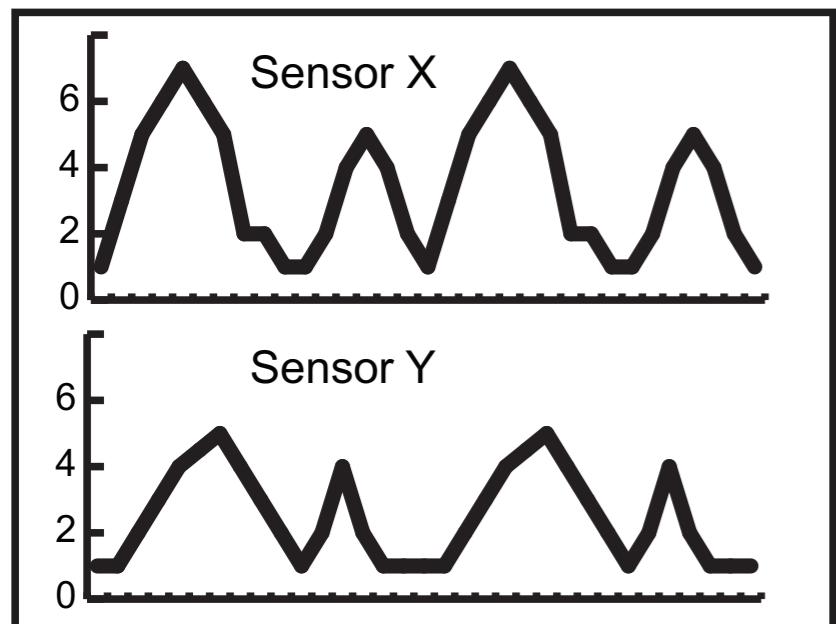
Static layers



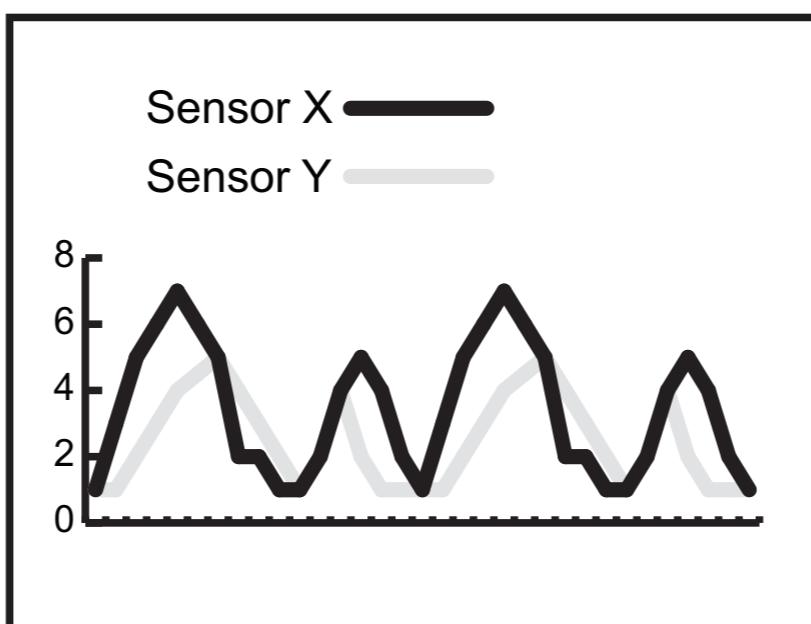
Hierarchical edge bundles



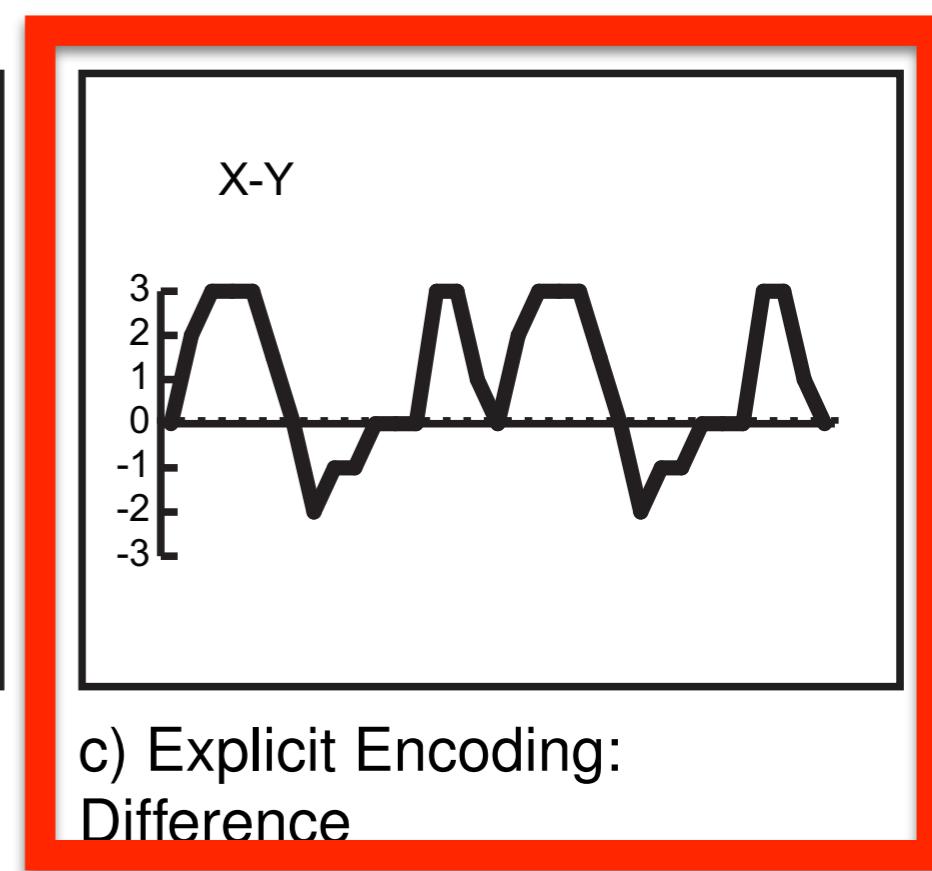
Difference views



a) Juxtaposition



b) Superposition



c) Explicit Encoding:
Difference

Thank you

- Any questions?