Remainder

Today: Interaction techniques

Tue: Tools

Wed: Evaluation

Tue: *General Q&A with Benjamin*

Wed: *General Q&A with Maria*

Interaction for Data Visualization

The Human Factor

Benjamin Bach

March 2019

Edinburgh University

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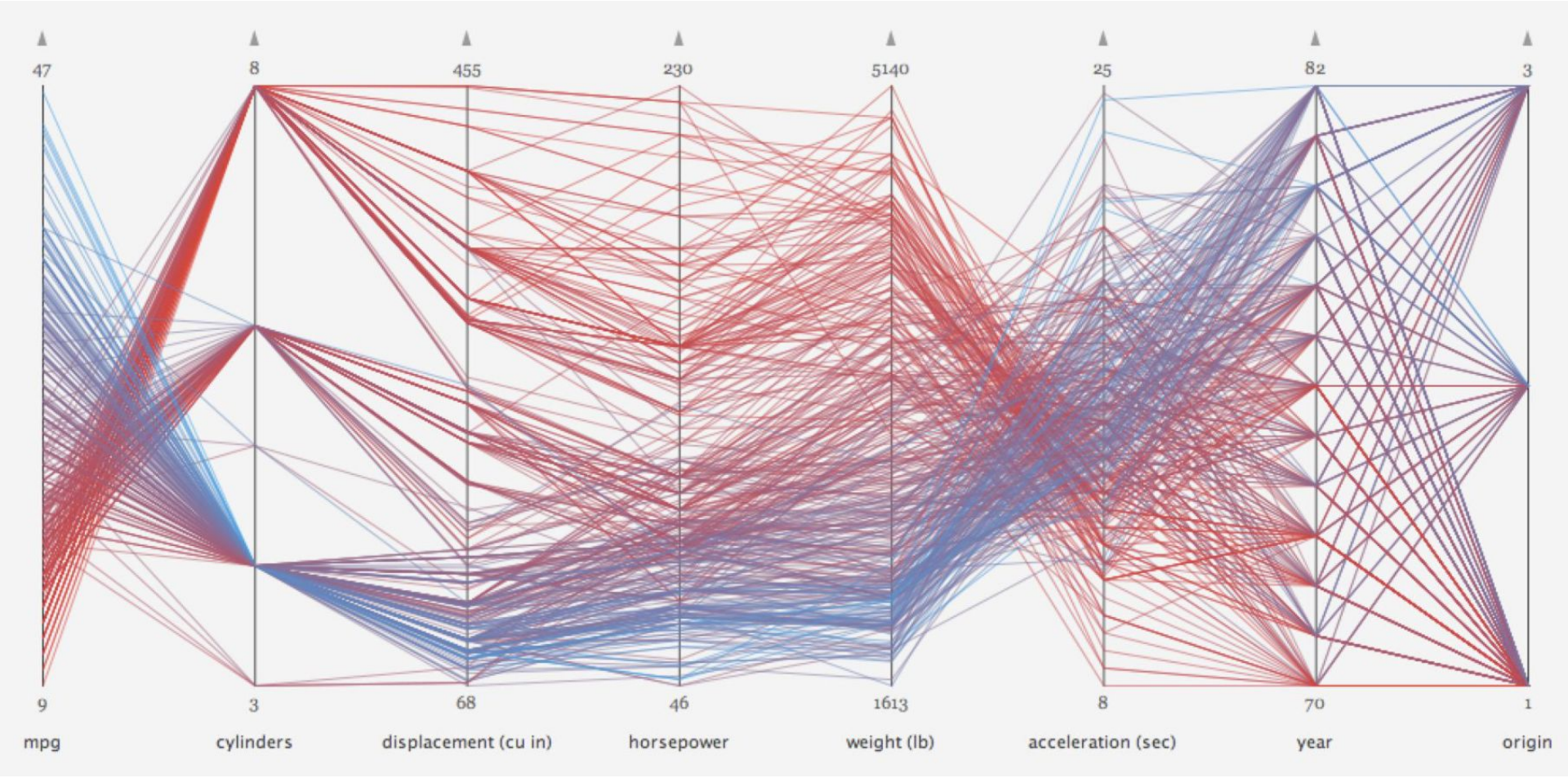
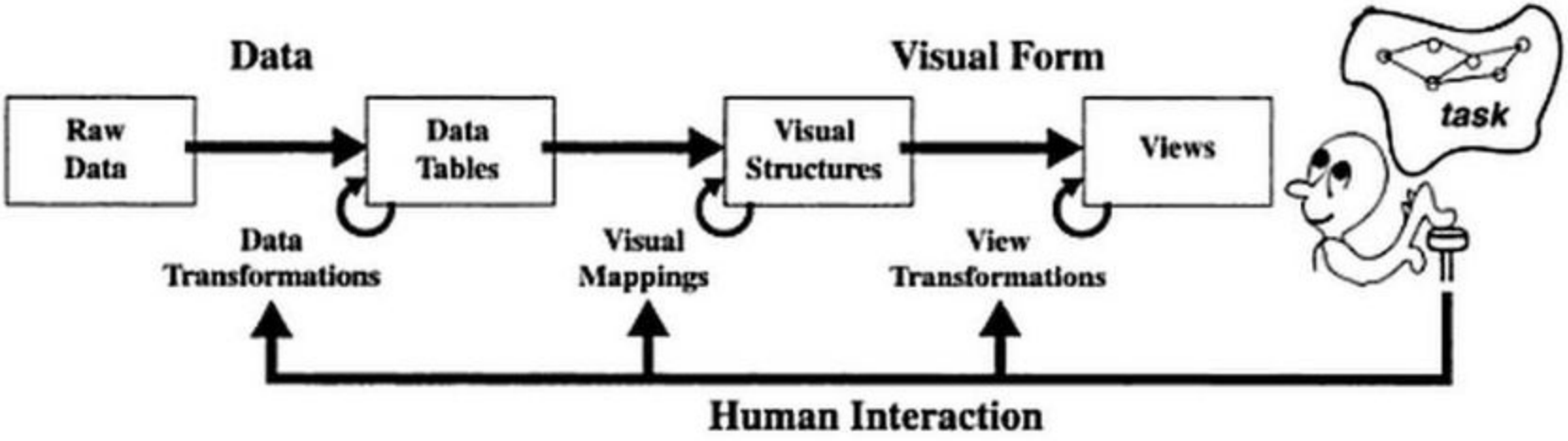
Why interaction?



Info Visualization Pipeline



Interaction

"features that provide users with the ability to directly or indirectly manipulate and interpret representations"

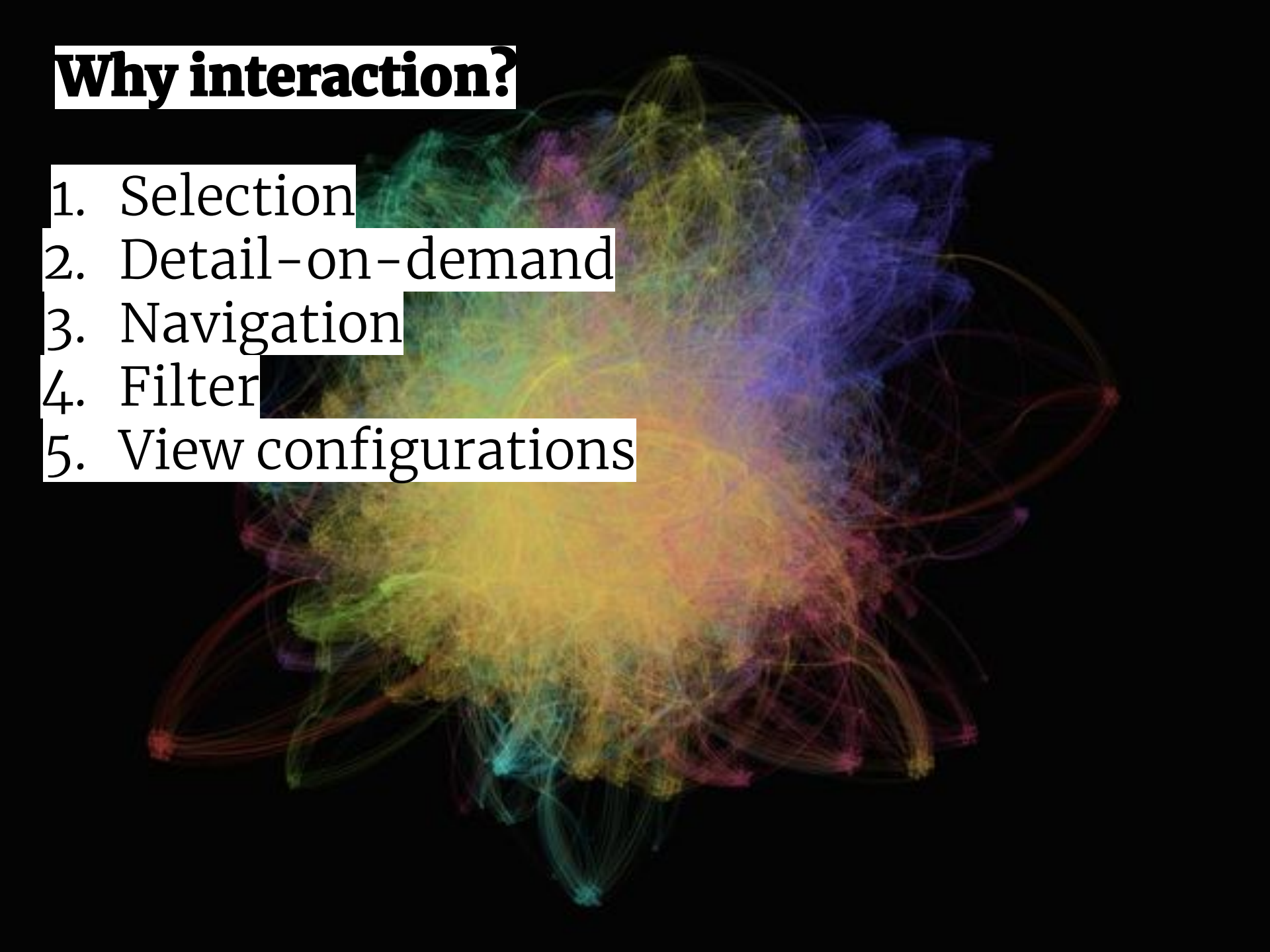
—

Yi, Ji Soo, Youn ah Kang, and John Stasko. "Toward a deeper understanding of the role of interaction in information visualization." *IEEE transactions on visualization and computer graphics* 13, no. 6 (2007): 1224-1231.

Sand dance

https://www.youtube.com/watch?v=ha0PO__ONPQ

Why interaction?



1. Selection
2. Detail-on-demand
3. Navigation
4. Filter
5. View configurations

Selection &
Details on Demand

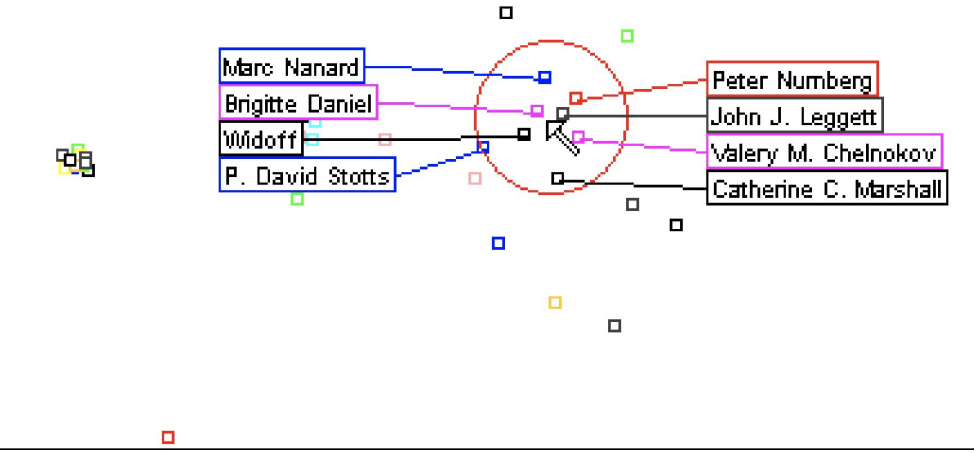
Brushing and Linking

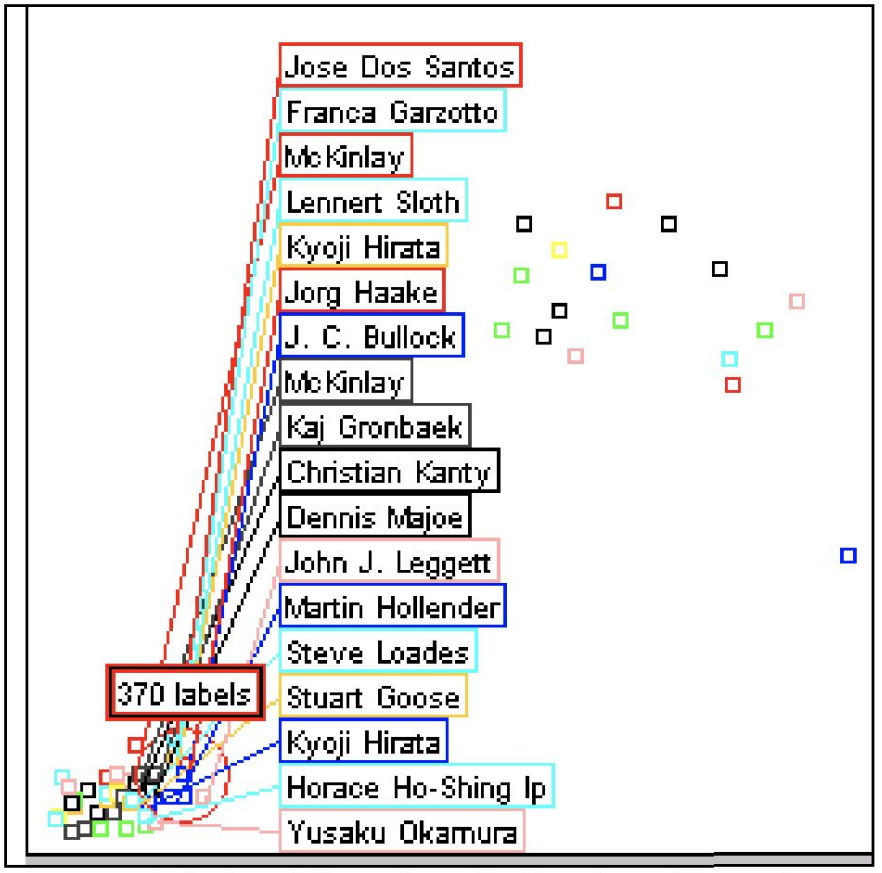
http://ramiksadana.com/tangereDesign.html

Pan & Zoom

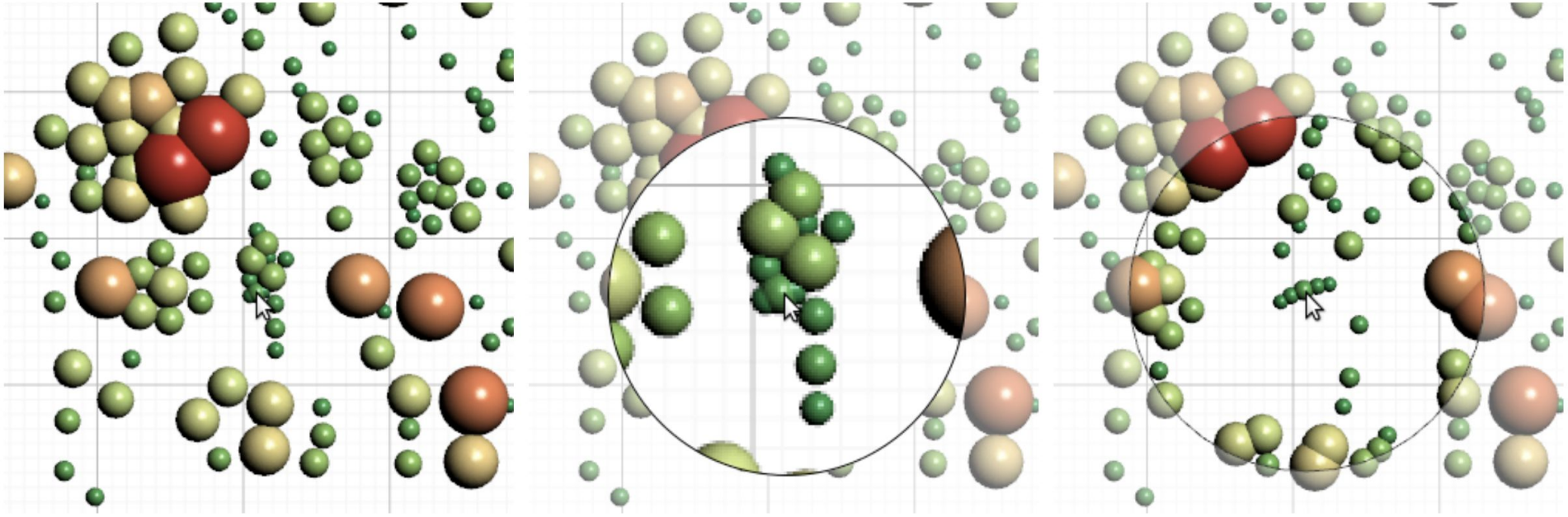

GOLDEN GATE
CHABOT
RD.
59
VISTA
THE UPLANDS
RD.
REATA PL.
MANO CREST
CHABOT CREST
CHABOLYN TER.
PATTON ST.
CHABOT CT.
GOLDEN
DR.

Excentric labeling





Lenses

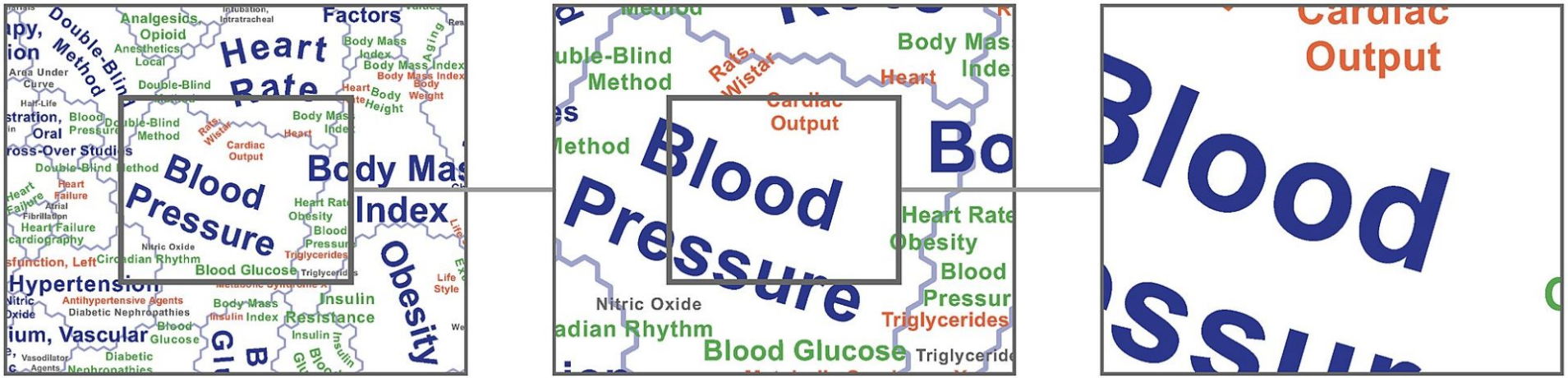


(a) Regular visualization

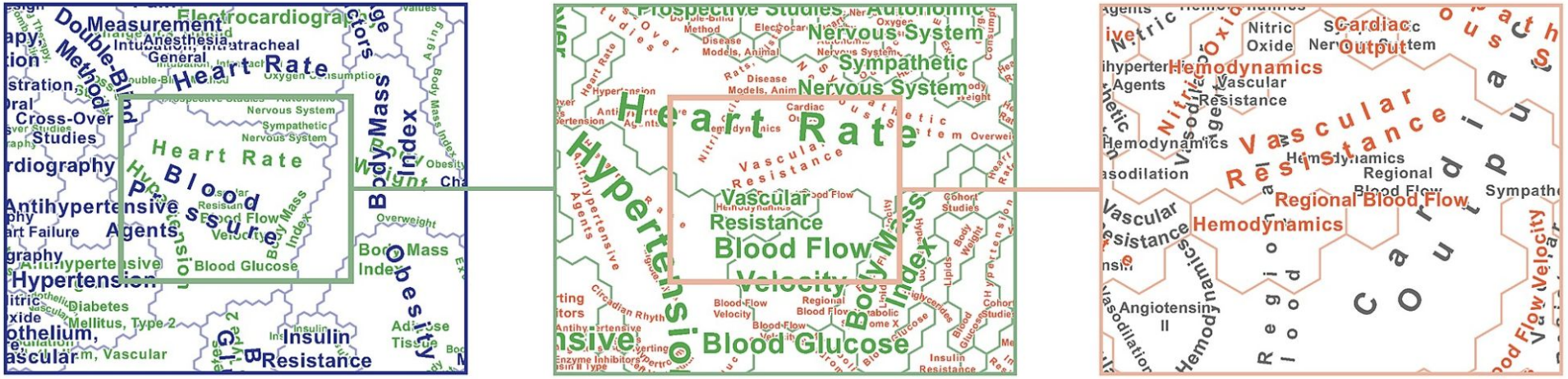
(b) Simple magnification

(c) Fish-eye distortion

Geometric Zoom ..



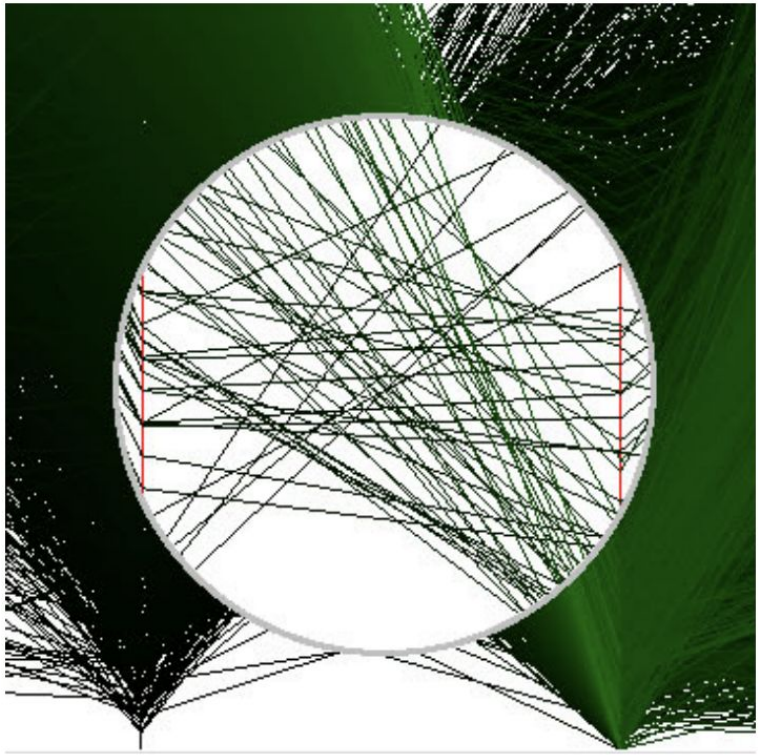
vs. Semantic Zoom:

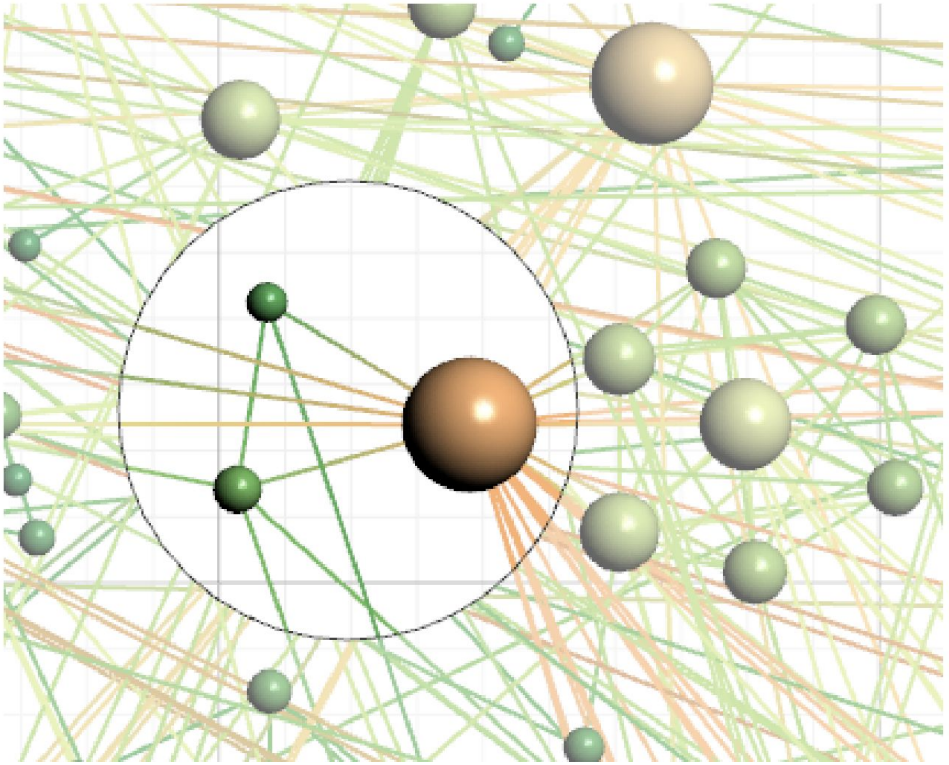


https://www.researchgate.net/figure/Juxtaposed-are-examples-of-geometric-zooming-into-the-static-display-of-multiple-levels_fig8_236105790

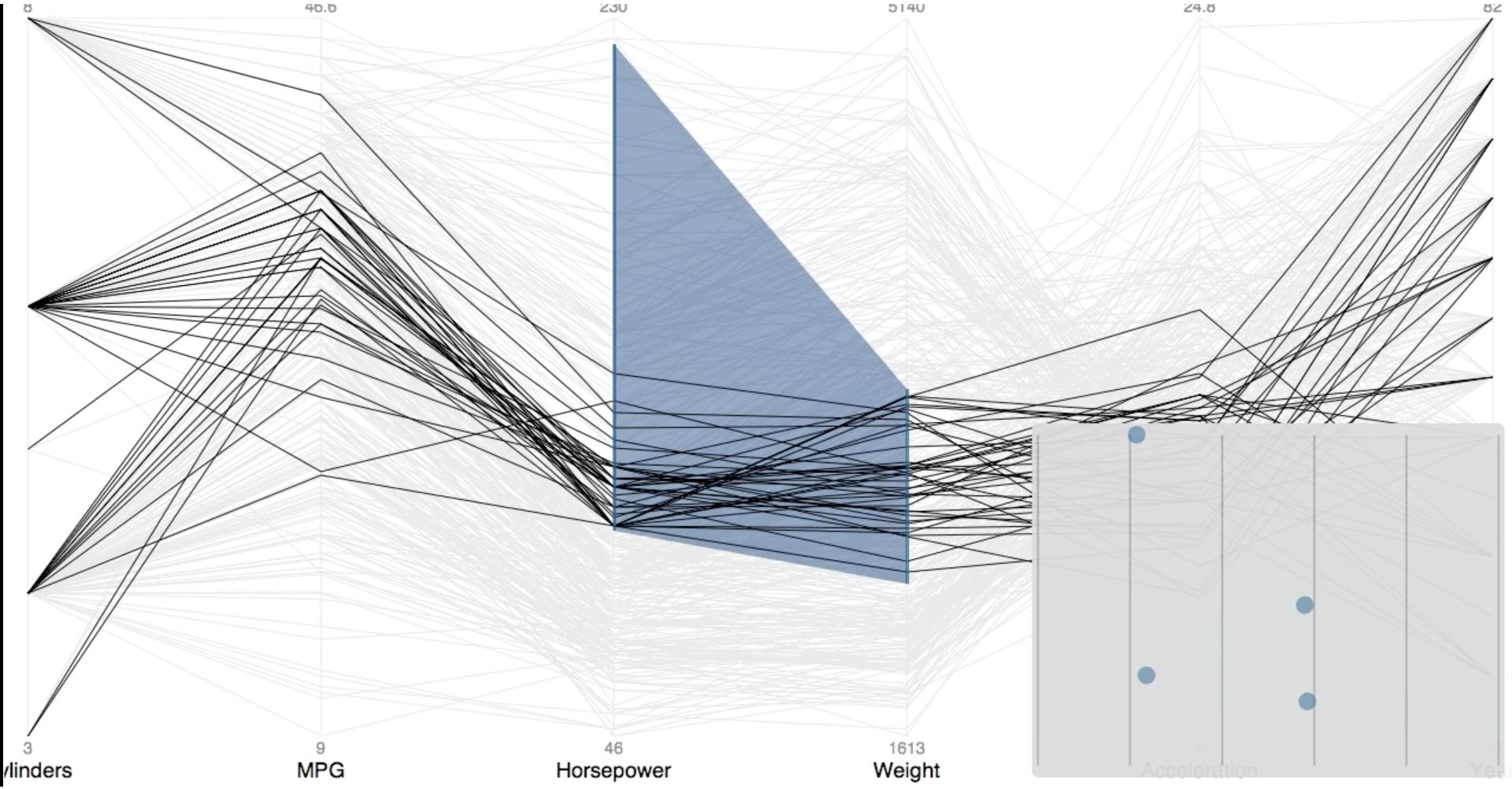
Filter

Lenses





Parallel Coordinates Plots



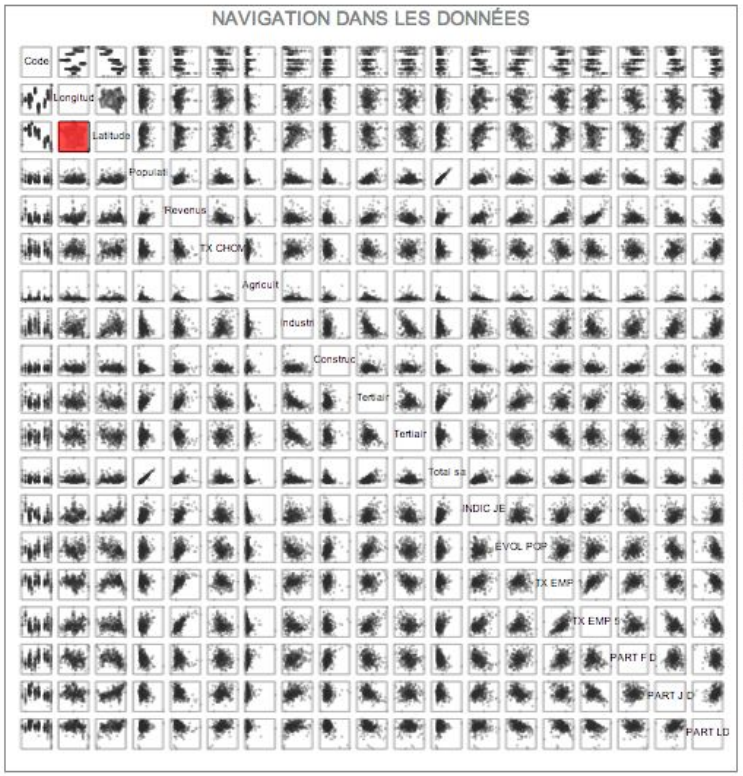
https://vimeo.com/13437693

EdgeLens

https://www.youtube.com/watch?v=xOli-vCNS9I

Navigation

Scatterdice



En savoir plus sur cette visualisation.
Testé avec Chrome, Safari et Firefox.
Ecrivez-nous pour toute question ou commentaire.

Aviz Inria

DATA PUBLICA

LISTE DES SÉLECTIONS	
Sélection 1	27/304
Sélection 2	27/304
Sélection 3	0/304
Sélection 4	0/304

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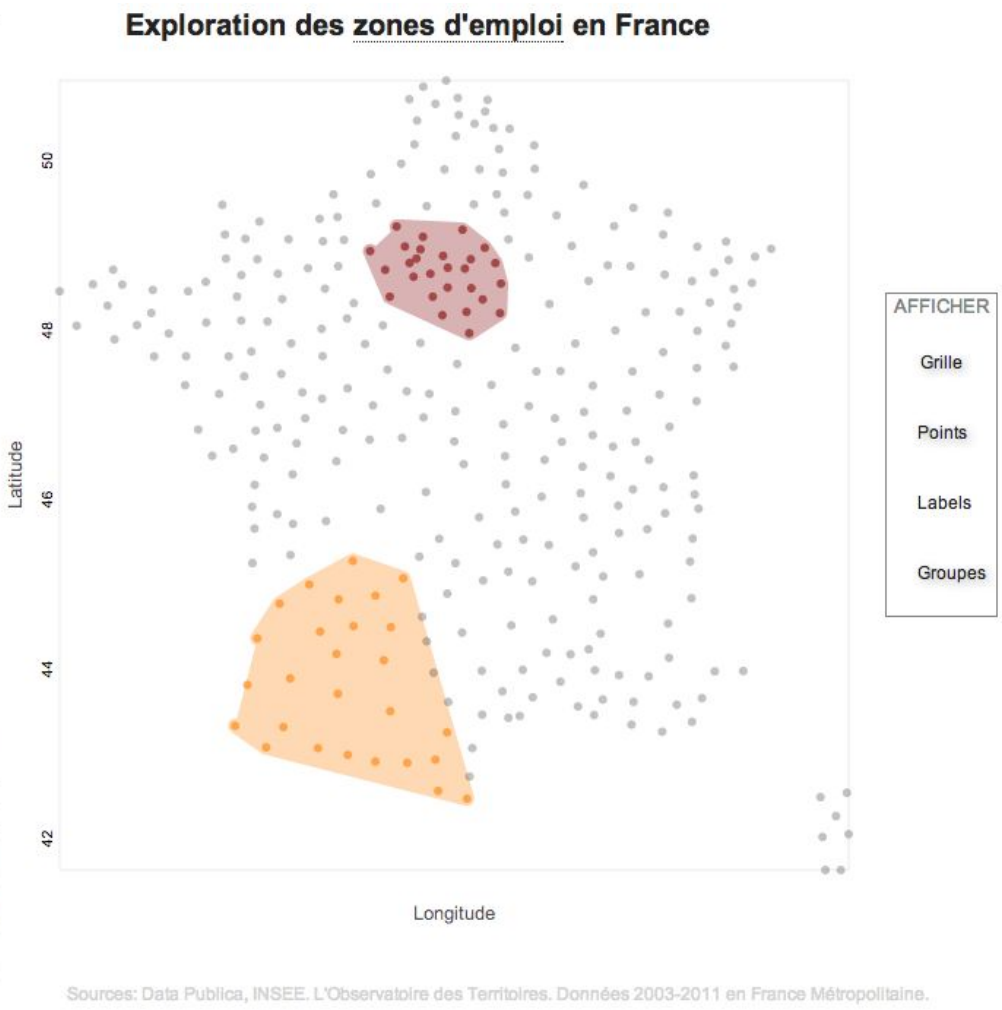
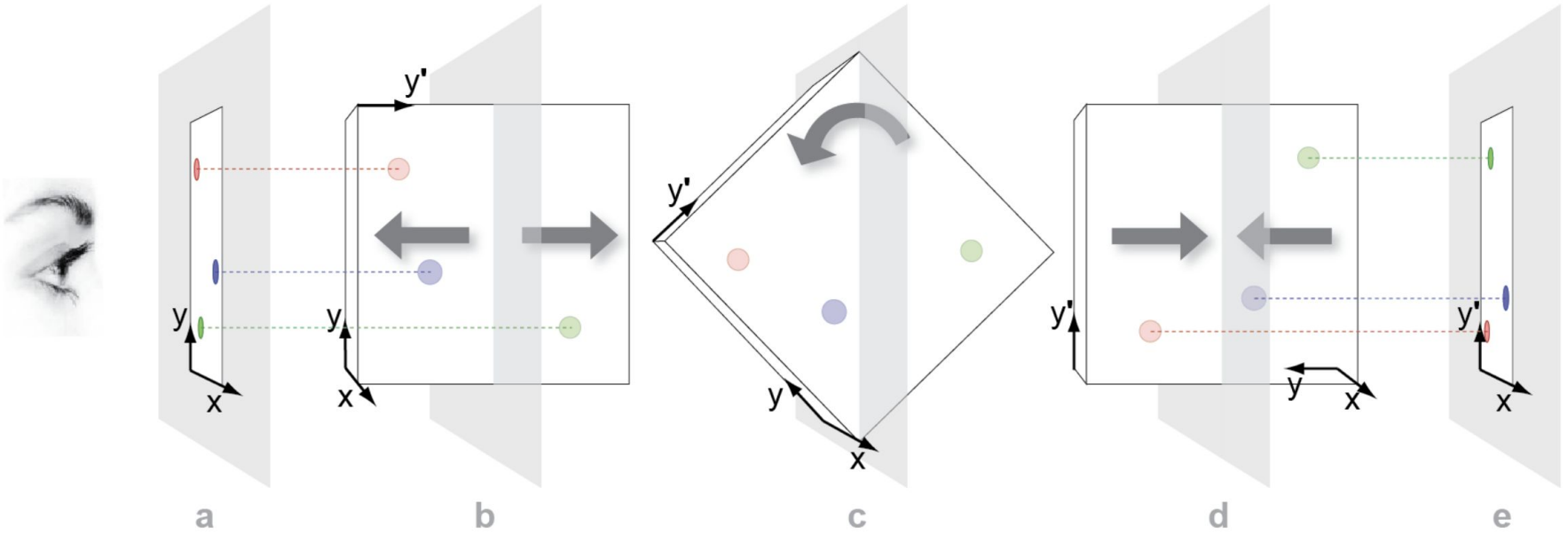


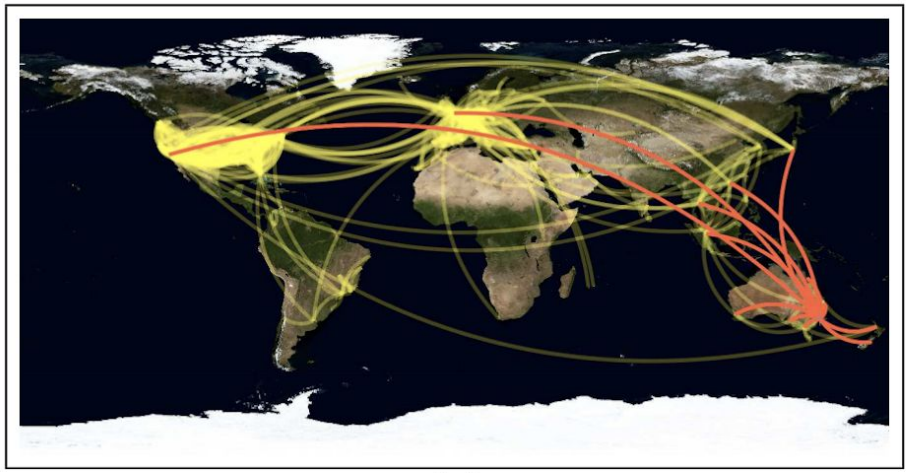
https://www.youtube.com/watch?v=2bYIRcO-gwg

Scatterdice

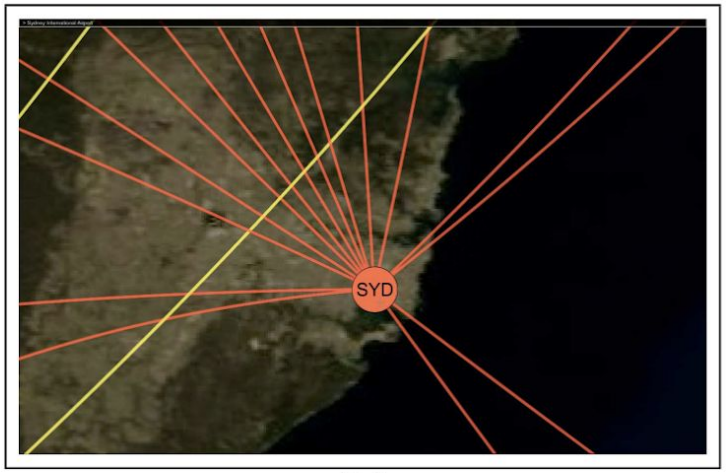


https://www.youtube.com/watch?v=2bYIRcO-gwg

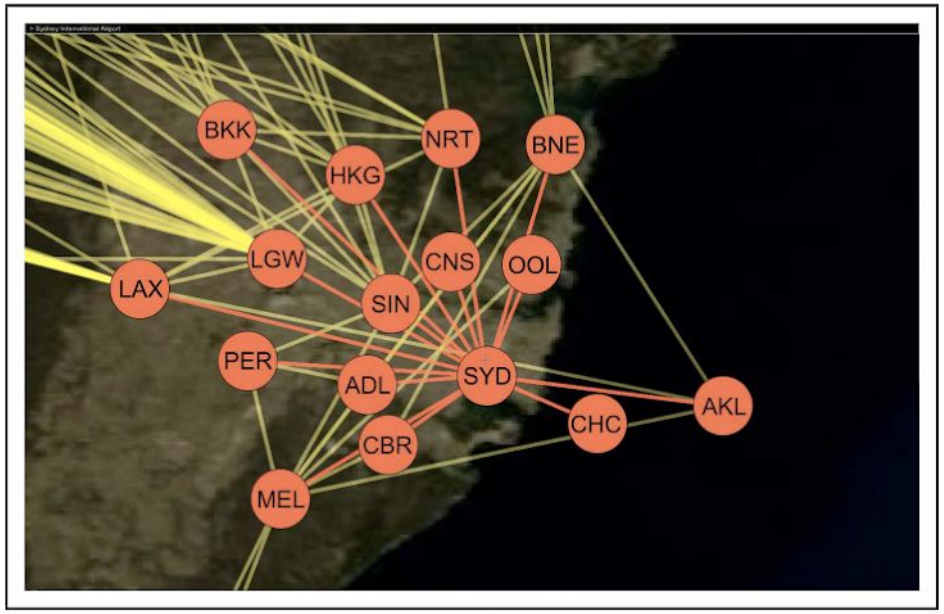
Bring and go (for networks)



(a)

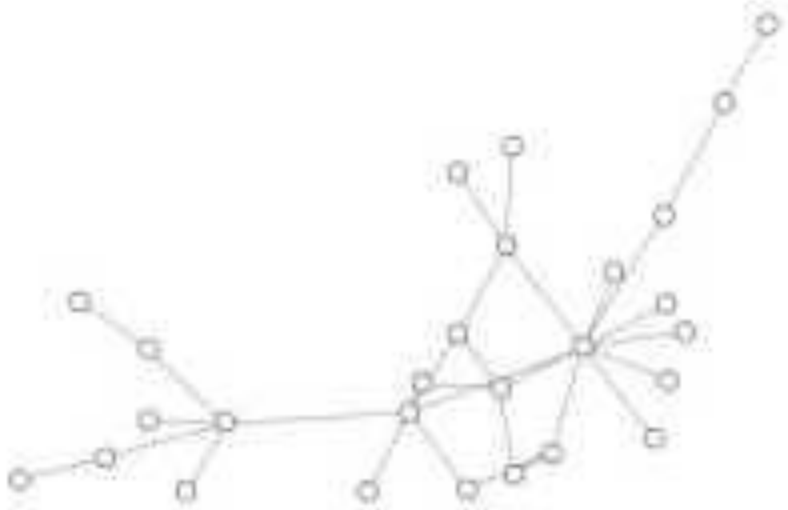


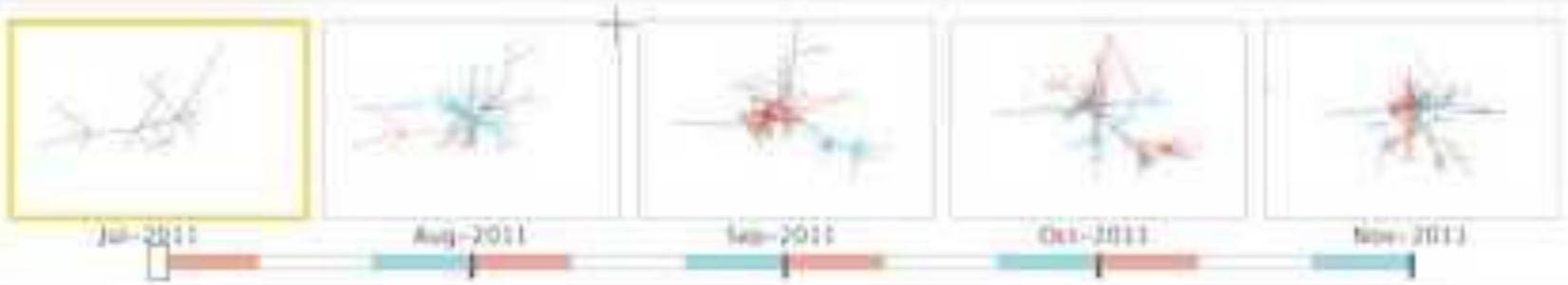
(b)



(c)

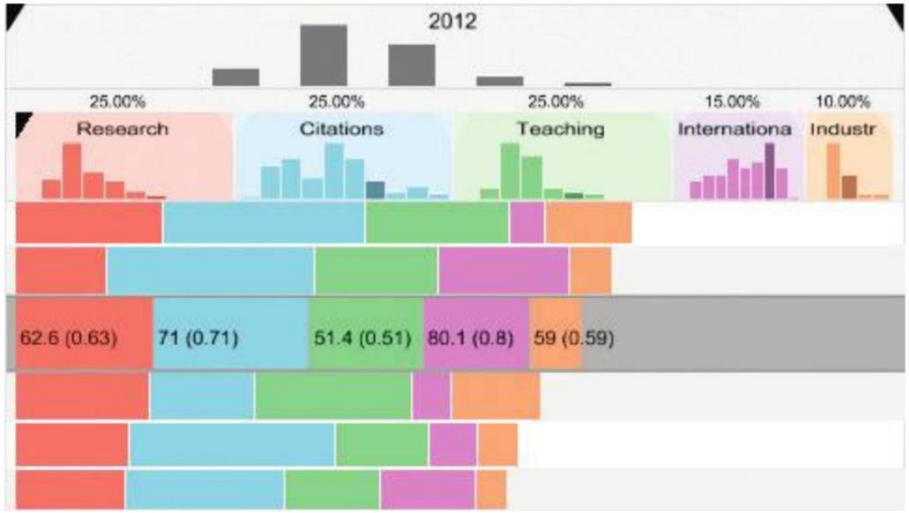
Temporal Navigation



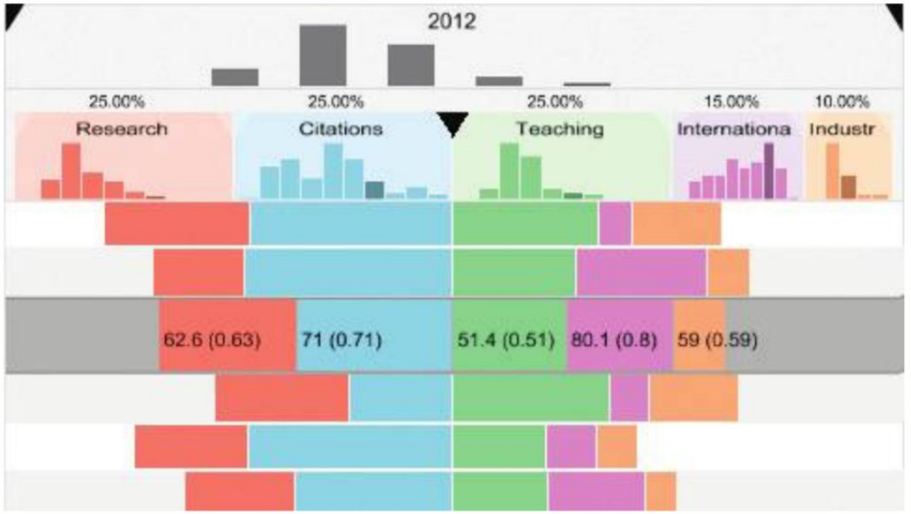


View Configuration

Stacked Bar Charts



(a)



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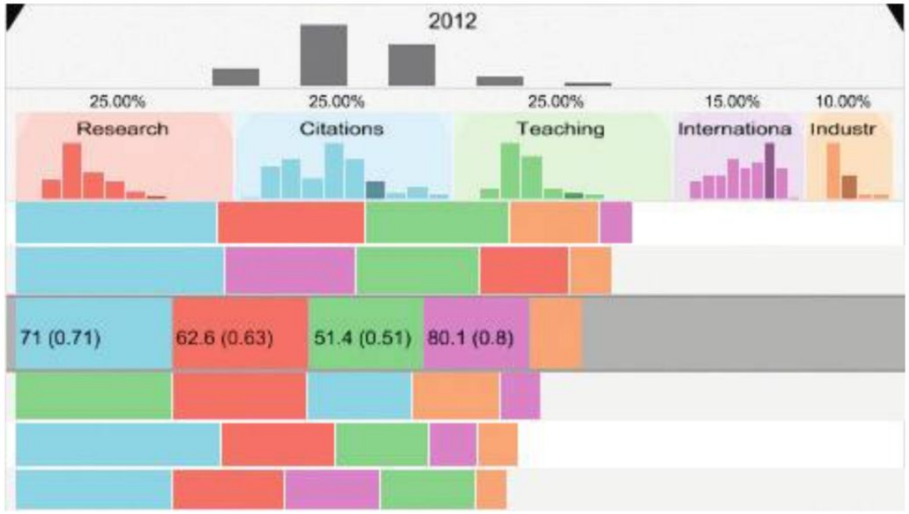

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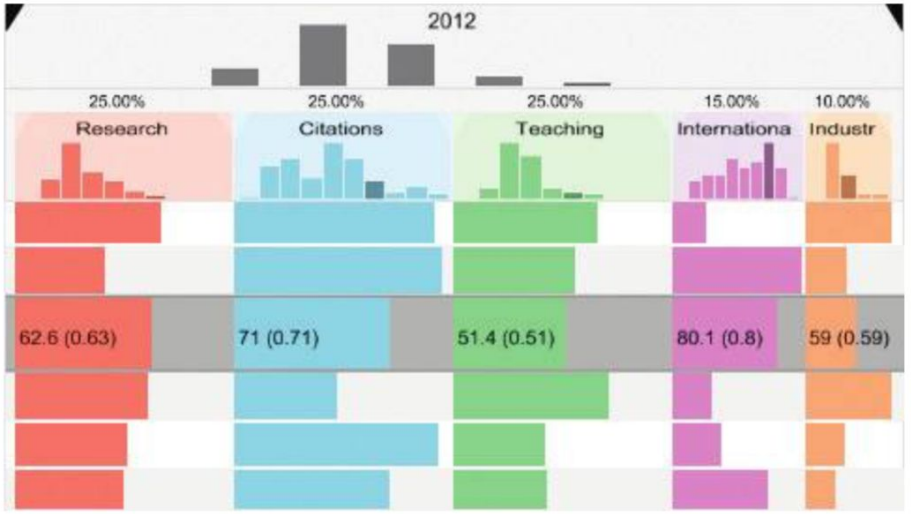
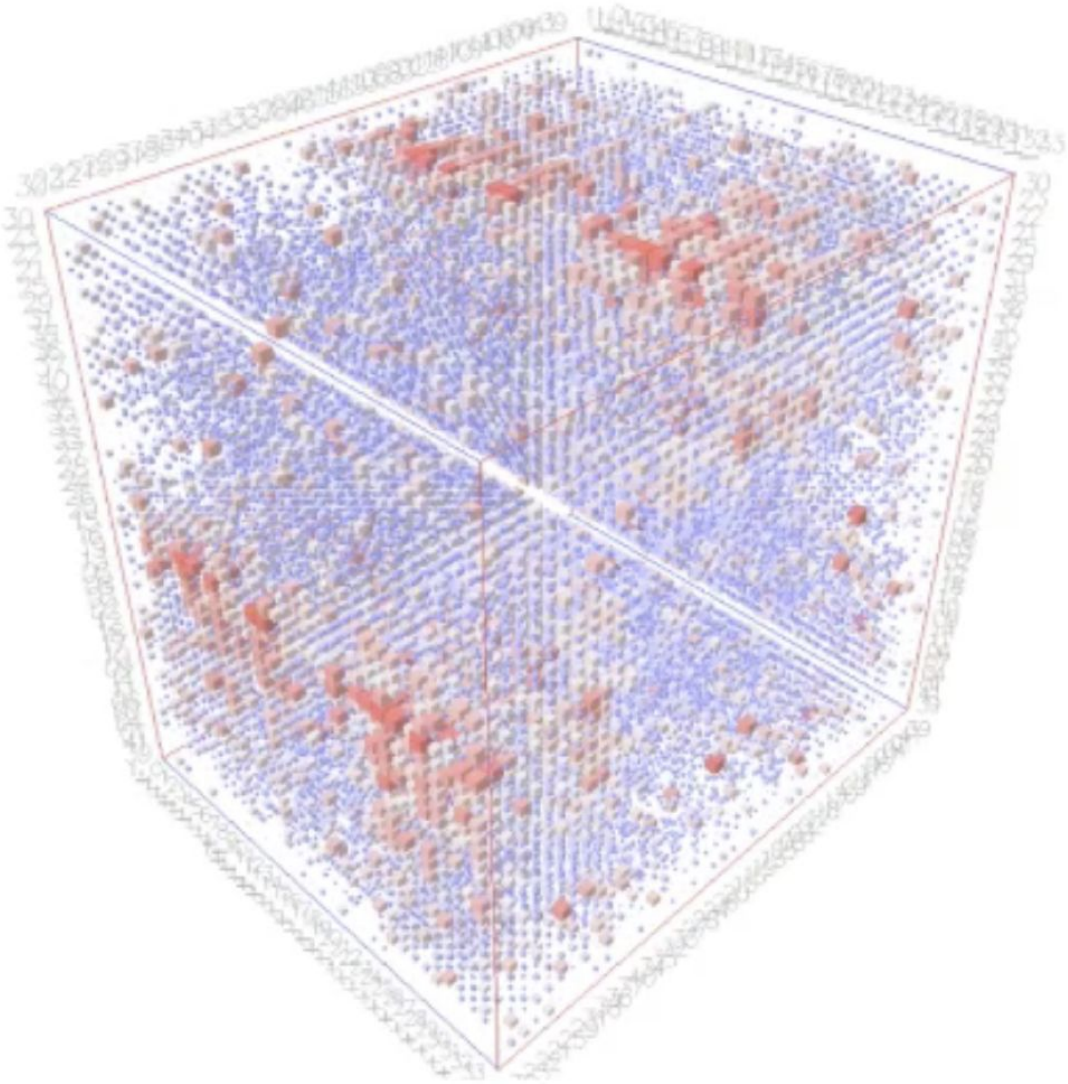
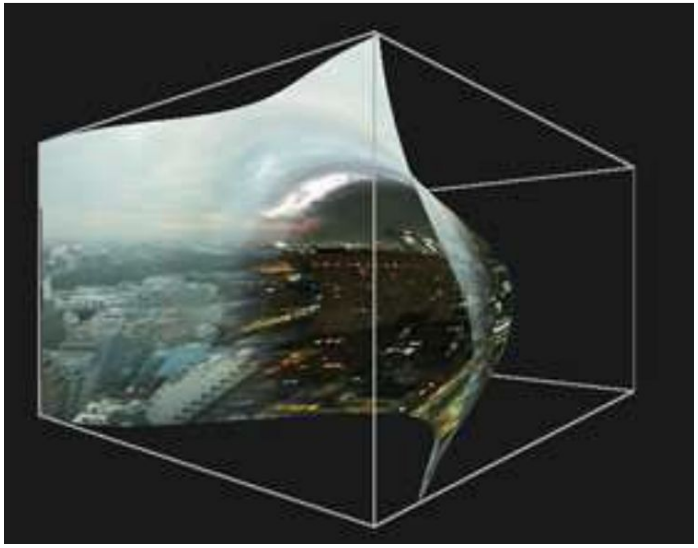


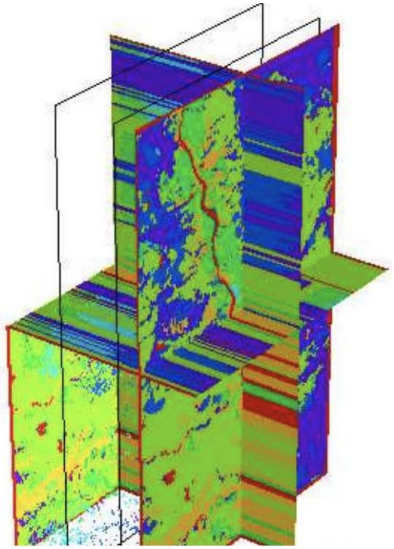
(d)

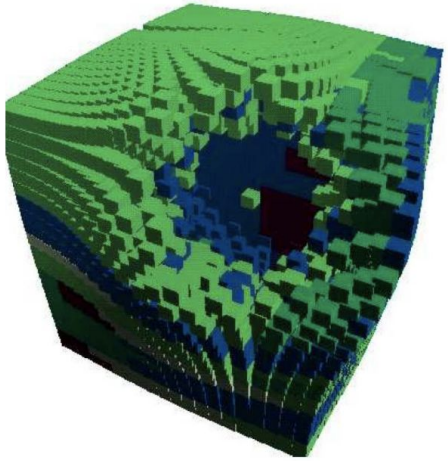
Space Time Cube

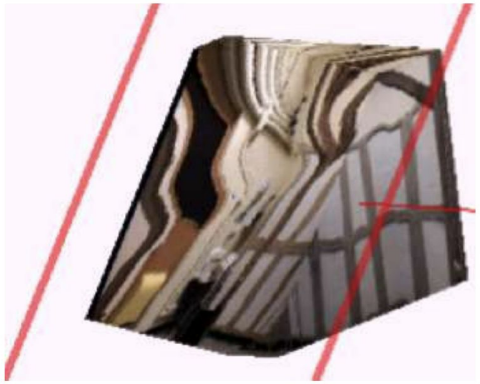


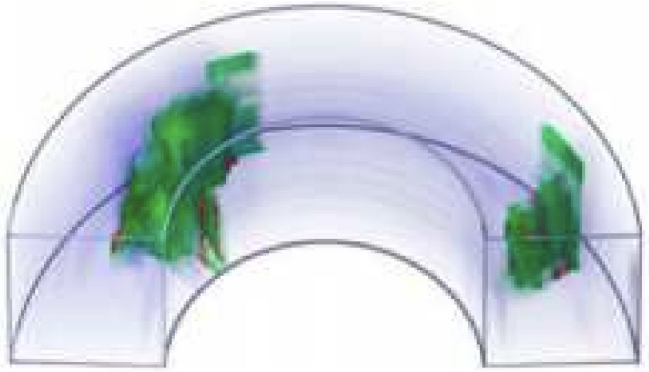
Interactive Exploration

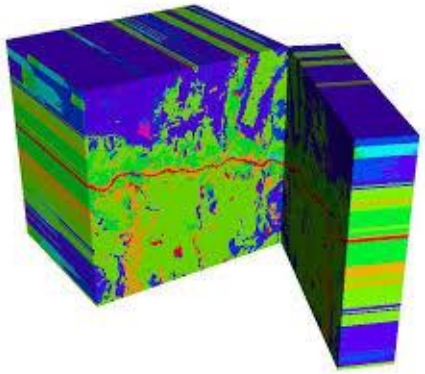




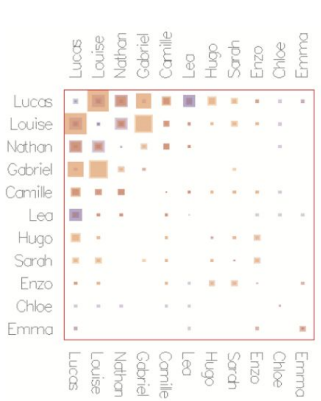




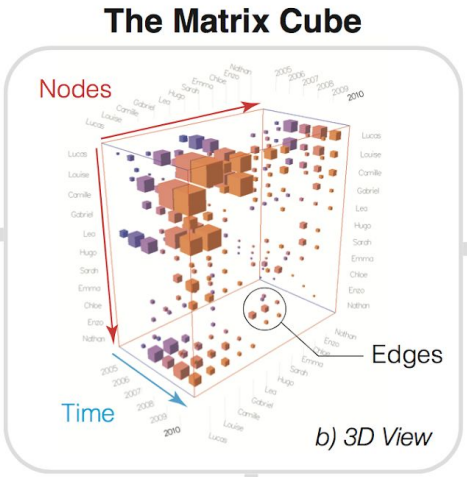


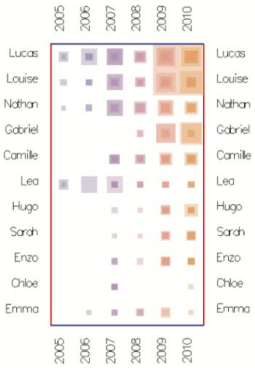


Space Time Cubes

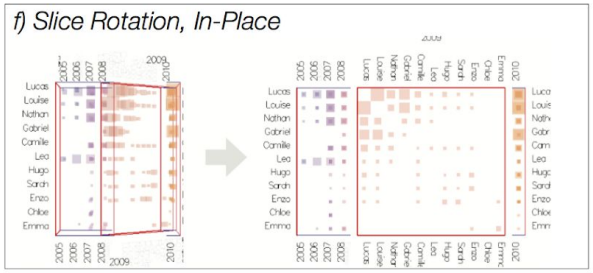


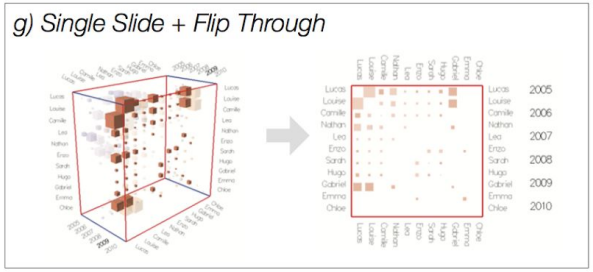
a) Rotation and Time Projection



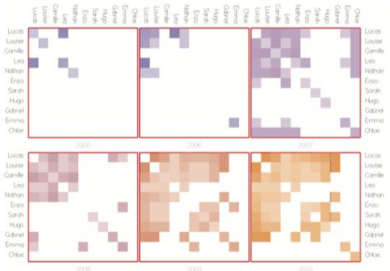


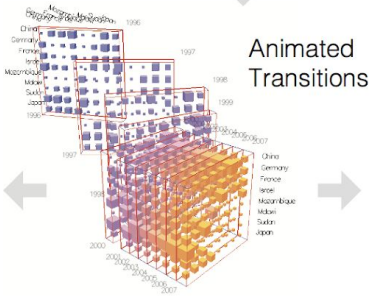
c) Rotation and Node Projection



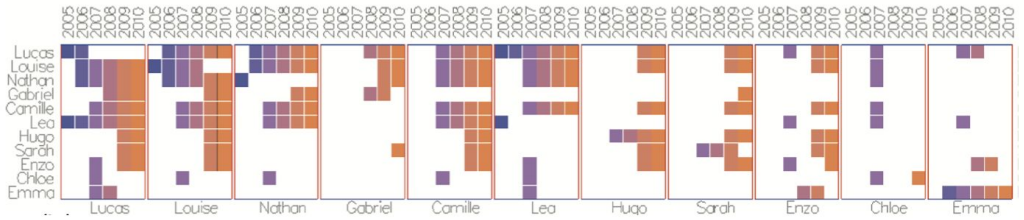


d) Time Small Multiples

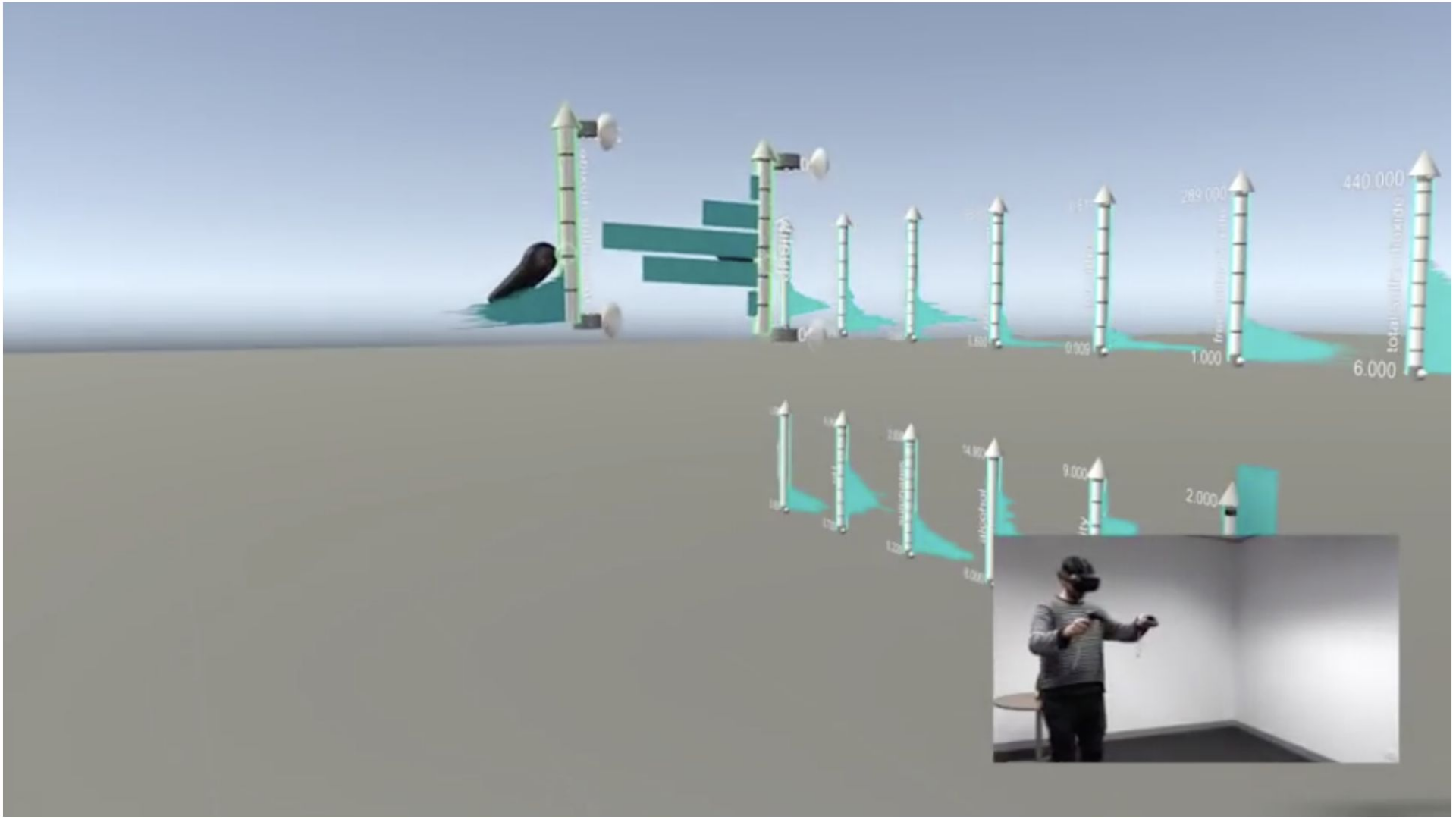




e) Node Small Multiples



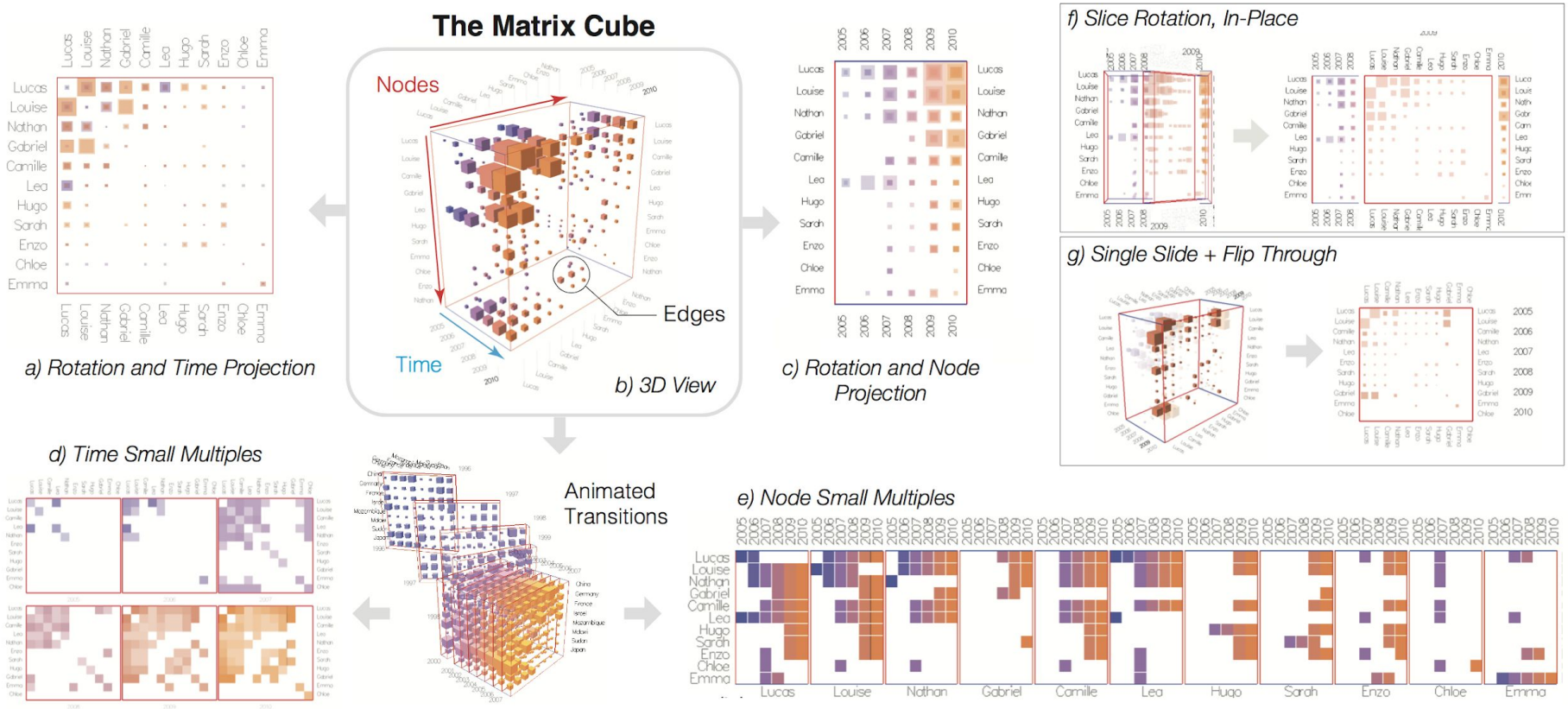
Imaxis



https://www.youtube.com/watch?v=hxqJJ934Reg&feature=youtu.be

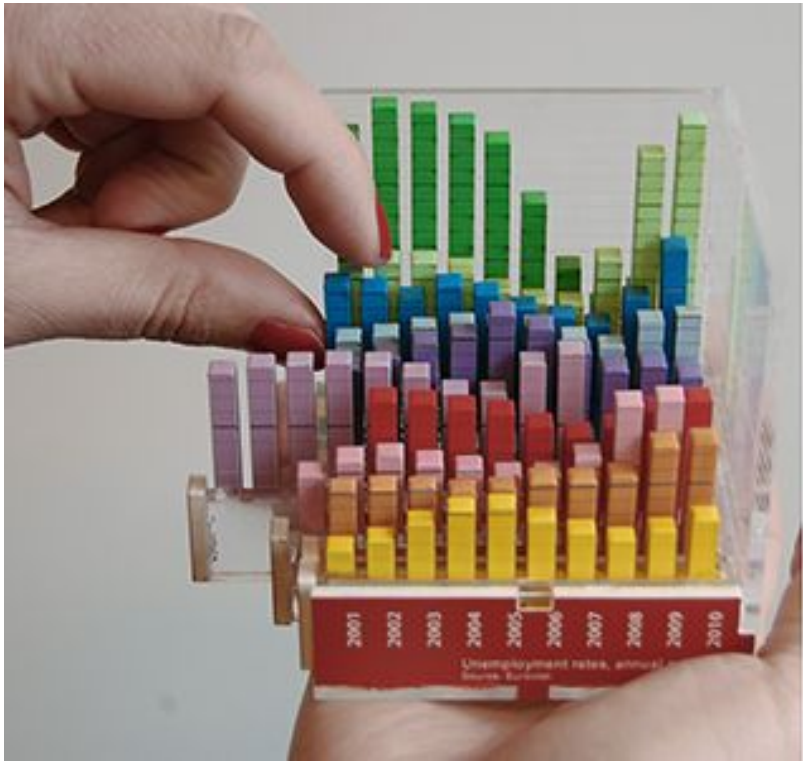
"Try first without interaction"

Balance visualizations and interaction



Data physicalization

Data Physicalizations

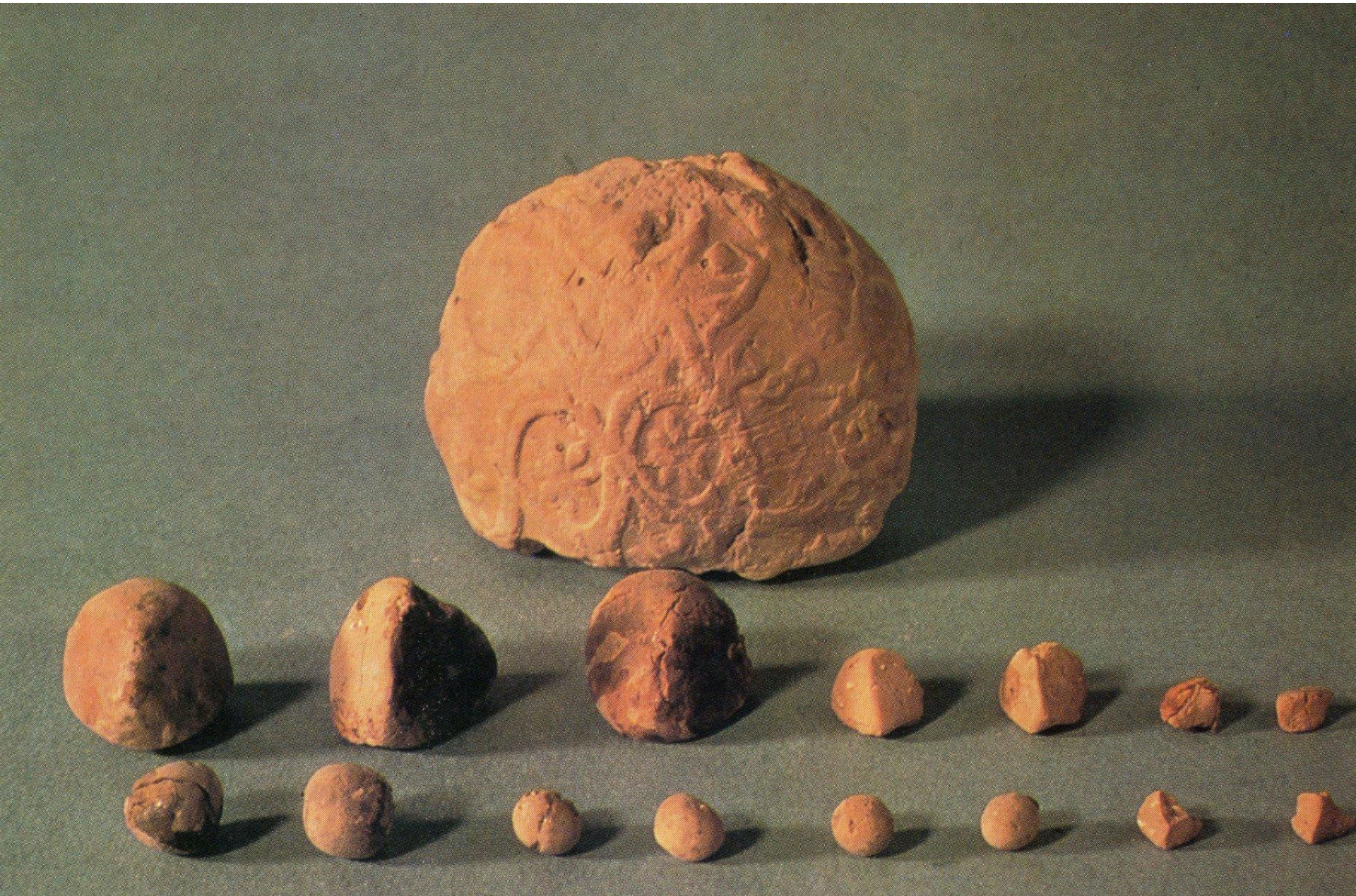


A data physicalization (or simply physicalization) is a physical artifact whose geometry or material properties encode data

- Active perception
- Depth perception
- Haptic senses
- Playfullnes and cognition
- Data in the real world

Jansen, Y., Dragicevic, P., Isenberg, P., Alexander, J., Karnik, A., Kildal, J., ... & Hornbæk, K. (2015, April). Opportunities and challenges for data physicalization. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 3227-3236). ACM.

Tokens

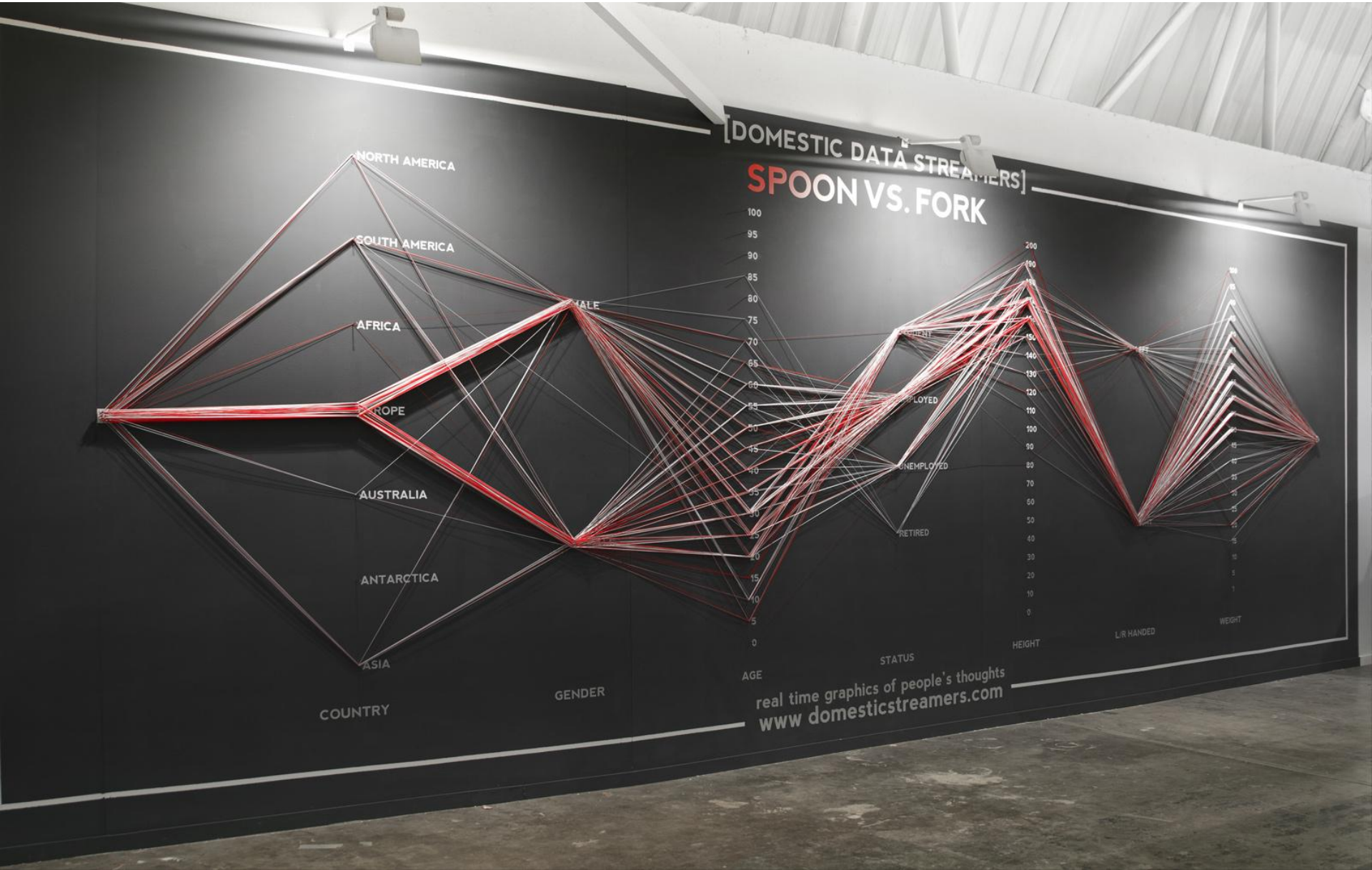


Physical (http://dataphys.org/list)

Münster Congestion Visualization

http://dataphys.org/list/congestion-visualization/

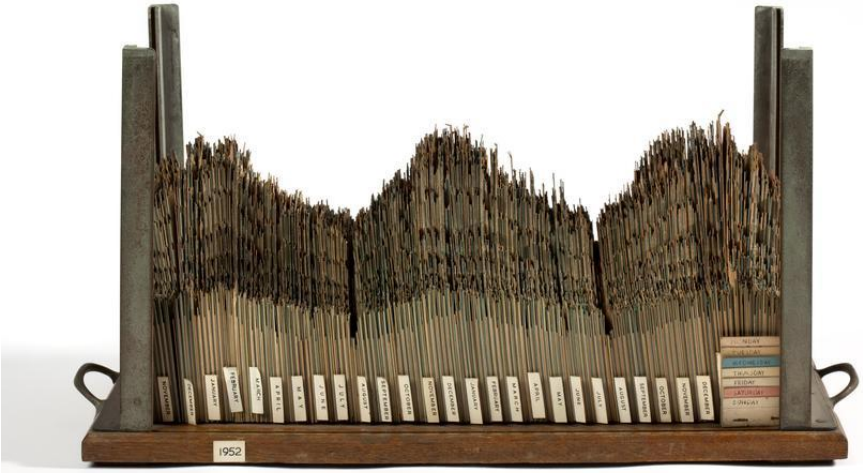
Interactivity



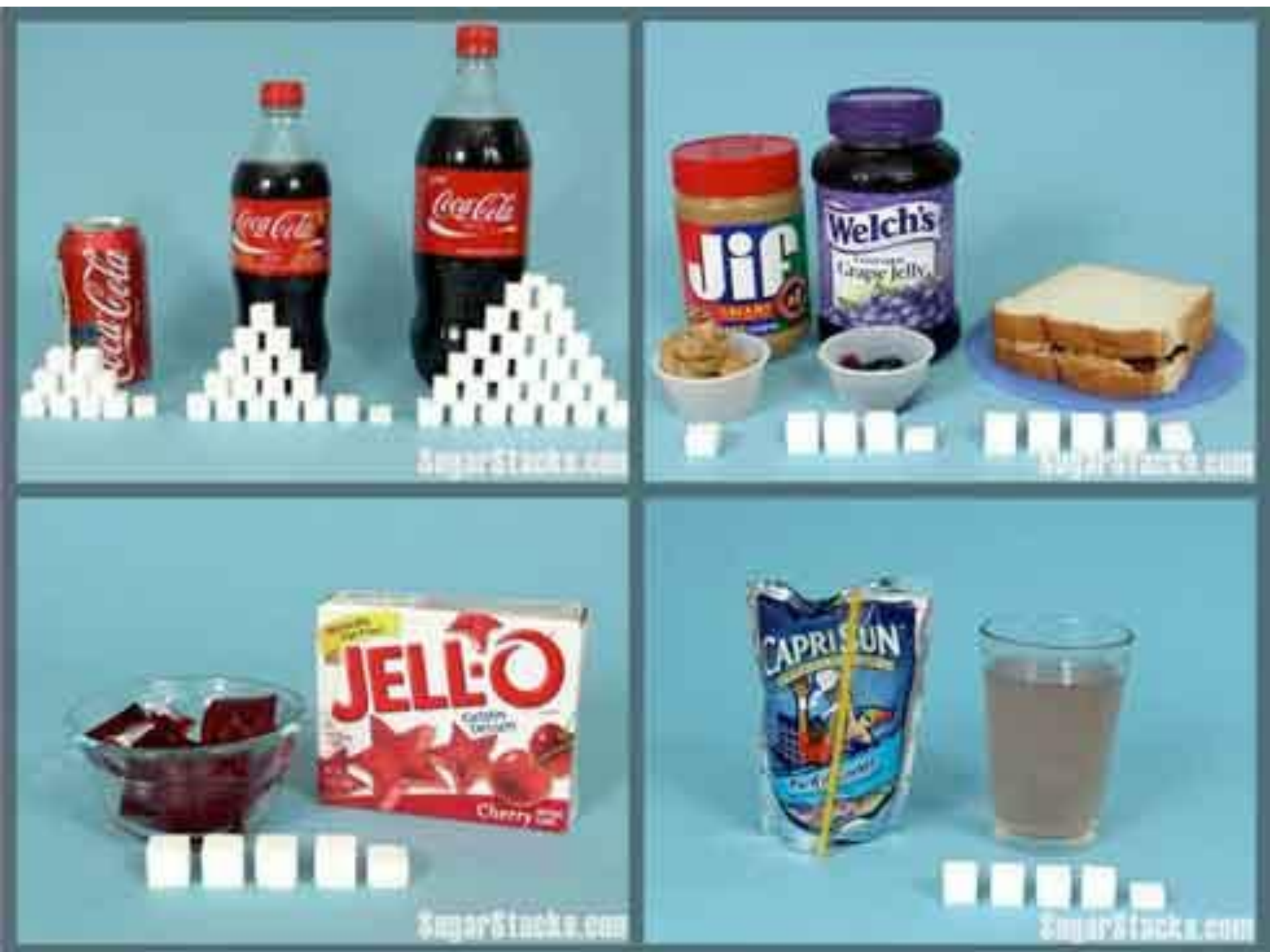

LONDON
MEXICO CITY
MEXICO CITY

1957
1971
1984
1993
AREA

Electricity generated and demanded (1951)



http://dataphys.org/list/electricity-generated-or-demanded/


Coca-Cola
Coca-Cola
Coca-Cola
JIF
Welch's
Grape Jelly
JELL-O
Cherry
CAPRI SUN

DataPhys List (*http://dataphys.org/list*)

List of Physical Visualizations

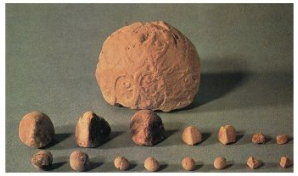
and Related Artifacts

This is a chronological list of physical visualizations and related artifacts, maintained by Pierre Dragicevic and Yvonne Jansen. Thanks to our contributors. Feel free to post a general comment or if you know of another interesting physical visualization, please **submit it**!

This list currently has 327 entries. See recent additions. You can also get notified of new entries through Twitter.

Gallery view | Passive physical visualizations (190) | Active physical visualizations (35) | Physical models (33) | Measuring instruments (11) | Interactive installations (7) | Enabling technologies (23) | Other (6) | Uncertain (22)

5500 BC – Mesopotamian Clay Tokens



The earliest data visualizations were likely physical: built by arranging stones or pebbles, and later, clay tokens. According to an eminent archaeologist (Schmandt-Besserat, 1999): "Whereas words consist of immaterial sounds, the tokens were concrete, solid, tangible artifacts, which could be handled, arranged and rearranged at will. For instance, the tokens could be ordered in special columns according to types of merchandise, entries and expenditures; donors [...]

Added by **Pierre Dragicevic**. Category: **Passive physical visualization**. Tags: anthropology, archaeology, clay tokens, mesopotamians, rearrangeable

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2600 BC – Inca Quipus

Quipus were complex assemblies of knotted ropes that were used in South America as a data storage device and played an important role in the Inca administration. Only a handful of specialists could use and decipher them. Their meaning mostly remains a mystery but it seems that color, relative position of knots, knot types and rope length were used to encode categorical and quantitative [...]