

# Space/Order

**Lecture 8 CPSC 533C, Fall 2004**  
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# Reading

The Visual Design and Control of Trellis Display

R. A. Becker, W. S. Cleveland, and M. J. Shyu

Journal of Computational and Statistical Graphics, 5:123–155. (1996).

<http://cm.bell-labs.com/stat/doc/trellis.jcgs.col.ps>

Envisioning Information. Edward Tufte. Graphics Press, 1990.

Chapter 4: Small Multiples, Chapter 6: Narratives of Space and Time

VisDB: Database Exploration using Multidimensional Visualization,

Daniel A. Keim and Hans-Peter Kriegel, IEEE CG&A, 1994

<http://www.dbs.informatik.uni-muenchen.de/dbs/projekt/papers/visdb.ps>

## More Reading

The Table Lens: Merging Graphical and Symbolic Representations in an Interactive Focus +

Context Visualization for Tabular Information

Ramana Rao and Stuart K. Card, SIGCHI '94, pp. 318–322.

<http://citeseer.ist.psu.edu/545353.html>

The Elements of Graphing Data, William S. Cleveland, Hobart Press 1994.

# Space and Order

## Trellis

- find order automatically: main-effects
- dot plots, matrices of small multiples

## VisDB

- choice of spacefilling pixel pattern

## small multiples

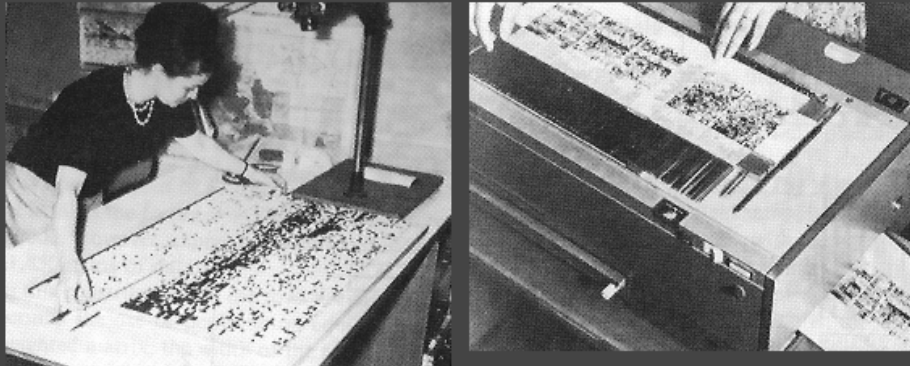
- side by side better than comparing to memory

## narratives of space and time

- using spatial position to encode temporal data
- derived spaces

# Reordering: Bertin

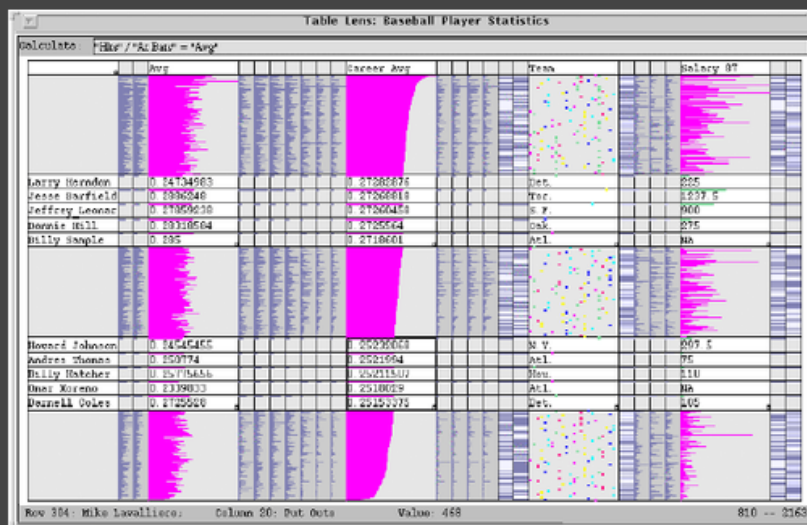
reorderable matrices – manually!



[Bertin, Graphics and Graphic Information Processing, p 34]

# Reordering: Table Lens

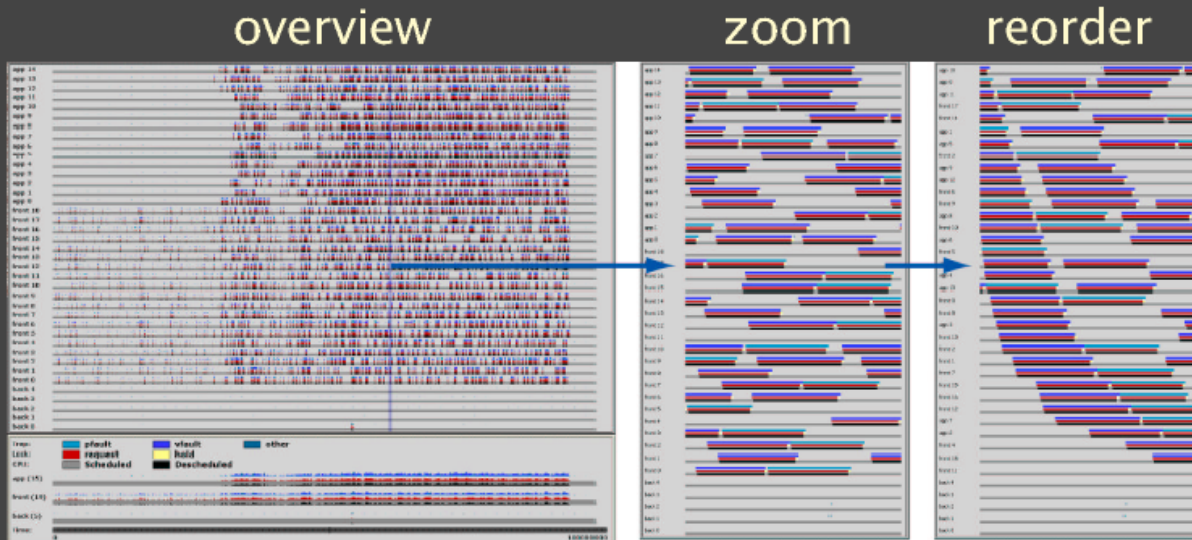
select column to sort  
demos available at [www.tablelens.com](http://www.tablelens.com)



we'll discuss focus+context aspects later

# Interactive Ordering: Rivet

performance analysis of parallel system

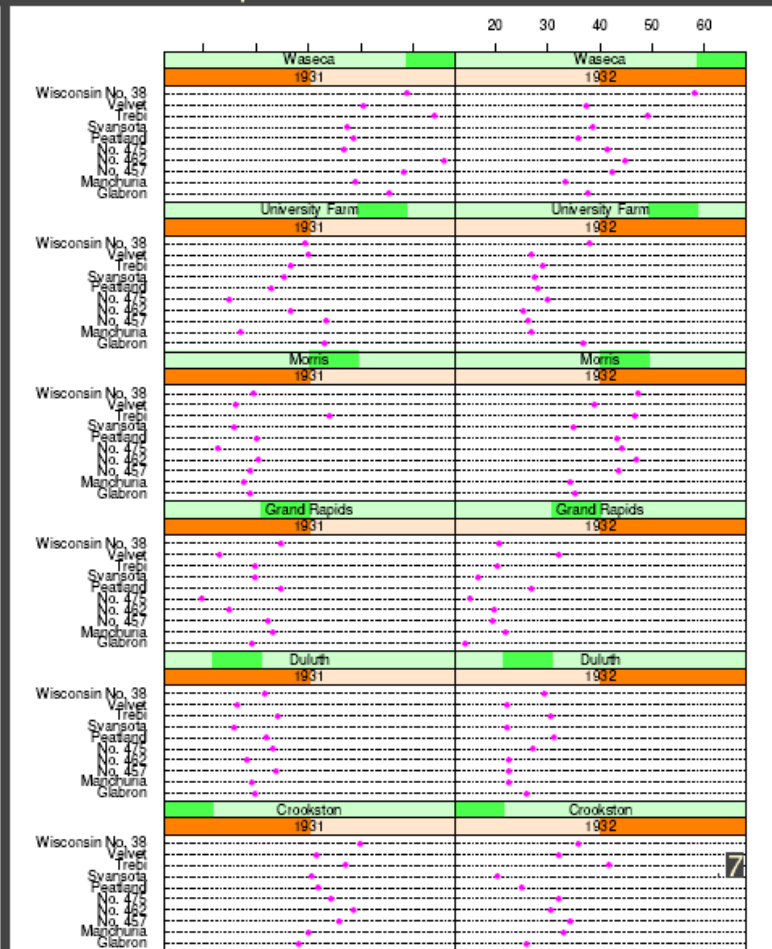
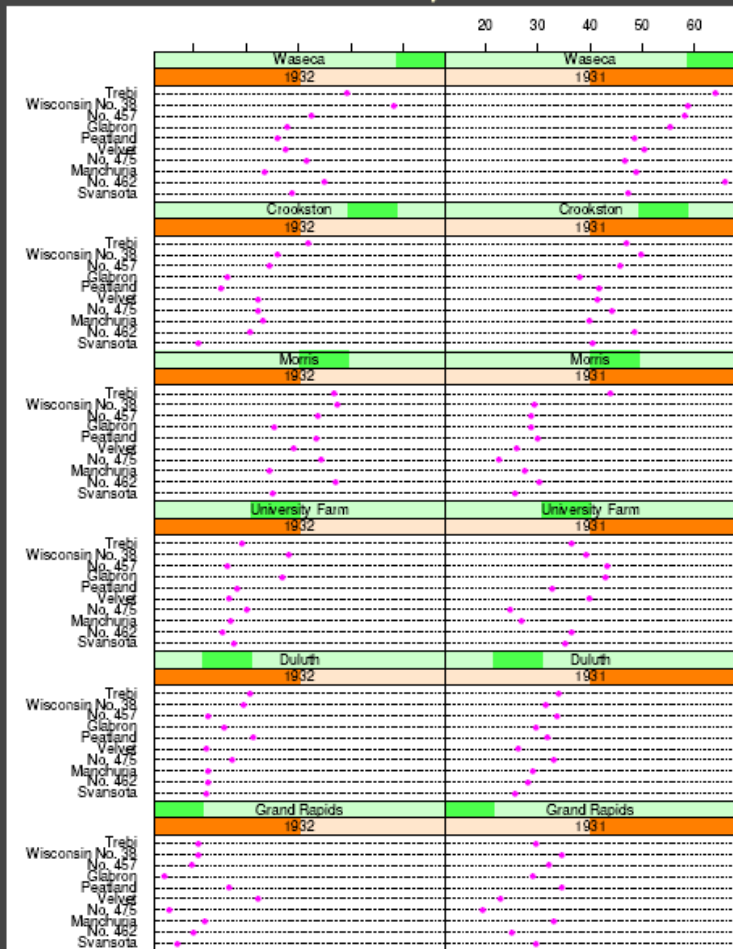


[Bosch, Performance Analysis and Visualization of Parallel Systems Using SimOS and Rivet: A Case Study, HPCA6, 2000. [graphics.stanford.edu/papers/rivet\\_argus](http://graphics.stanford.edu/papers/rivet_argus)]

# Automatic Ordering Support: Trellis

main-effects: sort by median value

alphabetical



# Statistically-Based Techniques

derived spaces

partial residuals

- differencing taking means into account

conditioning intervals

equal count algorithm

- shingles (overlapping windows) not bins

banking to 45 degrees

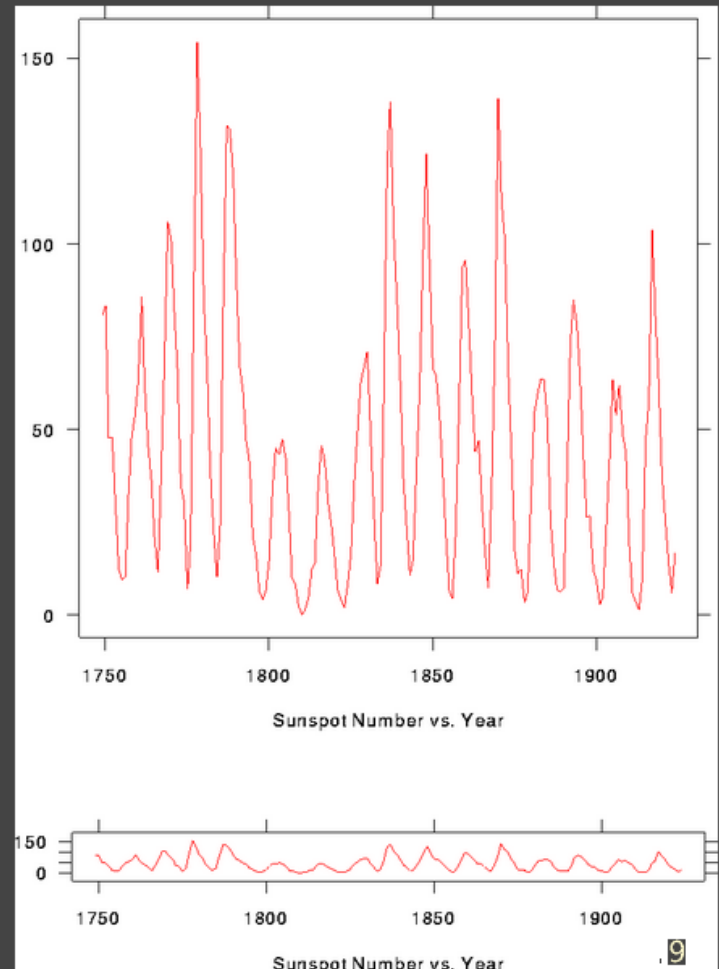
- take psychophysics into account



# Banking to 45 Degrees

principle: most accurate judgement at 45 degrees

pick aspect ratio (height/width) accordingly



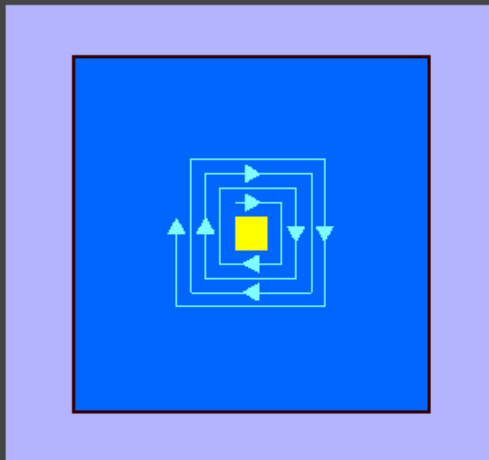
# Spacefilling Pixels: VisDB

how to draw pixels?

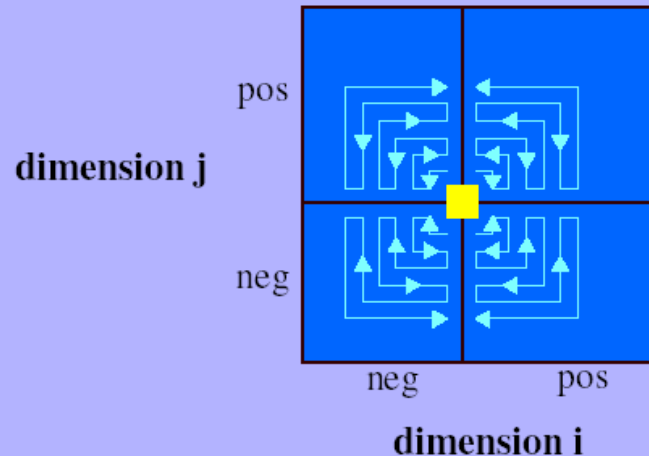
- sort, color by relevance

local ordering

spiral



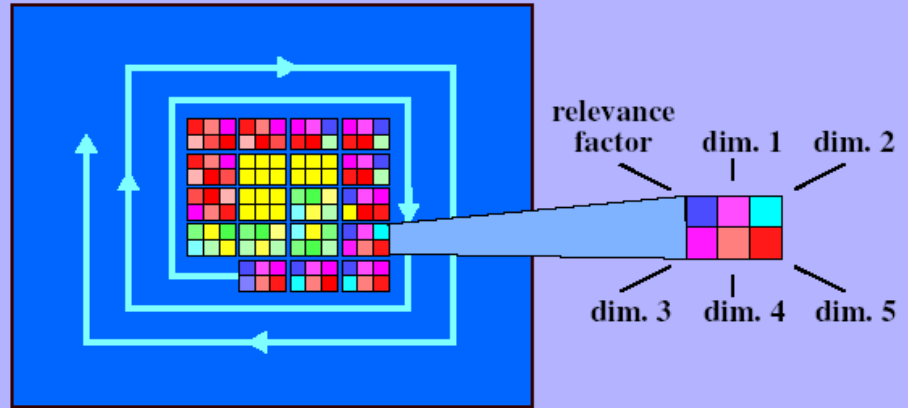
2D



# VisDB Windows

group dimensions

separate dimensions

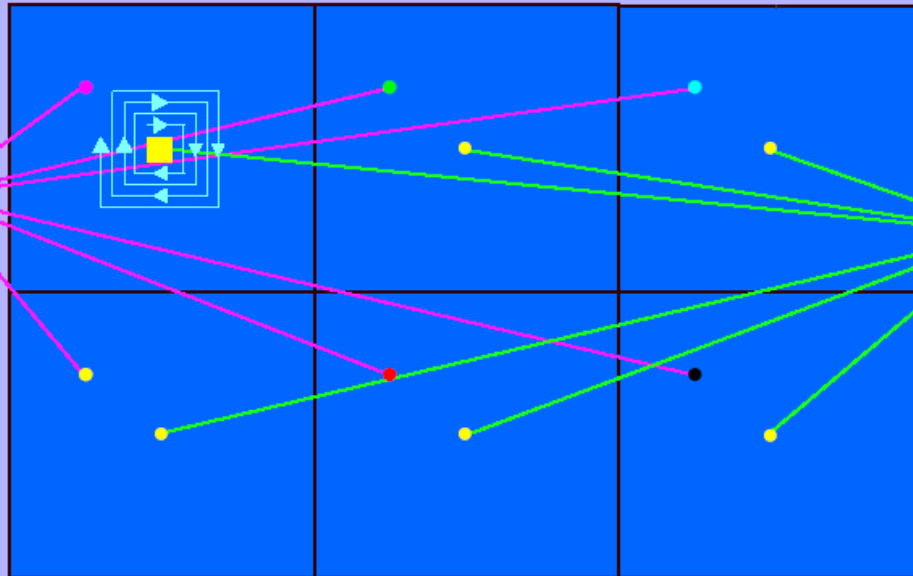


relevance factor

dimension 1

dimension 2

one data item  
approximately  
fulfilling the  
query

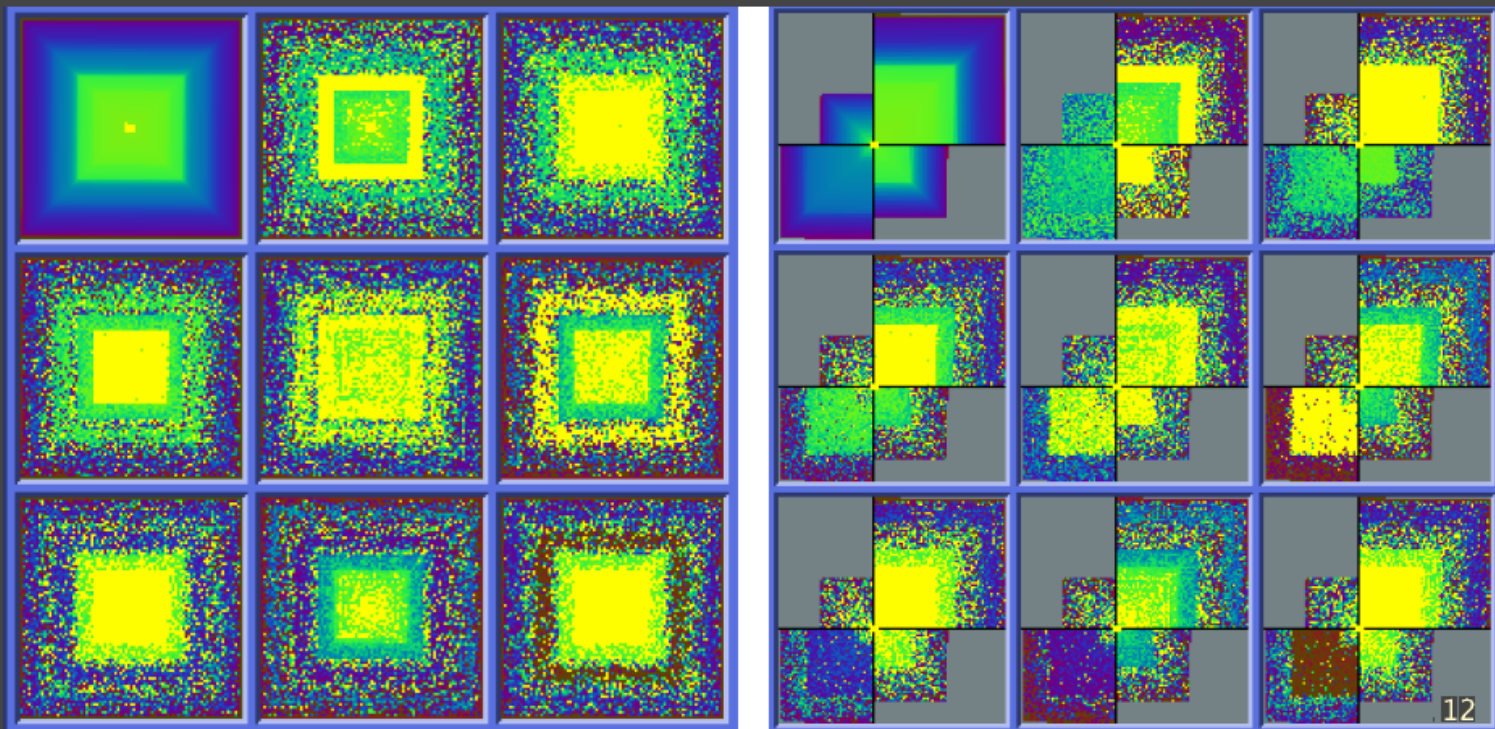


one data item  
fulfilling the  
query

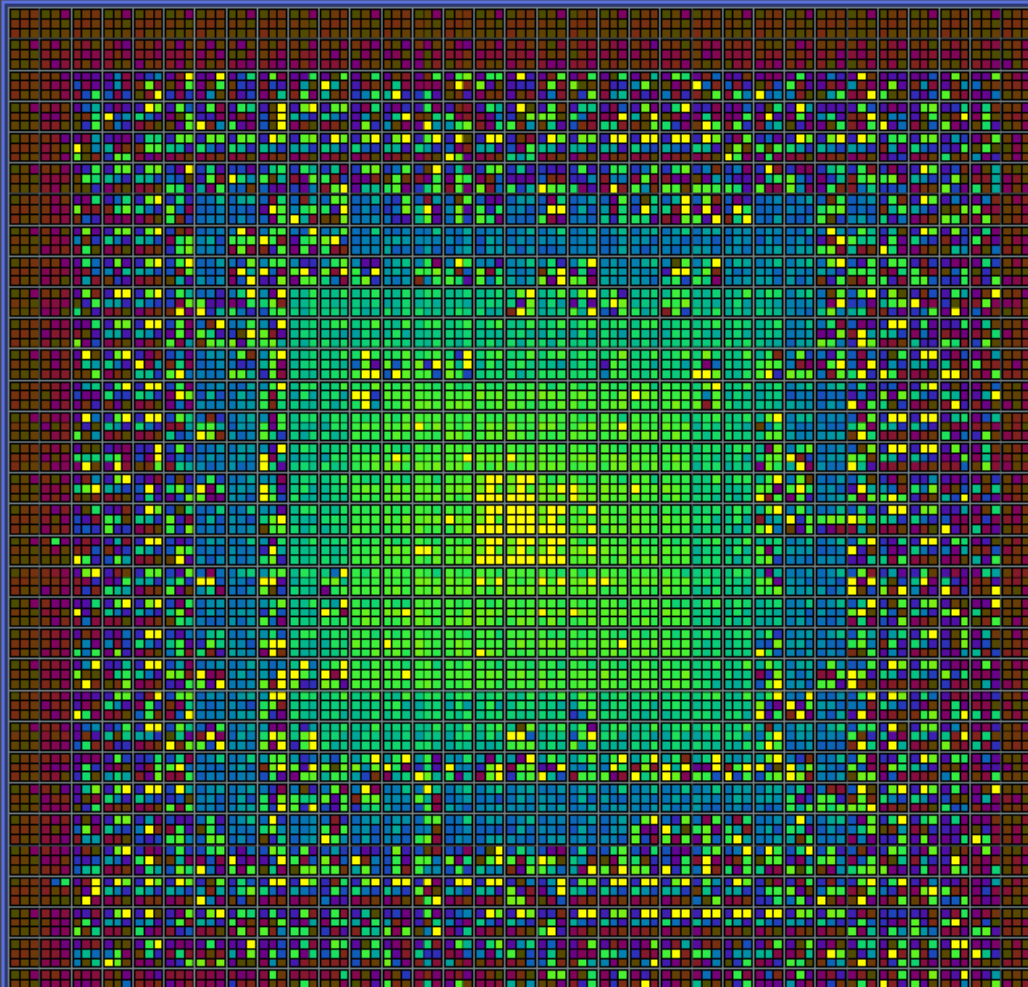
# VisDB Results: Separate Dimensions

spiral

2D



# VisDB Results: Grouped Dimensions



# Space vs. Time: Showing Change



animation: show time using temporal change

- good: show process



[[www.geom.uiuc.edu/docs/outreach/oi/evert.mpg](http://www.geom.uiuc.edu/docs/outreach/oi/evert.mpg)]

# Space vs. Time: Showing Change



animation: show time using temporal change

- good: show process
- good: compare by flipping between two things



[[www.geom.uiuc.edu/docs/outreach/oi/evert.mpg](http://www.geom.uiuc.edu/docs/outreach/oi/evert.mpg)] [[www.astroshow.com/ccdpho/pluto.gif](http://www.astroshow.com/ccdpho/pluto.gif)]

# Space vs. Time: Showing Change



animation: show time using temporal change

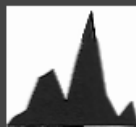
- good: show process
- good: compare by flipping between two things
- bad: compare between many things



[[www.geom.uiuc.edu/docs/outreach/oi/evert.mpg](http://www.geom.uiuc.edu/docs/outreach/oi/evert.mpg)]



[[www.astroshow.com/ccdpho/pluto.gif](http://www.astroshow.com/ccdpho/pluto.gif)]





# Space vs. Time: Showing Change



animation: show time using temporal change

- good: show process
  - good: compare by flipping between two things
  - bad: compare between many things
- interference from intermediate frames



[[www.geom.uiuc.edu/docs/outreach/oi/evert.mpg](http://www.geom.uiuc.edu/docs/outreach/oi/evert.mpg)] [[www.astroshow.com/ccdpho/pluto.gif](http://www.astroshow.com/ccdpho/pluto.gif)]

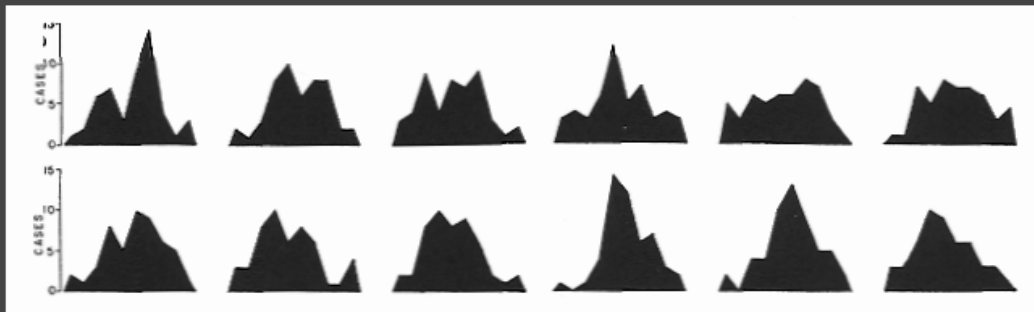


# Space vs. Time: Showing Change



small multiples: show time using space

- overview: show each time step in array
- compare: side-by-side easier than temporal  
external cognition instead of internal memory
- general technique, not just for temporal changes

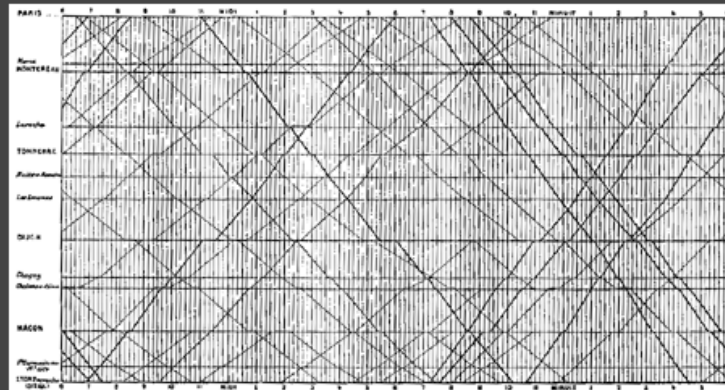


# Derived Spaces: Slope

narrative of space and time

Marey train schedule, 1885

- horizontal line length: stop length
- slope: speed
- intersection: time/place of crossing



[Tuftes I p 31, [www.nap.edu/html/hs\\_math/images/tl\\_f8.gif](http://www.nap.edu/html/hs_math/images/tl_f8.gif)]

# Linked Derived Spaces

Feature Detection in Linked Derived Spaces

· [video]

infovis vs. scivis

# Ordering

space for time

LifeLines

· [video]

Dynamic Timelines

· [video]

# Ordering

time for time  
space for space

Superscalar Processes

- [video]