

Using Space Effectively: 2D II

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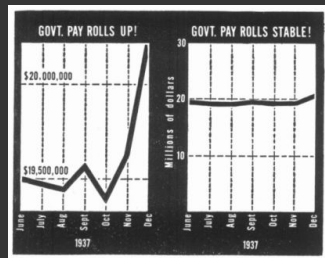
CS 294-10: Visualization
Spring 2011

Topics

- Displaying data in graphs
- Banking to 45 degrees
- Fitting data and depicting residuals
- Graphical calculations
- Zooming and distortion

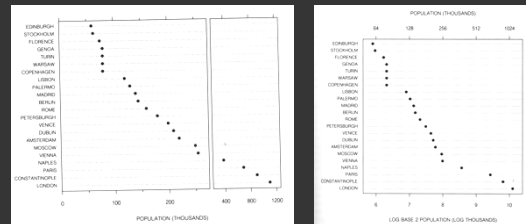
Effective use of space

Which graph is better?



Government payrolls in 1937 [How To Lie With Statistics. Huff 93]

Scale break vs. Log scale



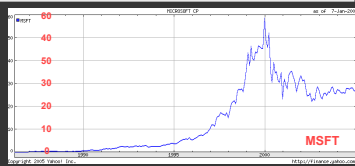
[Cleveland 85]

- Both increase visual resolution
- Log scale - easy comparisons of all data
- Scale break - more difficult to compare across break

Linear scale vs. Log scale

Linear scale

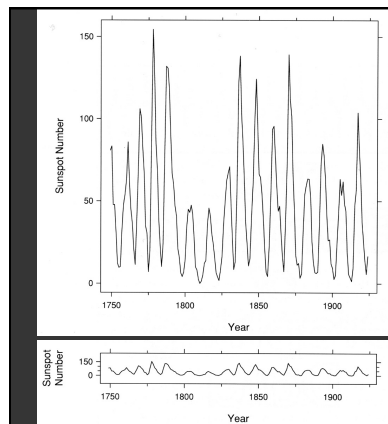
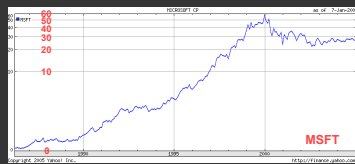
- Absolute change



Log scale

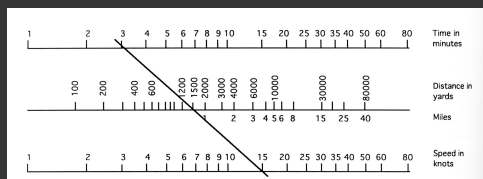
- Small fluctuations
- Percent change

$$d(10, 20) = d(30, 60)$$



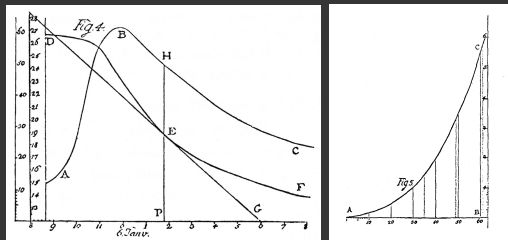
William S. Cleveland
*The Elements of
Graphing Data*

Nomograms

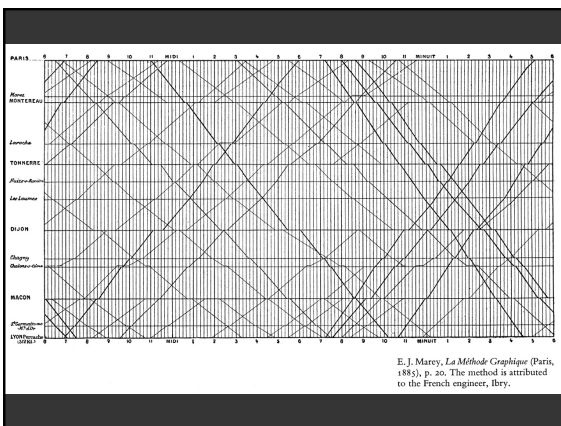


Sailing: The Rule of Three

Lambert's graphical construction



Johannes Lambert used graphs to study the rate of water evaporation as function of temperature [from Tuttle 83]



Announcements

Final project

Design new visualization method

- Pose problem, Implement creative solution

Deliverables

- Implementation of solution
- 8-12 page paper in format of conference paper submission
- 2 design discussion presentations

Schedule

- Project proposal: 3/14
- Project presentation: 4/4
- Final paper and presentation: TBD

Grading

- Groups of up to 3 people, graded individually
- Clearly report responsibilities of each member

Zooming



Eames' Powers of Ten [http://www.powersof10.com/]

Overview + details

[Hornbaek et al. 2002]

Interactive zooming

Pad++ [Bederson and Hollan 94]

Pad++

Semantic zooming

Change visual representations as zoom level changes

Figure 2: As you approach the calendar object the large scale display items fade out and disappear.

PAD [Perlin and Fox 93]

TableLens

[Rao & Card 94]

<http://www.youtube.com/watch?v=qWqTrRAC52U>

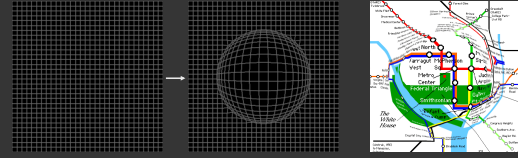
Datelens

[Bederson et al. 04]

Distortion

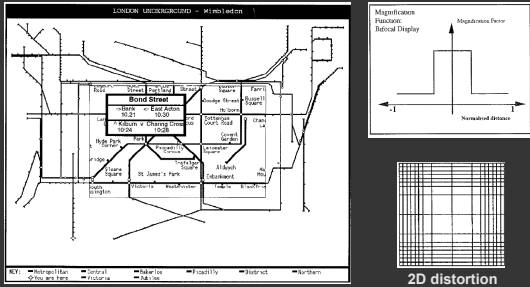
Single view detail + context

- Focus area – local details
- De-magnified area – surrounding context
- Like a rubber sheet with borders tacked down

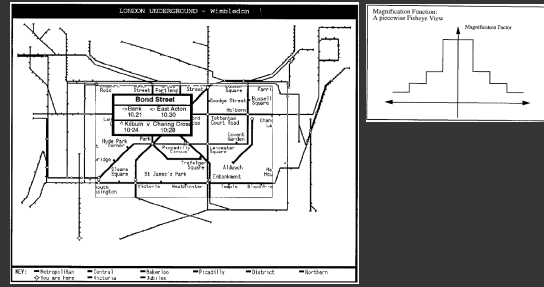


Nonlinear Magnification Infocenter (<http://www.cs.indiana.edu/~7E/keahay/research/nlm/nlm.html>)

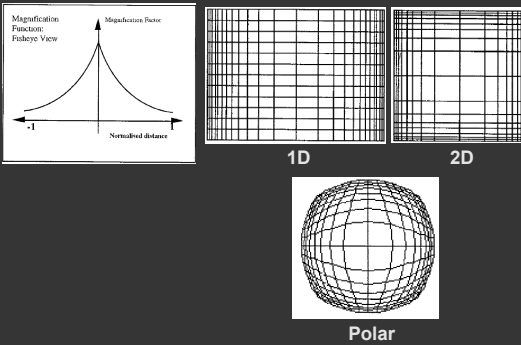
Bifocal display [Leung and Apperley 94]



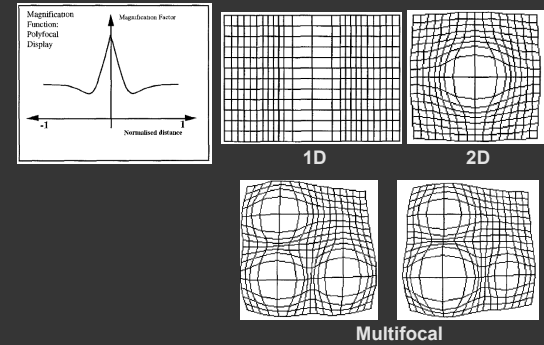
Multifocal display [Leung and Apperley 94]



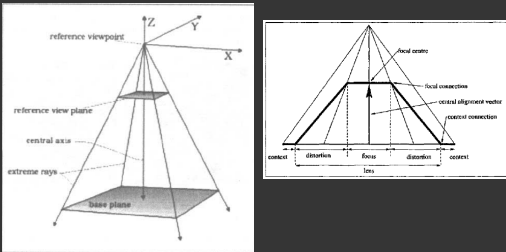
Fisheye [Leung and Apperley 94]



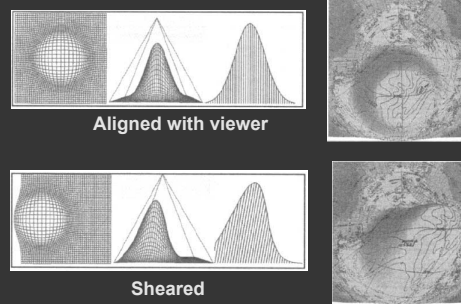
Nonlinear magnification [Leung and Apperley 94]



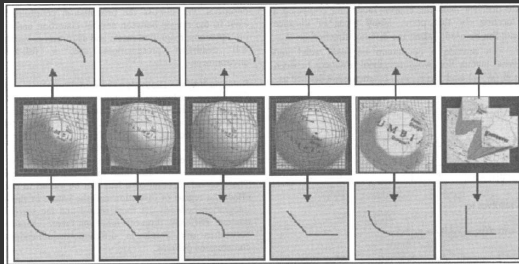
3D pliable surface [Carpendale & Montagnese 01]



Aligned and sheared [Carpendale & Montagnese 01]



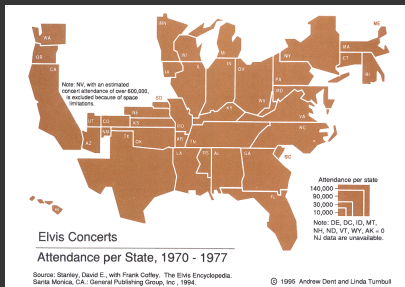
6 types of distortions [Carpendale & Montagnese 01]



Gaussian, Cosine, Hemisphere, Linear, Inverse Cosine and Manhattan. Top row shows transition from focus to distortion, bottom row from distortion to context.

Cartographic Distortions

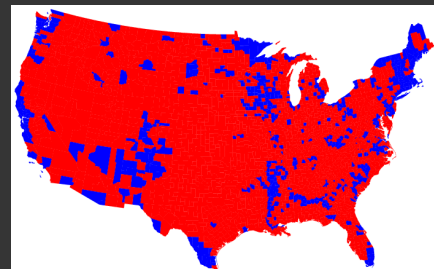
Cartograms: Distort areas



Scale area by data

[From Cartography, Dent]

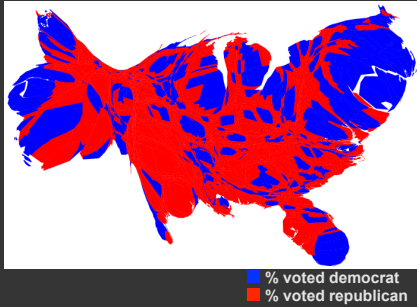
Election 2004 map



% voted democrat
% voted republican

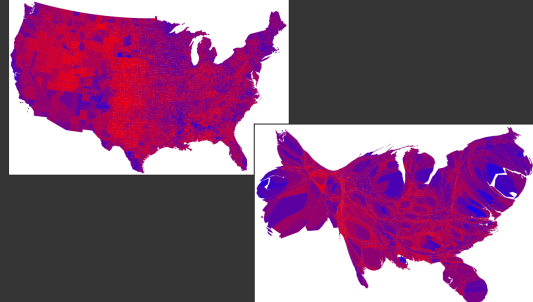
<http://www-personal.umich.edu/~mejn/election/>

Election 2004 map



<http://www-personal.umich.edu/~mejn/election/>

Election 2004 map



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Statistical map with shading

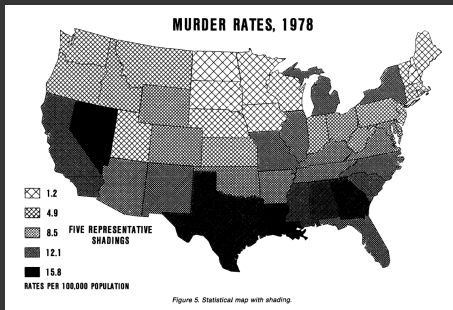
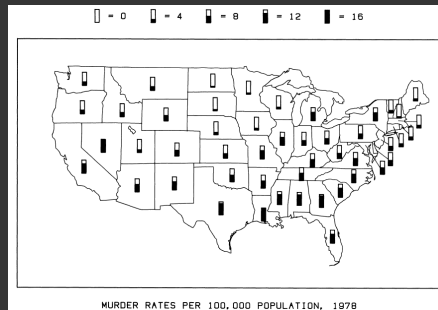


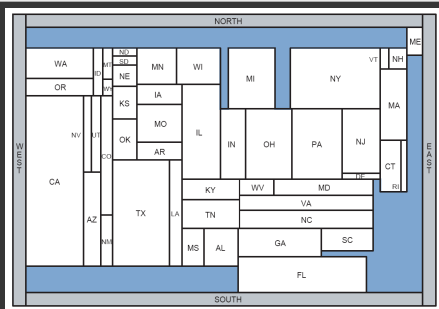
Figure 5. Statistical map with shading.
[Cleveland and McGill 84]

Framed rectangle chart



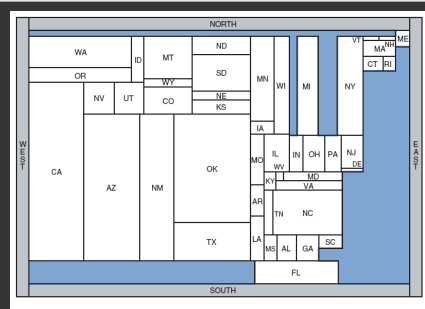
[Cleveland and McGill 84]

Rectangular cartogram



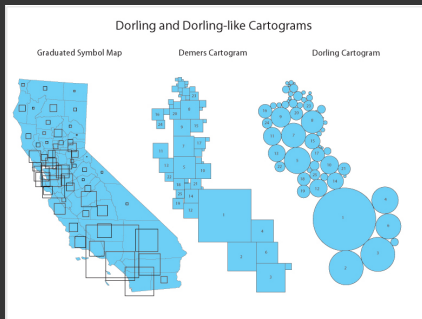
American population [van Kreveld and Speckmann 04]

Rectangular cartogram



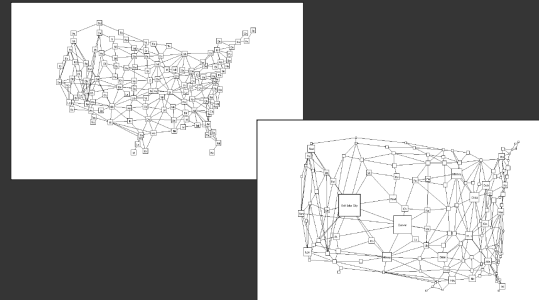
Native American population [van Kreveld and Speckmann 04]

Dorling cartogram



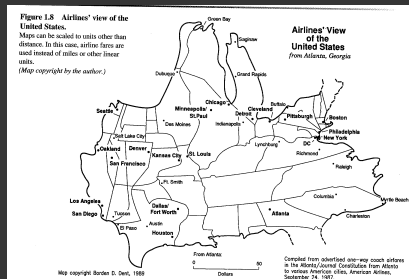
http://www.ncgia.ucsb.edu/projects/Cartogram_Central/types.html

States as nodes in a graph



Graphical fisheye views of graphs [Sarkar & Brown 92]

Distorting distances



Scale distance by data
[From *Cartography*, Dent]

London underground



<http://www.thetube.com/content/history/map.asp>

Comparison to geographic map



Summary

- Spatial layout is the most important visual encoding
- Geometric properties of spatial transforms support geometric reasoning
- Show data with as much resolution as possible
- Use distortions to emphasize important information