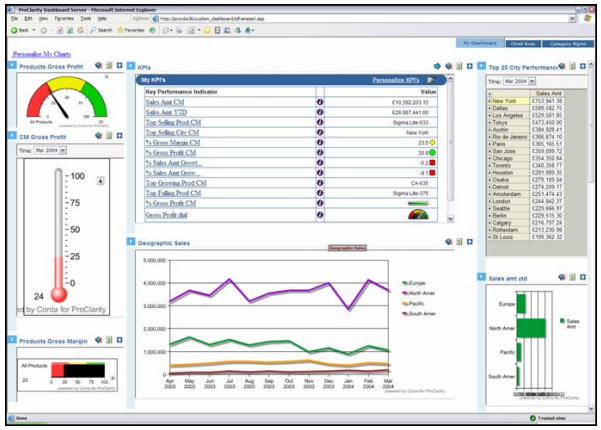
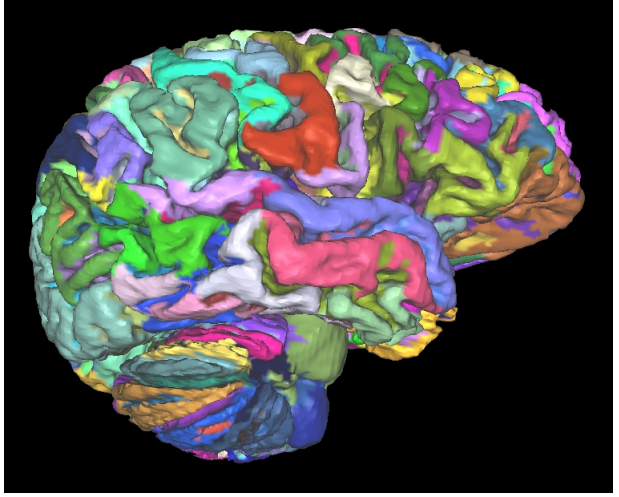


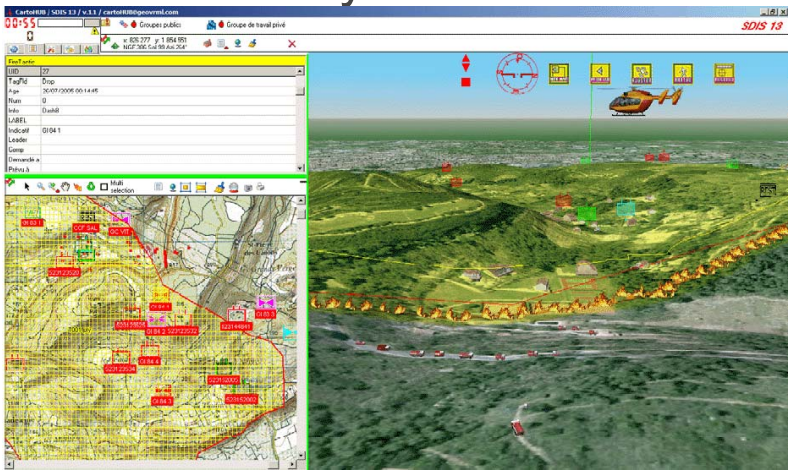


Knowledge Visualisation Introduction

Week 1 Lecture 1

IAT 814

Lyn Bartram



SCHOOL OF INTERACTIVE ARTS + TECHNOLOGY

Introductions

Instructor

- Lyn Bartram
- lyn@sfu.ca

Research

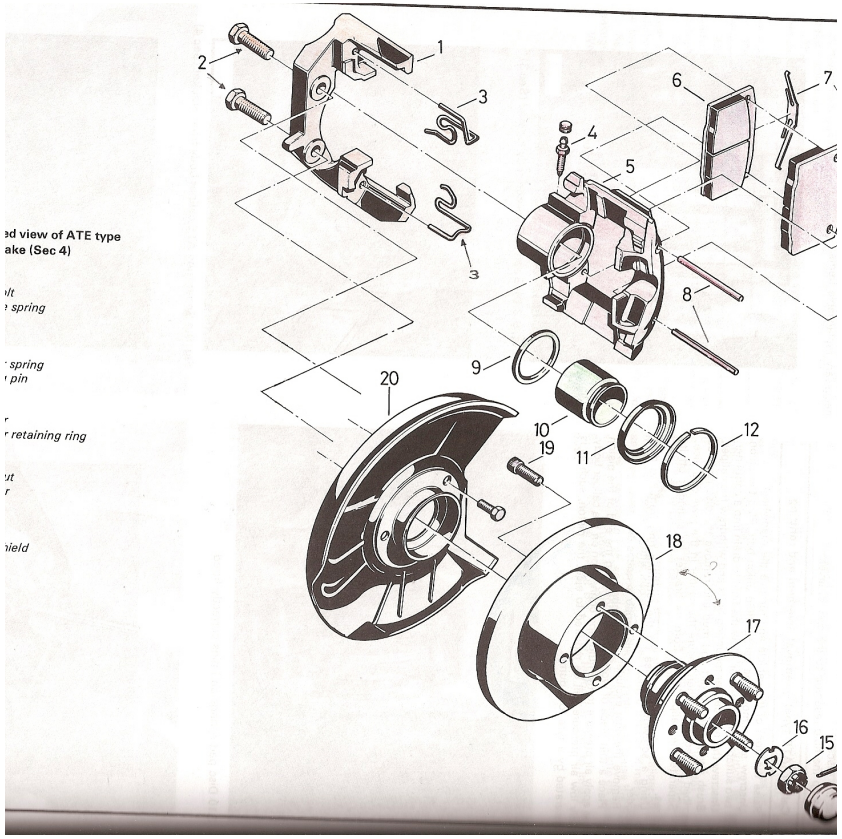
- Information visualization
- Perception, attention and visual representations
- Visualization for sustainable living/Ambient visualization
- Motion and Animation visual techniques
- And generally interactive visual systems

What is visualization?

Computer-based visualization systems provide visual representations of datasets designed to help people carry out tasks more effectively.

-- Tamara Munzner, 2014

What's the difference here?



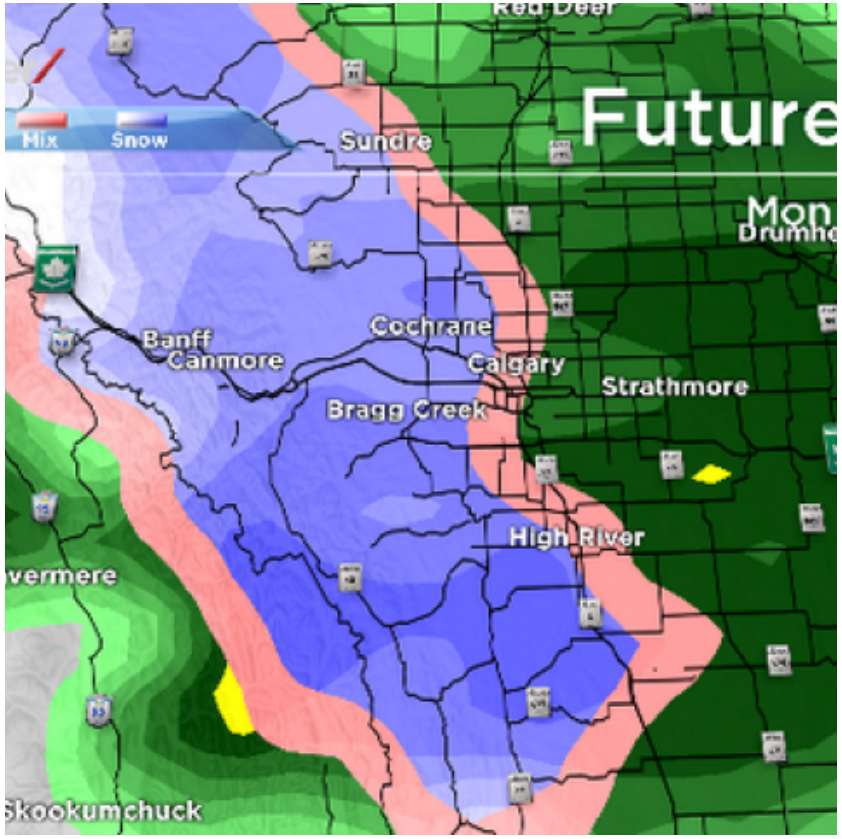


Illustration or visualization?

Illustration

- a visual representation (a picture or diagram) that is used to make some subject more pleasing or easier to understand

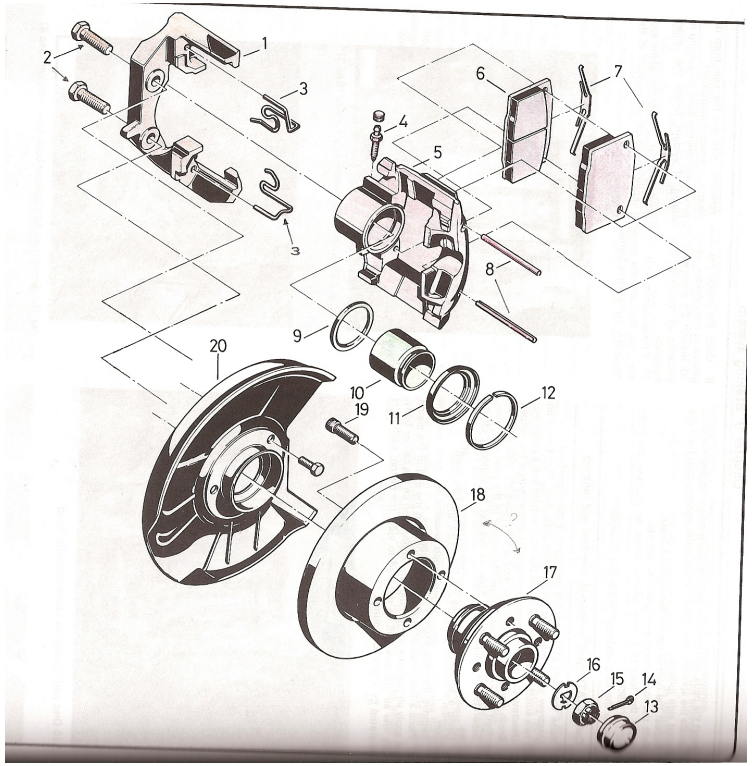
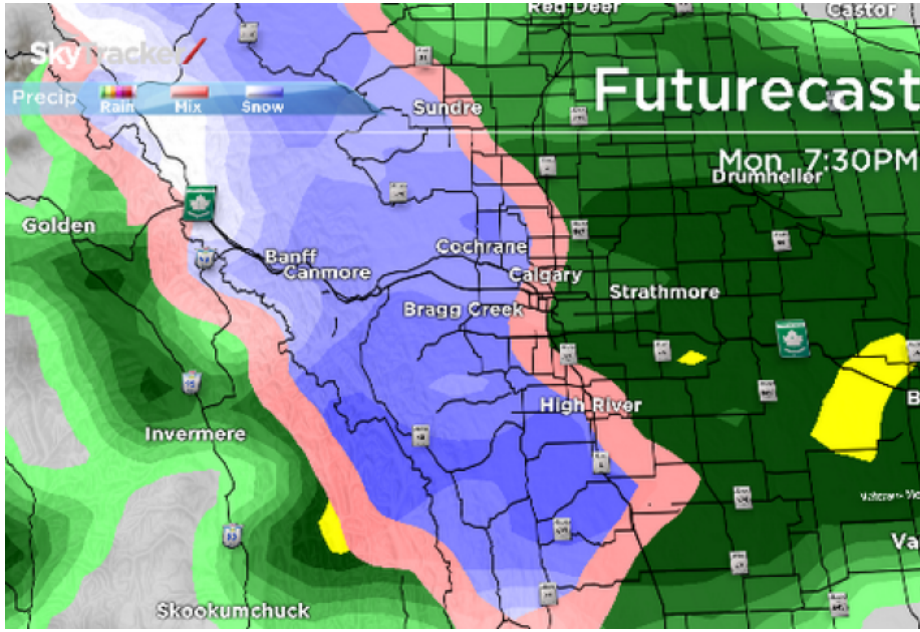


Illustration or visualization?

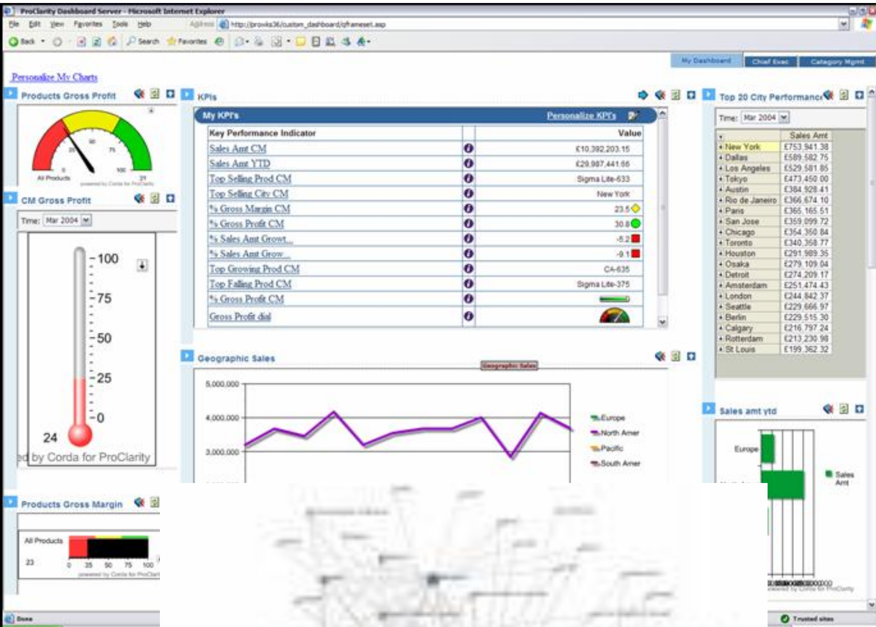
Visualization **communicates data**.

- from something that is abstract or at least not immediately visible (like the inside of the human body)….
- Visualization transforms from the invisible to the visible.

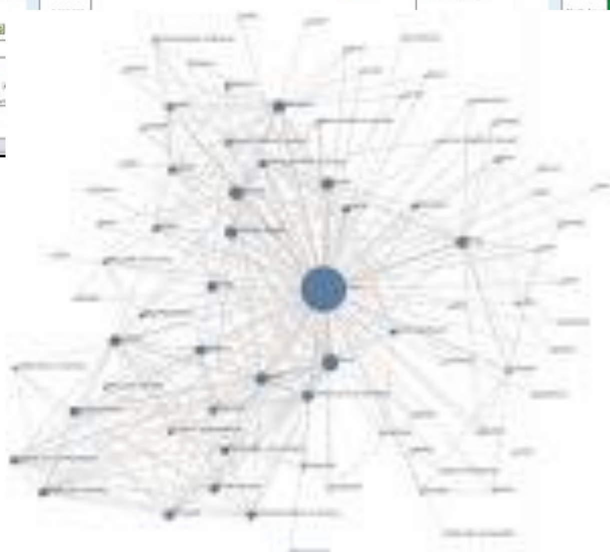
---- Robert Kosara

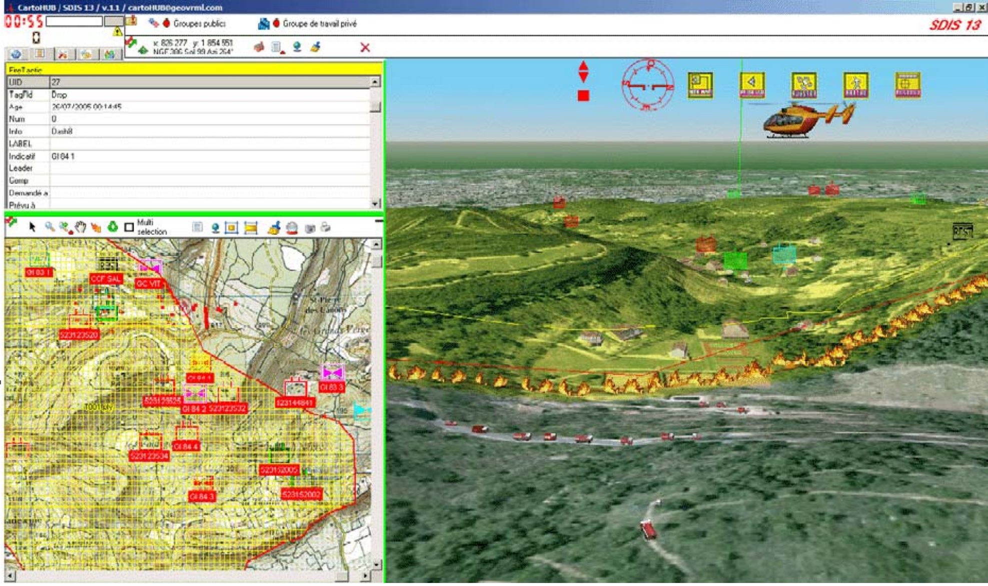


- Visualization is about MAPPING.

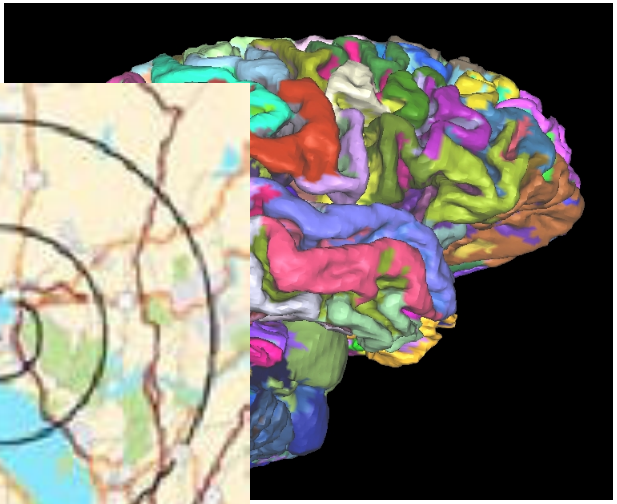


ProClarity Dashboard Server - Microsoft Internet Explorer
Personalize My Charts
Products Gross Profit
KPIs
Top 20 City Performance
CM Gross Profit
My KPI's
Personalize KPI's
Key Performance Indicator
Value
Sales Amt CM
Sales Amt YTD
Top Selling Prod CM
Top Selling City CM
% Gross Margin CM
% Gross Profit CM
Top Growing Prod CM
Top Falling Prod CM
Gross Profit dial
Geographic Sales
Sales amt ytd
Products Gross Margin
Europe
North Amer
Pacific
South Amer





SDIS 13



What is visualisation?

- [geek] branches of computer graphics and UI design concerned with presenting data to users by means of images
  - A computational tool or method for generating images
- [psychologist] The formation of mental visual images
  - The act or process of interpreting in visual terms
- [designer] The process of putting into visual form
  - The craft of assigning representational “codes” and techniques to data attributes and conveying meaning
  - The practice of assembling images

Some of the things we will cover in this course

- How we see and “think visually”
- Contrast and colour
- PreAttentive :things that pop out
- Motion and Animation
- Visual Awareness and Attention
- space perception
- Interaction and Navigation
- Images, words and gesture
- Visualization in practice: scientific, information and affective
- 2D Visualization techniques
- Single and multiple views
- Interaction
- Transforming data and visualizing multidimensional data

Administrivia

- Course textbook:
  - Colin Ware. Visual Thinking for Design
- Course web site
  - www.sfu.ca/siatclass/IAT814/Fall2014
- Course management site
  - canvas.sfu.ca

Course Evaluation

- 3 components:

1. 2 Visualisation critiques (20%, 10% each)
   - Part 1. Find an example of practice, critique and present
   - Part 2. Discuss from perceptual perspective!
   - We will revisit these.
2. Research critique (20%) -
   - critical review of recent research, presentation and report
3. Final project (60%)
   - Research paper
   - Design proposal of technique or method to address a visualization challenge
   - Study of existing techniques applied to visualization/analytics problem

Policies and expectations

- Participation
  - Graduate classes are most effective when grad students engage.
- Academic honesty
  - SFU Code of Conduct
  - Plagiarism will result in automatic 0

- Publication. Students are often interested in publishing the results of their projects and I thoroughly encourage this effort
  - the work is reviewed with me and deemed appropriate and a venue selected;
  - the senior supervisor is consulted and gives explicit permission for the extra effort required in preparing work for publication;
  - the authorship includes the senior supervisor and myself unless either of us waives it.

Policies and expectations

- Project work across multiple courses.
  - In principle I have no problem with the same research project serving two different courses, but this means that the actual work is much bigger than required in either course, and that the applicability of the visualization component of the work suits the nature of this course. This must be cleared with me and the instructor of the other course before the project is approved. Failure to do so will result in the project being marked out of 50%.

Why do we care?

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Why?

- We are in a new era of human history:
- Since 1994 we have witnessed an information explosion
  - Everyone can get all of the data that's out there
    - News, sports, financial, purchases, etc...

- What do we do with it?

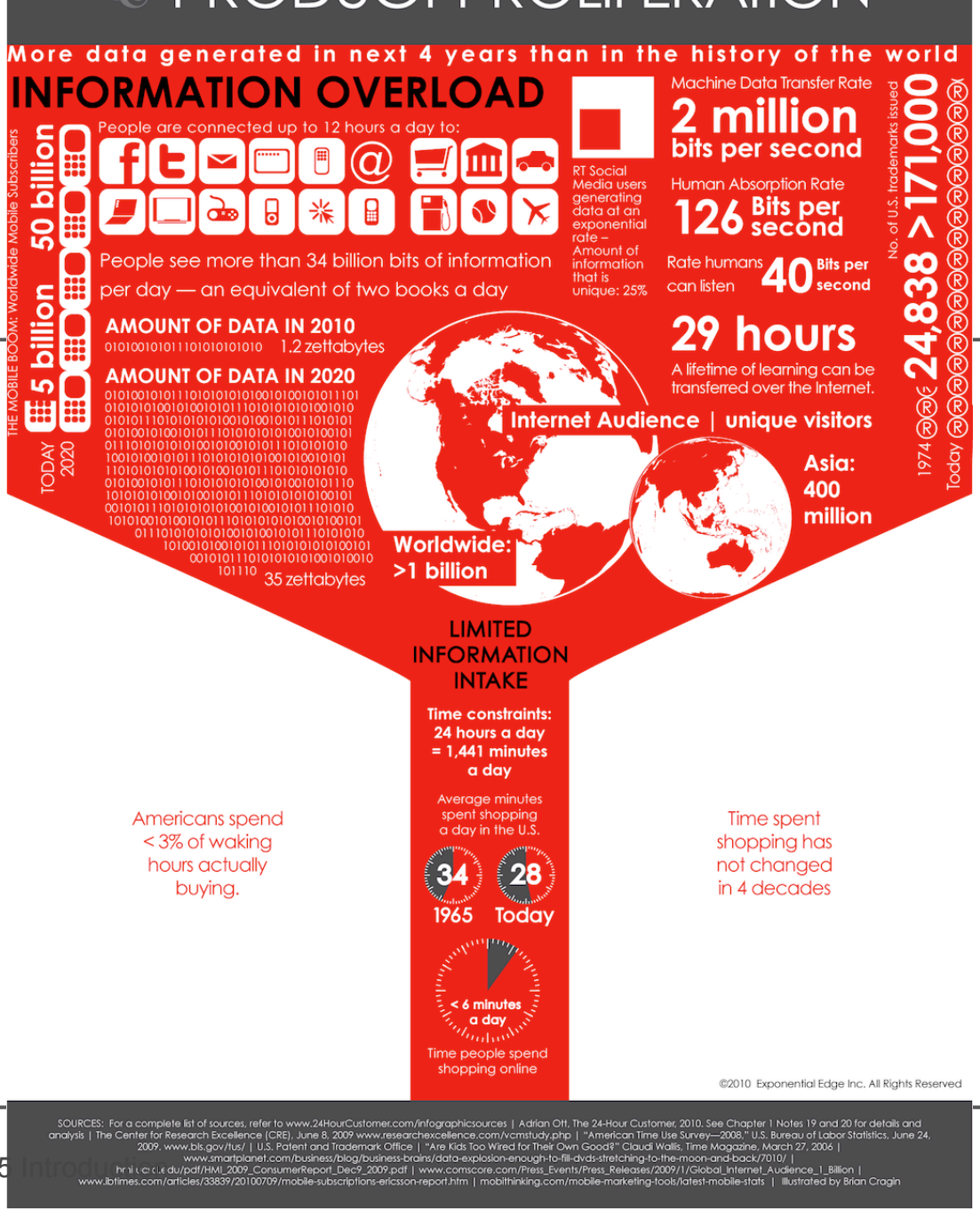
Kegs of data

- Between 1 and 2 exabytes of unique data produced per year
  - 10000000000000000 (10^{18}) bytes
  - 800 meg for every person (2003)
  - Printed documents only .003% of total

    Lyman and Varian, 2000

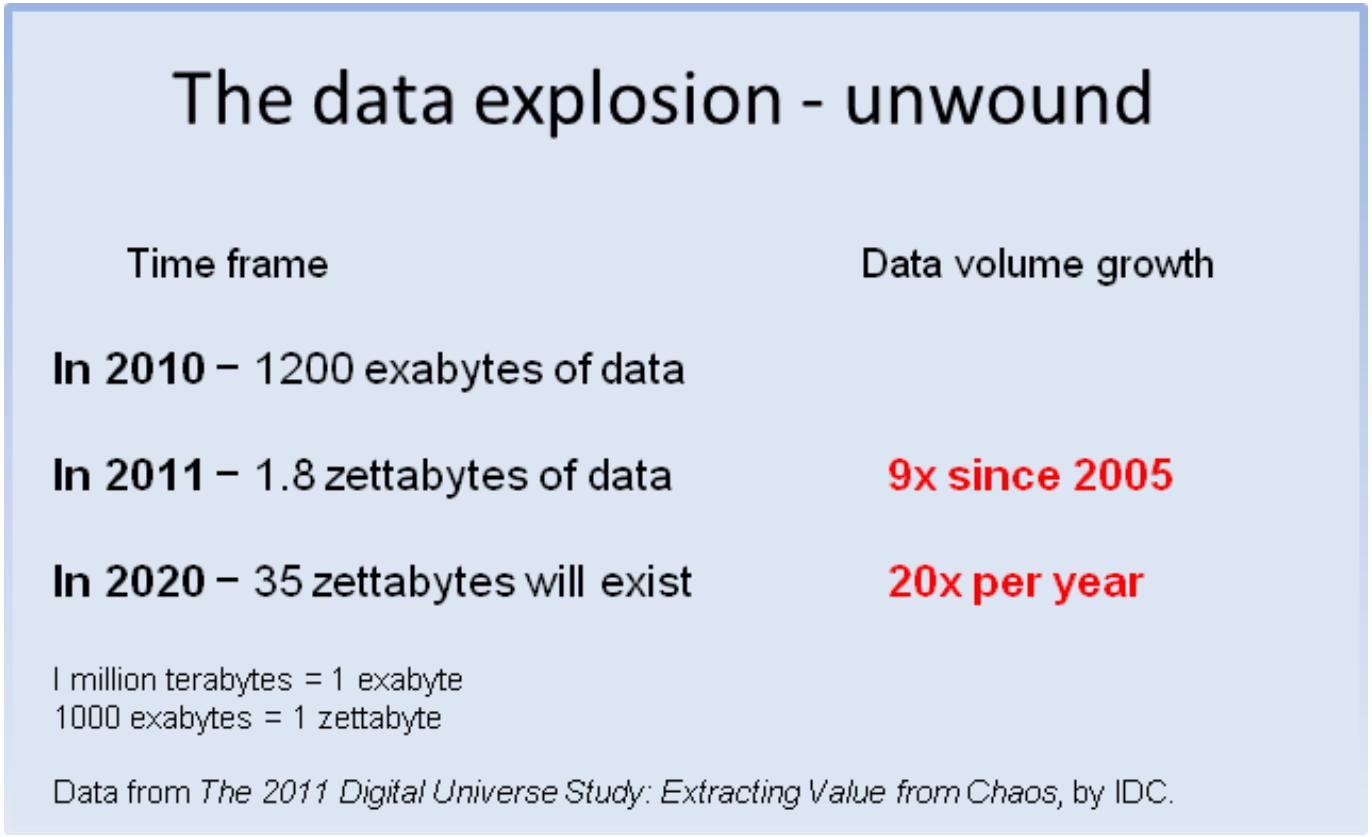
    Cal-Berkeley, Info Mgmt & Systems

    www.sims.berkeley.edu/how-much-info
  - 90 trillion emails sent on the Internet in 2009


PRODUCT PROLIFERATION
More data generated in next 4 years than in the history of the world
INFORMATION OVERLOAD
THE MOBILE BOOM: Worldwide Mobile Subscribers
5 billion
50 billion
TODAY 2020
People are connected up to 12 hours a day to:
People see more than 34 billion bits of information per day — an equivalent of two books a day
AMOUNT OF DATA IN 2010
1.2 zettabytes
AMOUNT OF DATA IN 2020
35 zettabytes
RT Social Media users generating data at an exponential rate – Amount of information that is unique: 25%
Machine Data Transfer Rate
2 million bits per second
Human Absorption Rate
126 Bits per second
Rate humans can listen
40 Bits per second
29 hours
A lifetime of learning can be transferred over the Internet.
Internet Audience | unique visitors
Worldwide: >1 billion
Asia: 400 million
No. of U.S. trademarks issued
1974 24,838
Today >171,000
LIMITED INFORMATION INTAKE
Time constraints: 24 hours a day = 1,441 minutes a day
Average minutes spent shopping a day in the U.S.
34
1965
28
Today
< 6 minutes a day
Time people spend shopping online
Americans spend < 3% of waking hours actually buying.
Time spent shopping has not changed in 4 decades
©2010 Exponential Edge Inc. All Rights Reserved
SOURCES: For a complete list of sources, refer to www.24HourCustomer.com/infographicsources | Adrian Ott, The 24-Hour Customer, 2010. See Chapter 1 Notes 19 and 20 for details and analysis | The Center for Research Excellence (CRE), June 8, 2009 www.researchexcellence.com/vcmstudy.php | "American Time Use Survey—2008," U.S. Bureau of Labor Statistics, June 24, 2009. www.bls.gov/tus/ | U.S. Patent and Trademark Office | "Are Kids Too Wired for Their Own Good?" Claudi Wallis, Time Magazine, March 27, 2006 | www.smartplanet.com/business/blog/business-brains/data-explosion-enough-to-fill-dvds-stretching-to-the-moon-and-back/7010/ | http://ecle.du/pdf/HMI_2009_ConsumerReport_Dec9_2009.pdf | www.comscore.com/Press_Events/Press_Releases/2009/1/Global_Internet_Audience_1_Billion | www.ibtimes.com/articles/33839/20100709/mobile-subscriptions-ericsson-report.htm | mobithinking.com/mobile-marketing-tools/latest-mobile-stats | Illustrated by Brian Cragin

- 6 million FedEx transactions per day
  http://www.fedex.com/us/about/today/companies/corporation/facts.html
- Average of 98 million Visa credit-card transactions per day in 2005
  http://www.corporate.visa.com/md/nr/press278.jsp
- Average of 5.4 petabytes of data crosses AT&T's network per day
  http://att.sbc.com/gen/investor-relations?pid=5711
- Average of 610 to 1110 billion e-mails worldwide per year (based on estimates in 2000)
  http://www2.sims.berkeley.edu/research/projects/how-much-info/internet.html

SAP prediction



Unlike Before…

- Used to be (15 years ago), you had to go to a library
  - read the info, put it on some sort of storage device, take notes, run a specialized program
  - On a computer 1000 times slower than today
- Now:
  - How do we make sense of the data?
  - How do we harness this data in decision making processes?
  - How do we avoid being overwhelmed?

The only reasonable solution

- Computing + Human Vision
  - Highest bandwidth sense
  - Fast, parallel
  - Pattern recognition
  - Extends memory and cognitive capacity
  - Many People think visually

When do we need to visualize?

- Many other techniques for data analysis
  - Statistics, DB, data mining, machine learning
- •Visualization most useful in exploratory data analysis
  - -Don’t know what you’re looking for
  - -Don’t have a priori questions
- Want to know what questions to ask
  - “A graphic display has many purposes but it achieves its highest value when it forces us to see what we were not expecting.” H. Wainer

EDA Example 1

Business

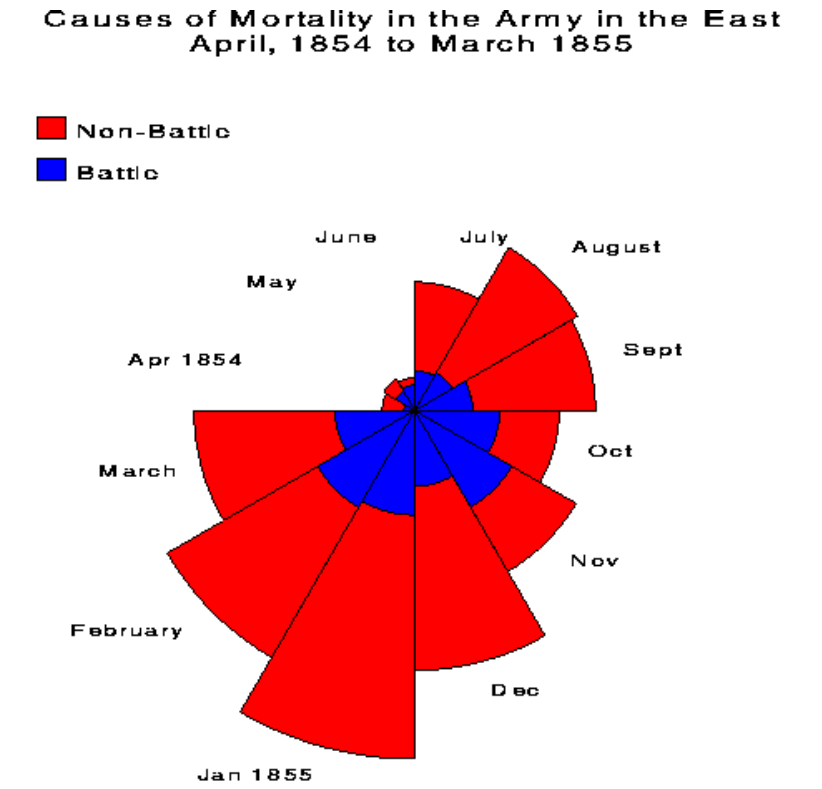
- Why did Toyota outpace Chrysler in the auto market?
- How did their business decisions differ?
- Have their cars changed in design? If so, in what major ways?

EDA 2

Airlines

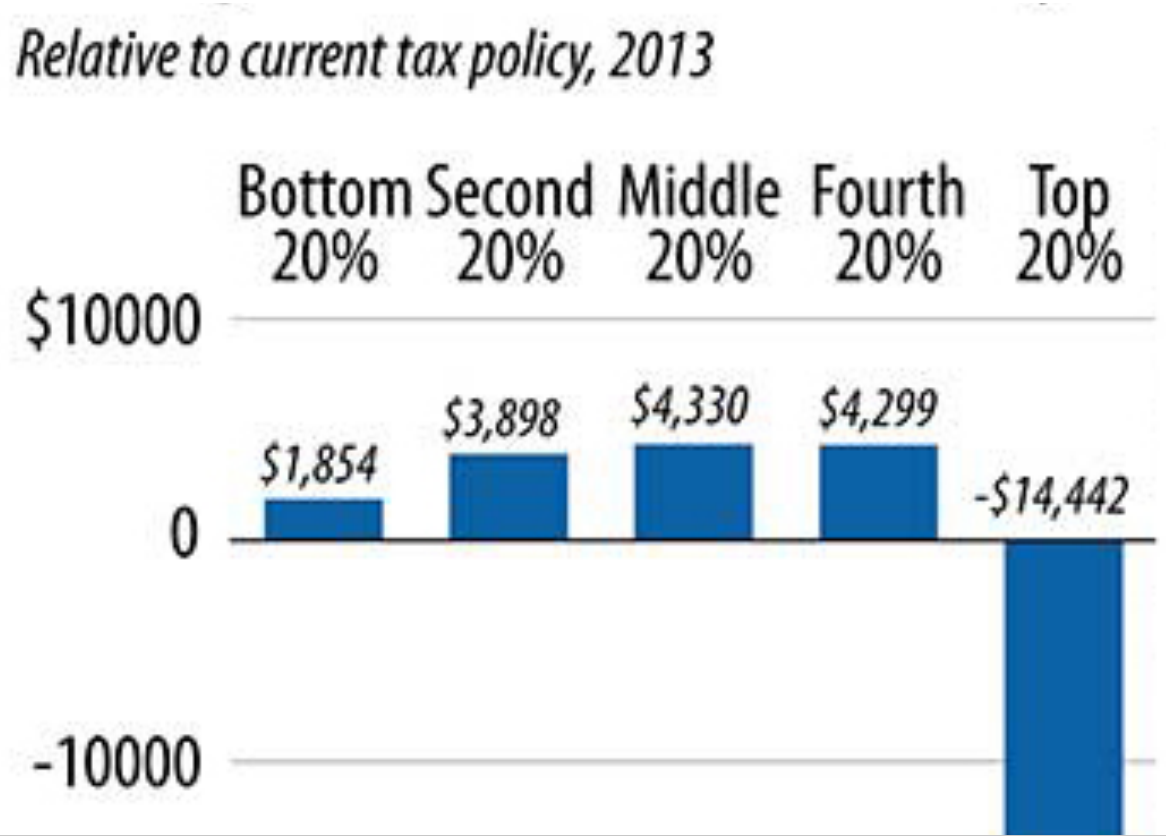
- What are the key factors causing flight delays in the US?
- Are delays worse in the summer or winter?
- Is the seasonal effect influenced by geographic location?
- How does competition at an airport affect flight delays?

Visualizations make data into information

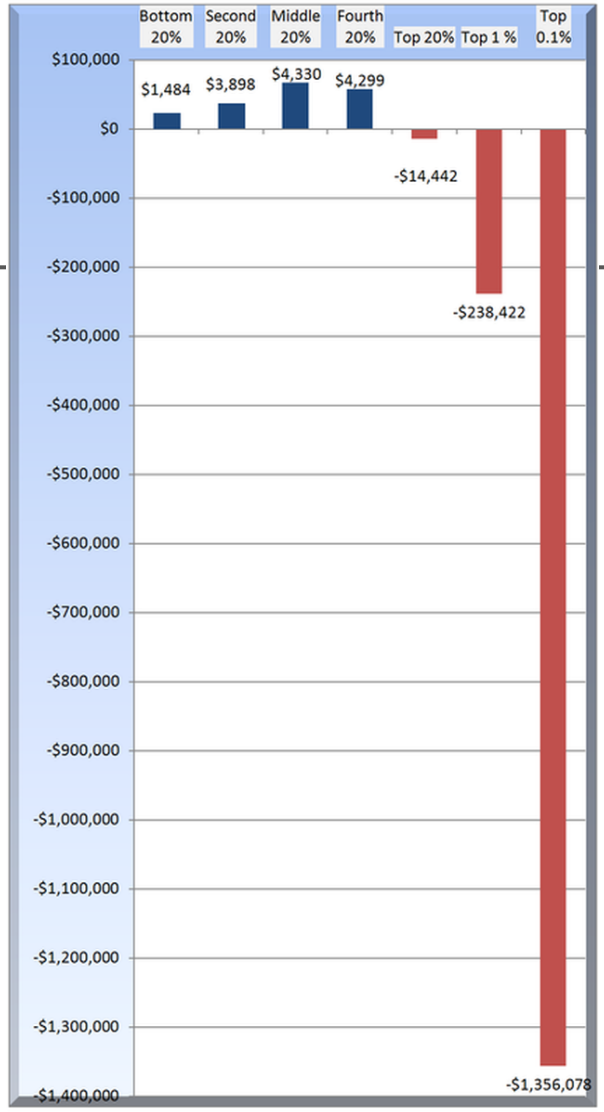


From: F. Nightingale, "Notes on Matters Affecting the Health, Efficiency and Hospital Administration of the British Army", 1858

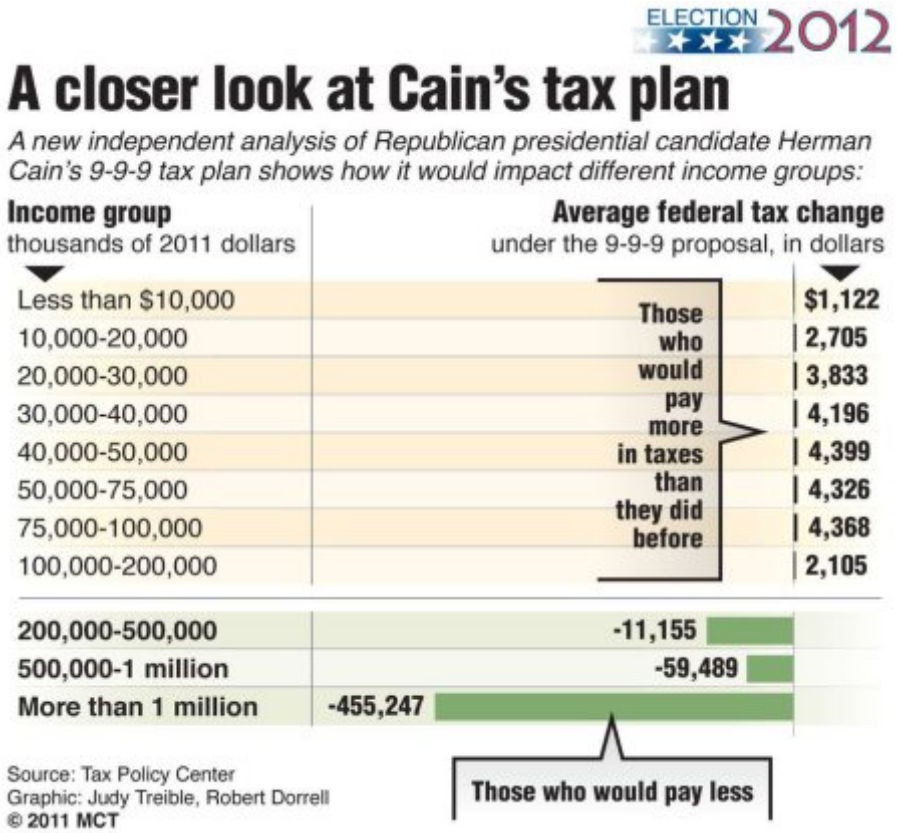
At first glance: the Cain 9-9-9 tax proposal



Not the whole story



More is not necessarily better



Key benefits

- Facilitating awareness and understanding
- Helping to raise new questions and supply answers
- Generating insights and hypotheses
- Telling a story and making a point

Visualization goals

- depict and present constantly growing large data volumes of increasing dimensionality
- Support the revealing and discovery of patterns
- Display and reveal complex relationships and inter-relationships
- Convey an impression, evoke an emotion -- affect

Visualization goals

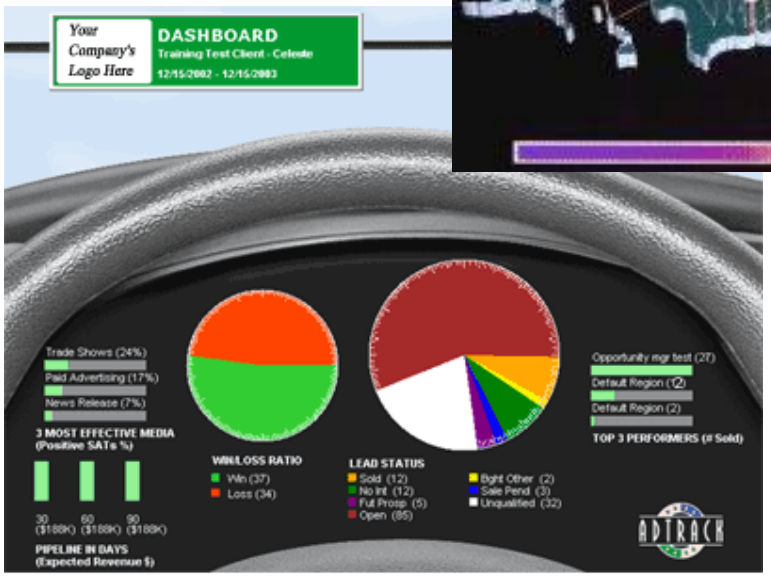
- ☑ depict and present constantly growing large data volumes of increasing dimensionality
- ☑ Support the revealing and discovery of patterns
- ☑ Display and reveal complex relationships and inter-relationships
- ☑ Convey an impression, evoke an emotion -- affect

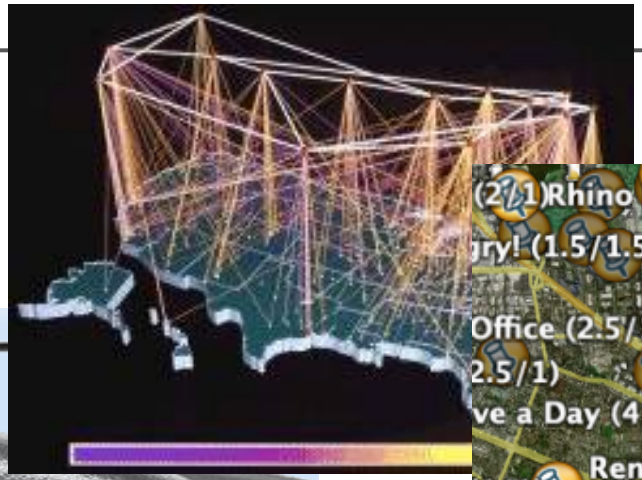
Using vision to think

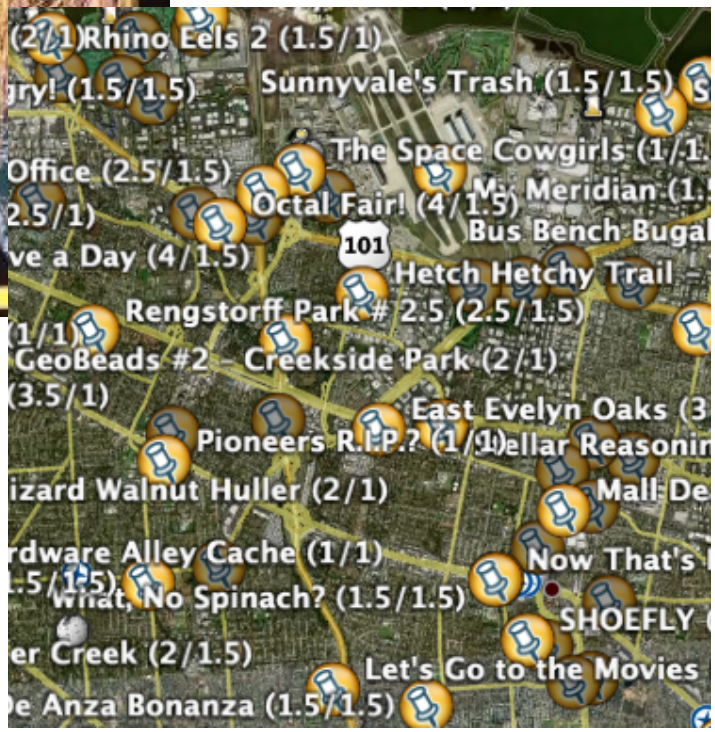
- Comprehend huge amounts of data
- Emergent properties and relations
- Detect problems and inconsistencies in data
- Facilitates understanding of large- and small-scale features of the data
- Facilitates hypothesis formation: the forming of new questions and
- insights

IF....

Visualization goals: not quite there







(click on image for a larger view)

So what is visualization again ? (take 2)

Visual thinking involves:

- Constructing visual queries on displays
- Visual search strategies through eye movements and attention to relevant patterns
- Visual notification and attention “redirection” to new patterns and events

- Well structured balance of elements and tasks

Essential issues

- What **mental models** most effectively carry various kinds of information ?
- Which definable and recognizable **visual attributes** of these models are most useful for conveying specific information either independently or in conjunction with other attributes ?
- How can we most effectively induce chosen mental models in the mind of an observer ?
- How can we provide guidance on choosing appropriate models and their attributes to a human or automated display designer ?
    - ------- G. Robertson
- Progress in [scientific] visualization can be accelerated if workers could more readily find visualization techniques relevant to a given problem
- ---Wehrend and Lewis

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------- G. Robertson

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---Wehrend and Lewis

What makes/is a good visualisation?

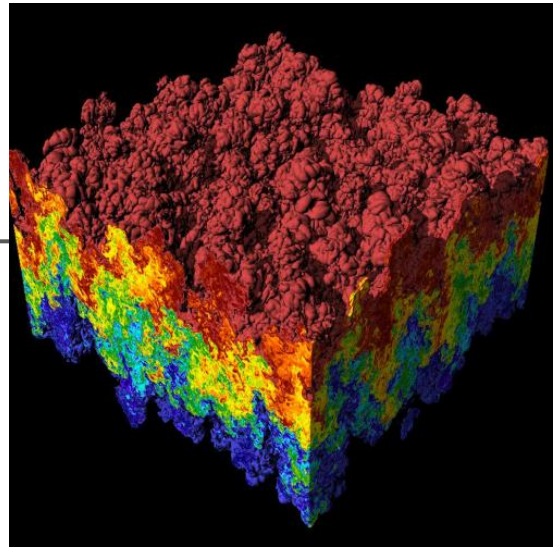
- a **model** that captures the essence of a system
  - A model is an abstraction with the important things in and the unimportant out
- Different visualizations provide different levels of detail, show and hide different things; so support **different abstractions**
- useful to **aid understanding**, not just realistic representations (what color is a carbon atom?)
- map the important part of the **tasks** onto techniques that show the relevant **characteristics** best

Key challenges

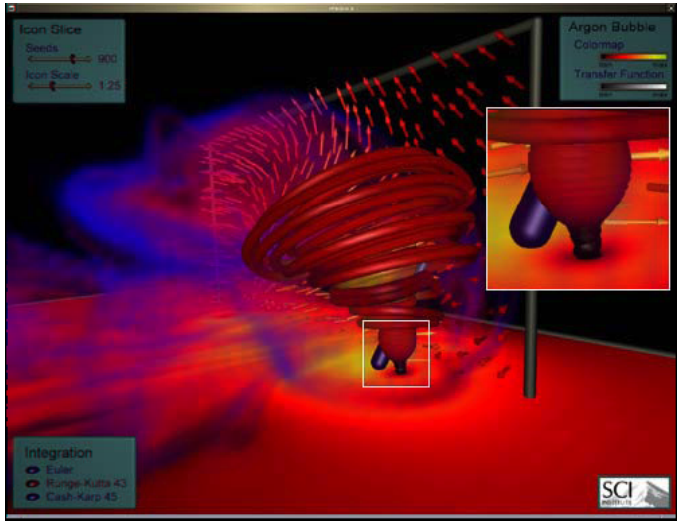
- Scale
  - Challenge often arises when data sets become large
- Diversity
  - Data of data types, forms, sizes

- Evaluation
  - How to measure and prove?
  - All those benefits are not easily quantifiable and measured
  - perhaps primary open research challenge for visualization

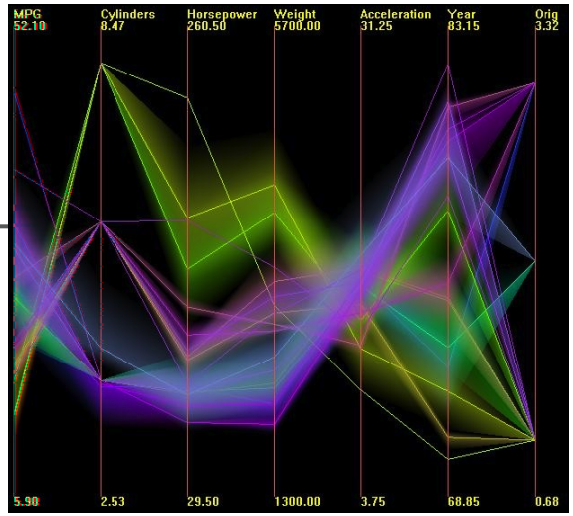
Scientific visualization



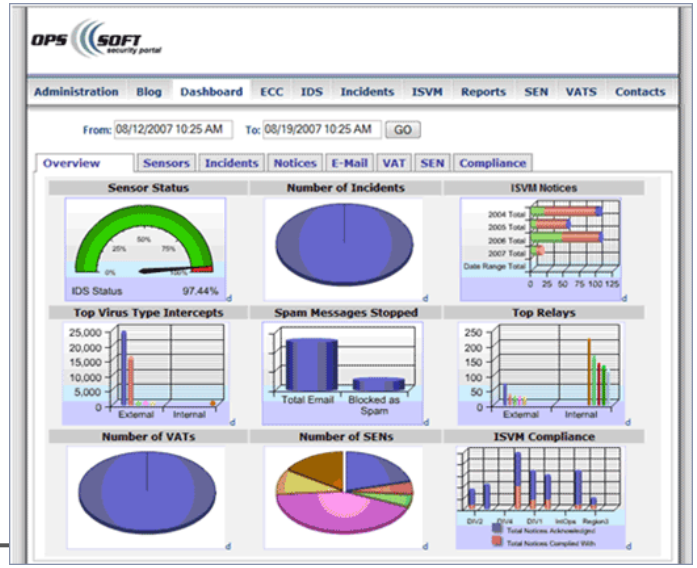
- the visual display of spatial data associated with scientific processes such as the bonding of molecules in computational chemistry
- deals with data that has a natural geometric structure (e.g. chemical data or wind flows)



Information visualization

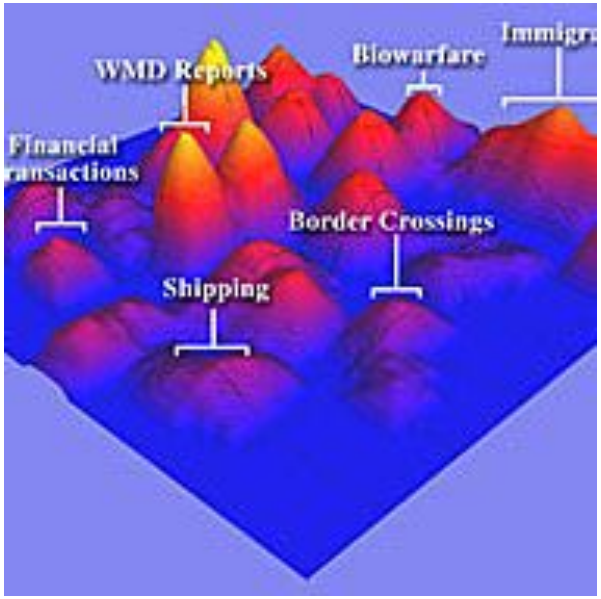


- visual metaphors for non-inherently spatial data such as the exploration of text-based document databases.
- More abstract
- Assign structure and position to information that has none

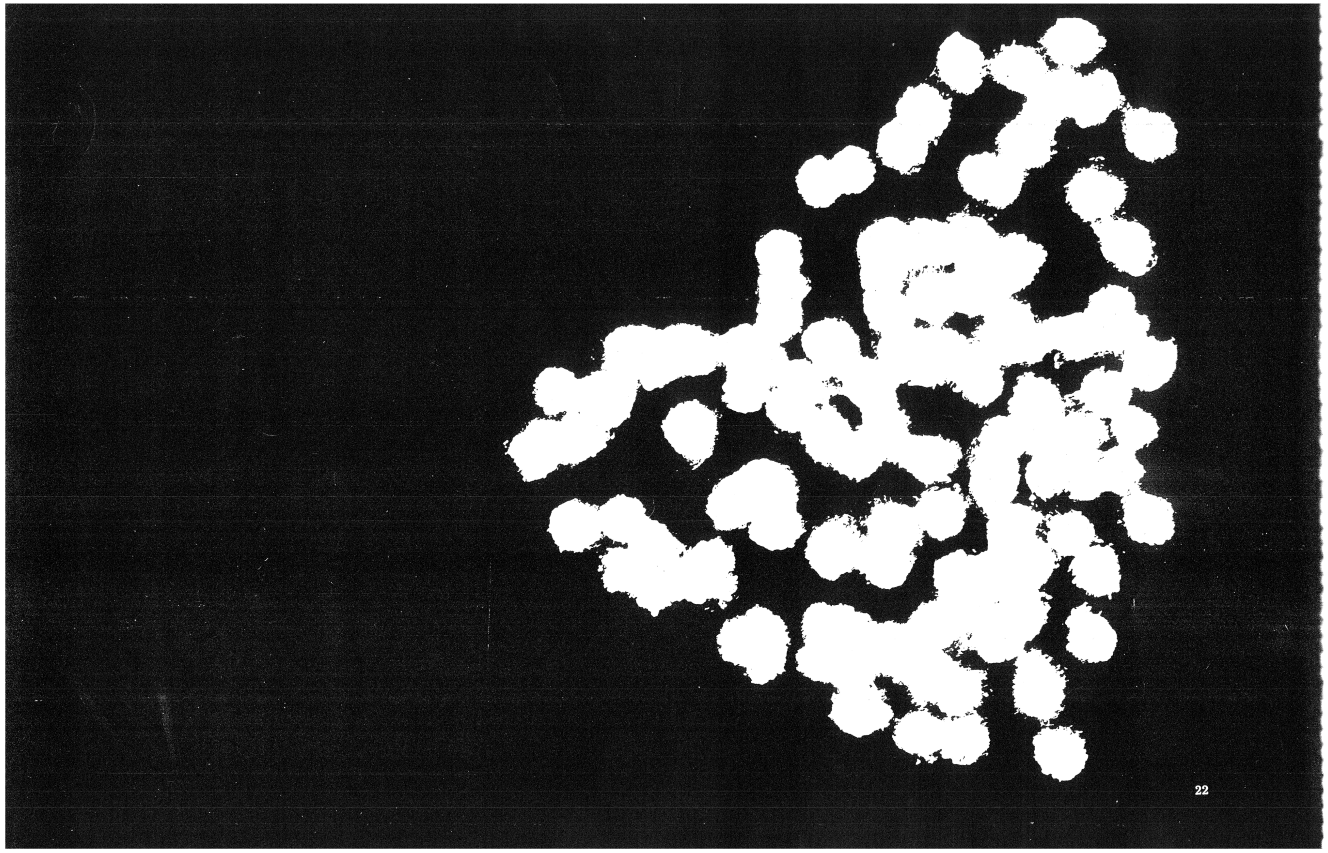


Visual analytics

- analytical reasoning supported by the interactive visual interface
- Intersection of visualization with data analysis
- Biology
- Business
- National security



Affective (experience) visualisation



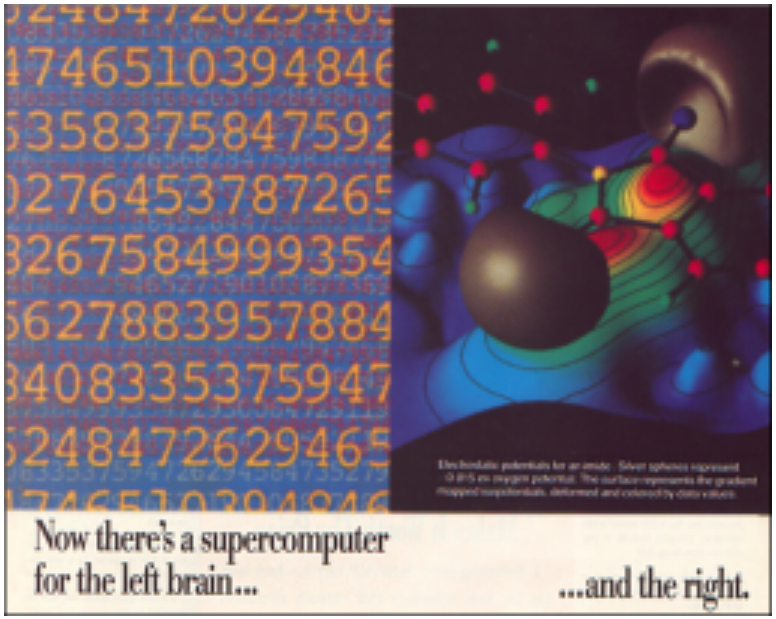
What is (Information) Visualization?

"Transformation of the symbolic into the geometric"

(McCormick et al., 1987)

"... finding the artificial memory that best supports our natural means of perception."

(Bertin, 1983)



Visual Aids for Thinking

- We build tools to amplify cognition.
- Example: multiplication (Card, Moran, & Shneiderman.)
  - In your head, multiply 35 x 95
  - Now do it on paper
  - People are 5 times faster with the visual aid

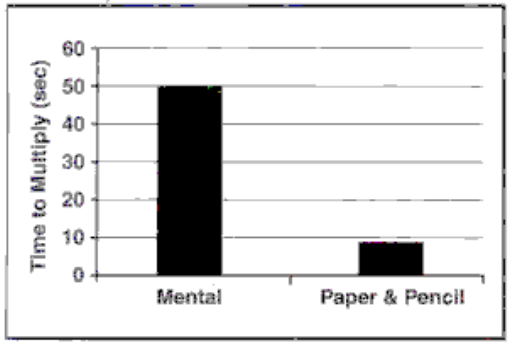


FIGURE 1.1

Use of external aids amplifies ability to do multiplication.

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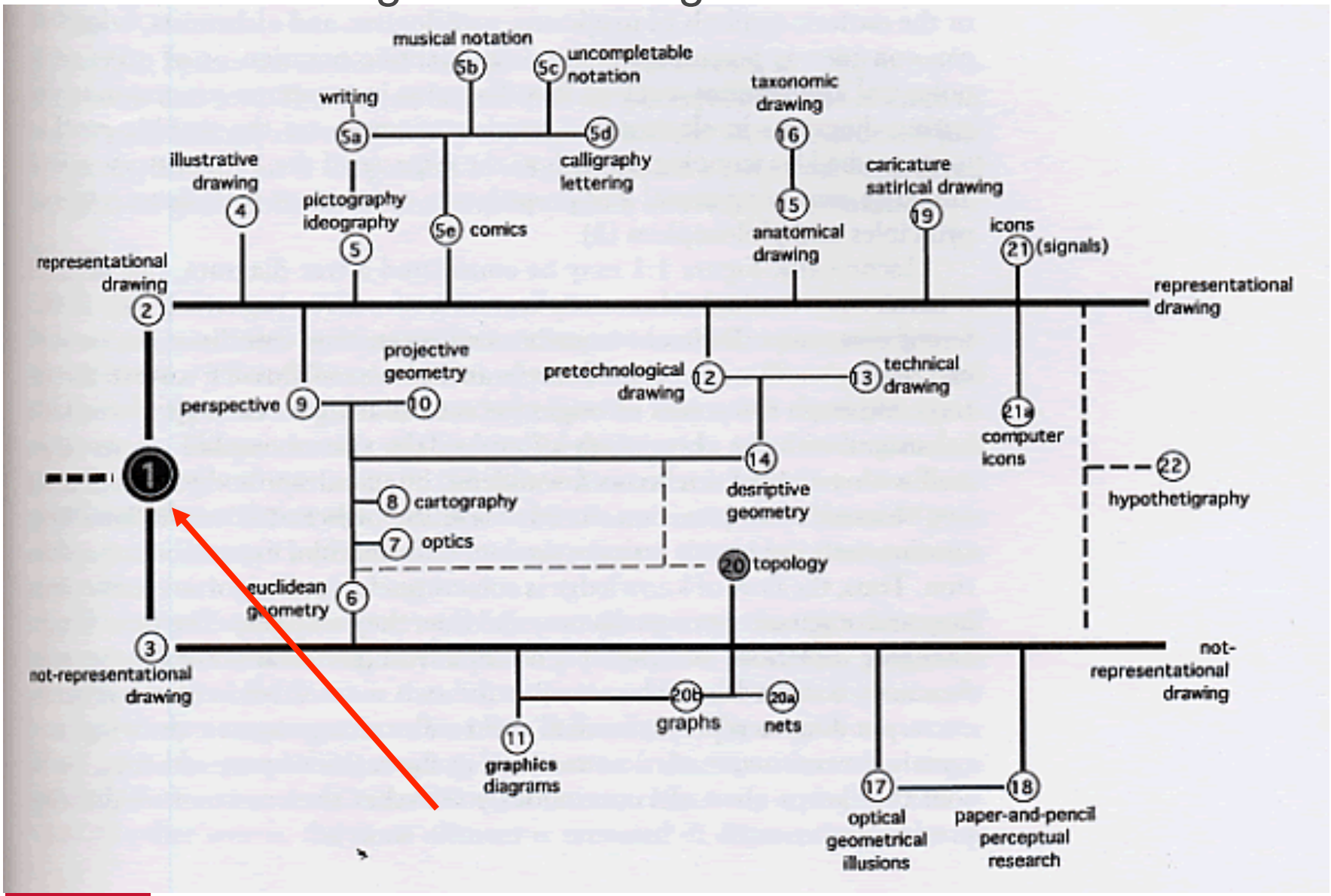
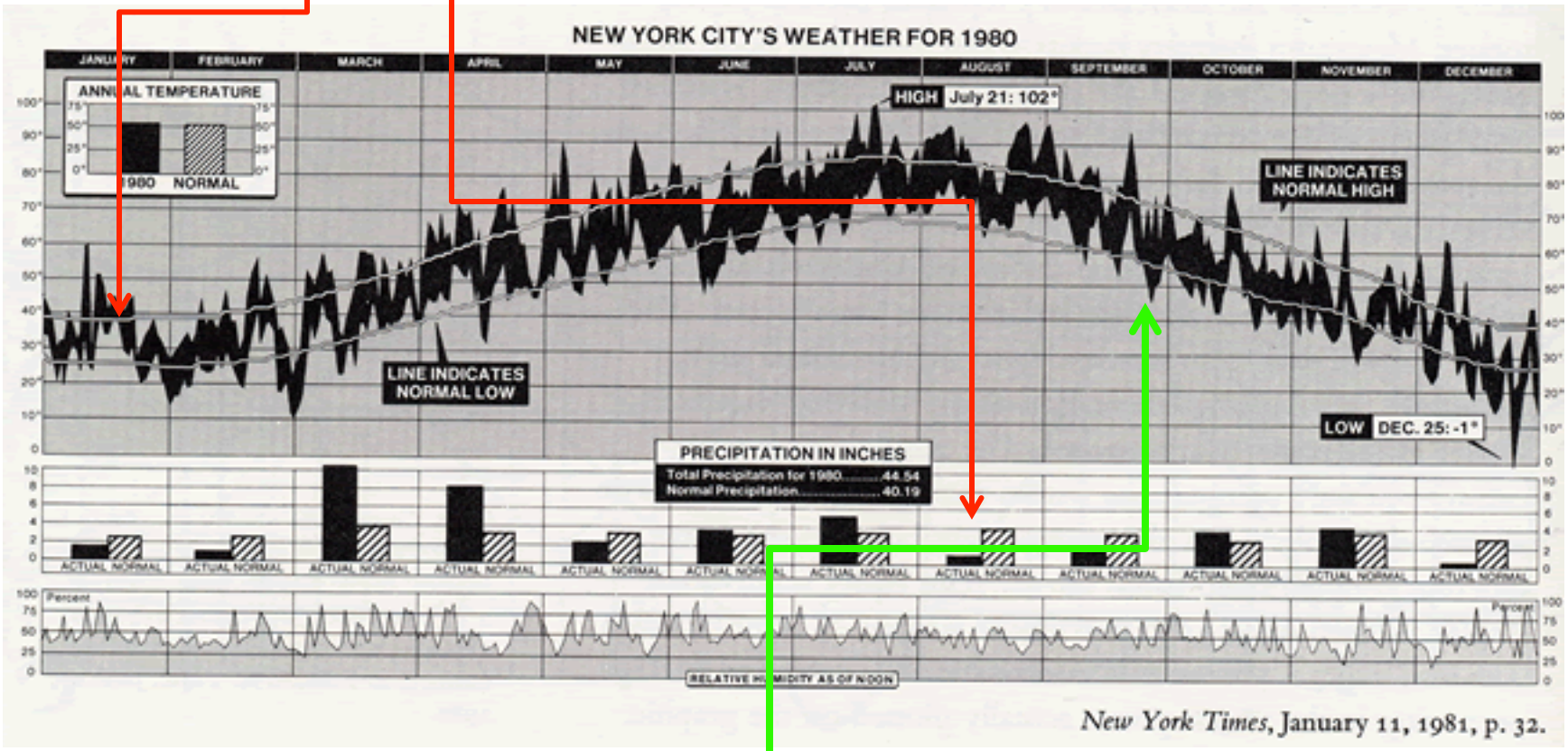
We've been doing this for a long time



We look at the pattern(s) first



Focus on individual numbers … >2K data points!

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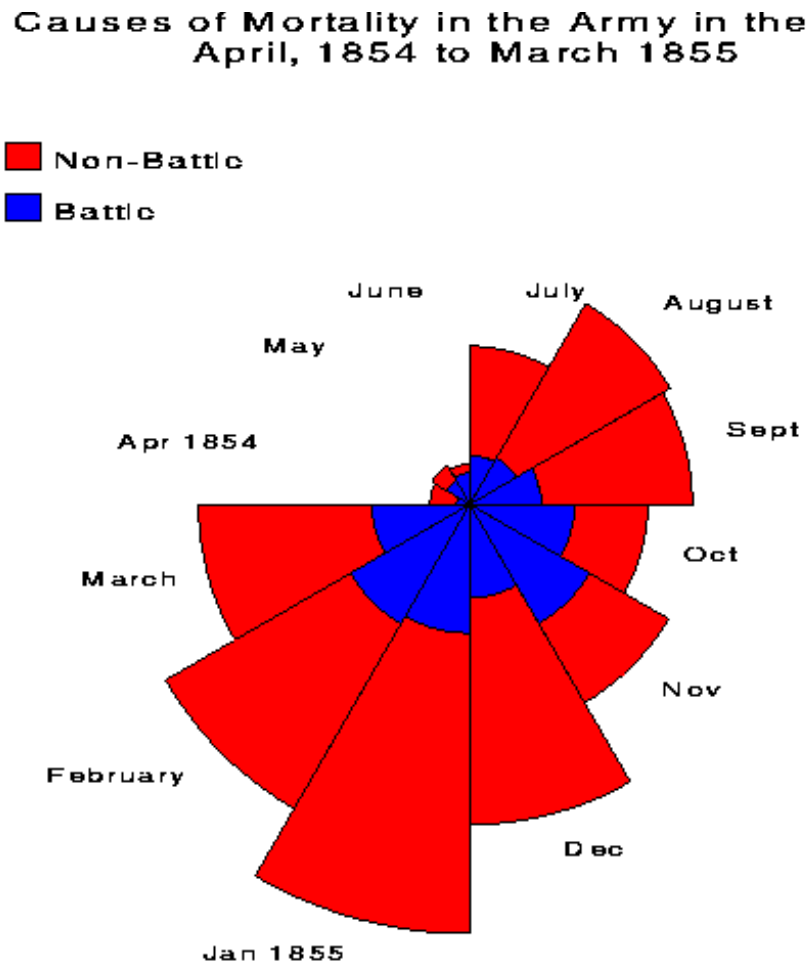
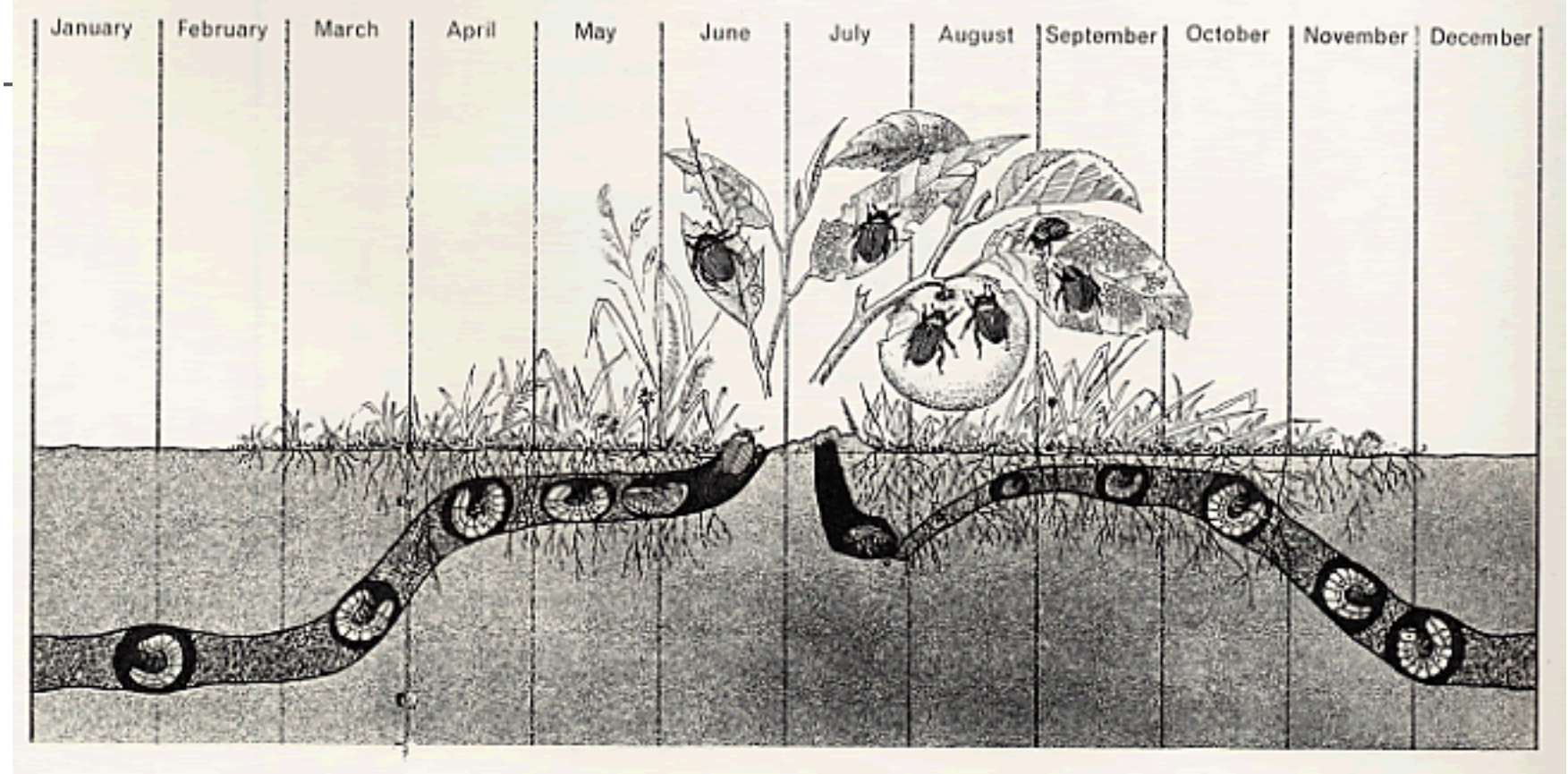
Nightingale's Coxcomb



From: F. Nightingale, "Notes on Matters Affecting the Health, Efficiency and Hospital Administration of the British Army", 1858


January
February
March
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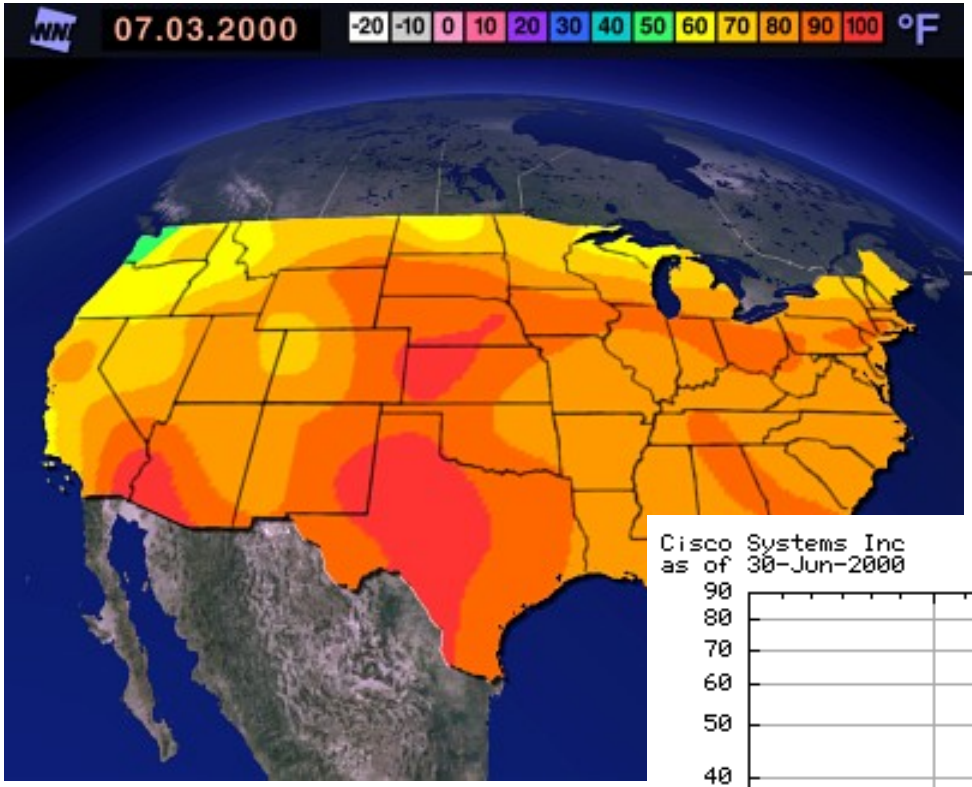
The Power of Info. Visualization



Two key aspects

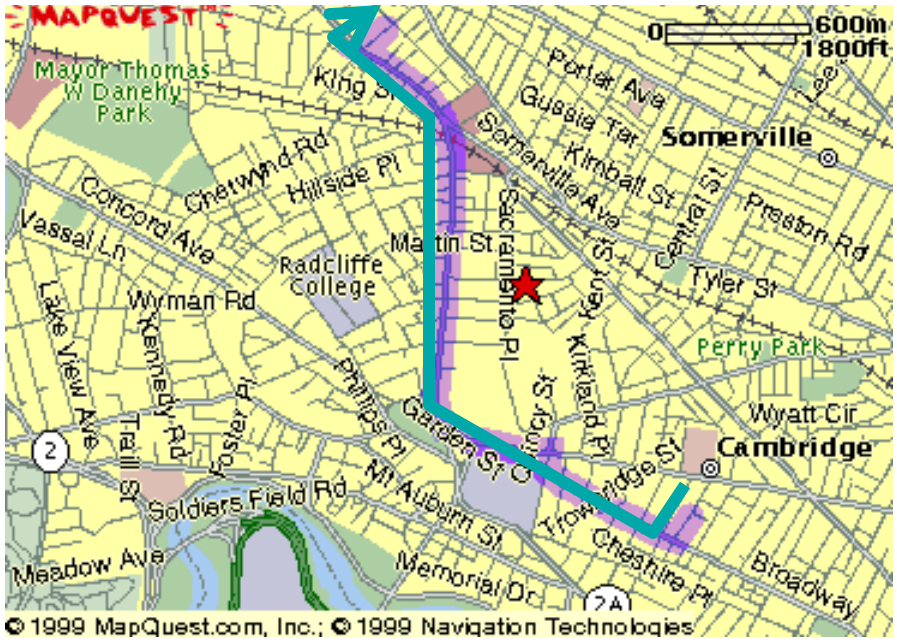
- Representation
- Interaction

"The effectiveness of information visualization hinges on two things: its ability to clearly and accurately represent information and our ability to interact with it to figure out what the information means."

---S. Few, Now you see it

The Power of Visualization

1. Start out going Southwest on ELLSWORTH AVE
   Towards BROADWAY by turning right.
2: Turn RIGHT onto BROADWAY.
3. Turn RIGHT onto QUINCY ST.
4. Turn LEFT onto CAMBRIDGE ST.
5. Turn SLIGHT RIGHT onto MASSACHUSETTS AVE.
6. Turn RIGHT onto RUSSELL ST.

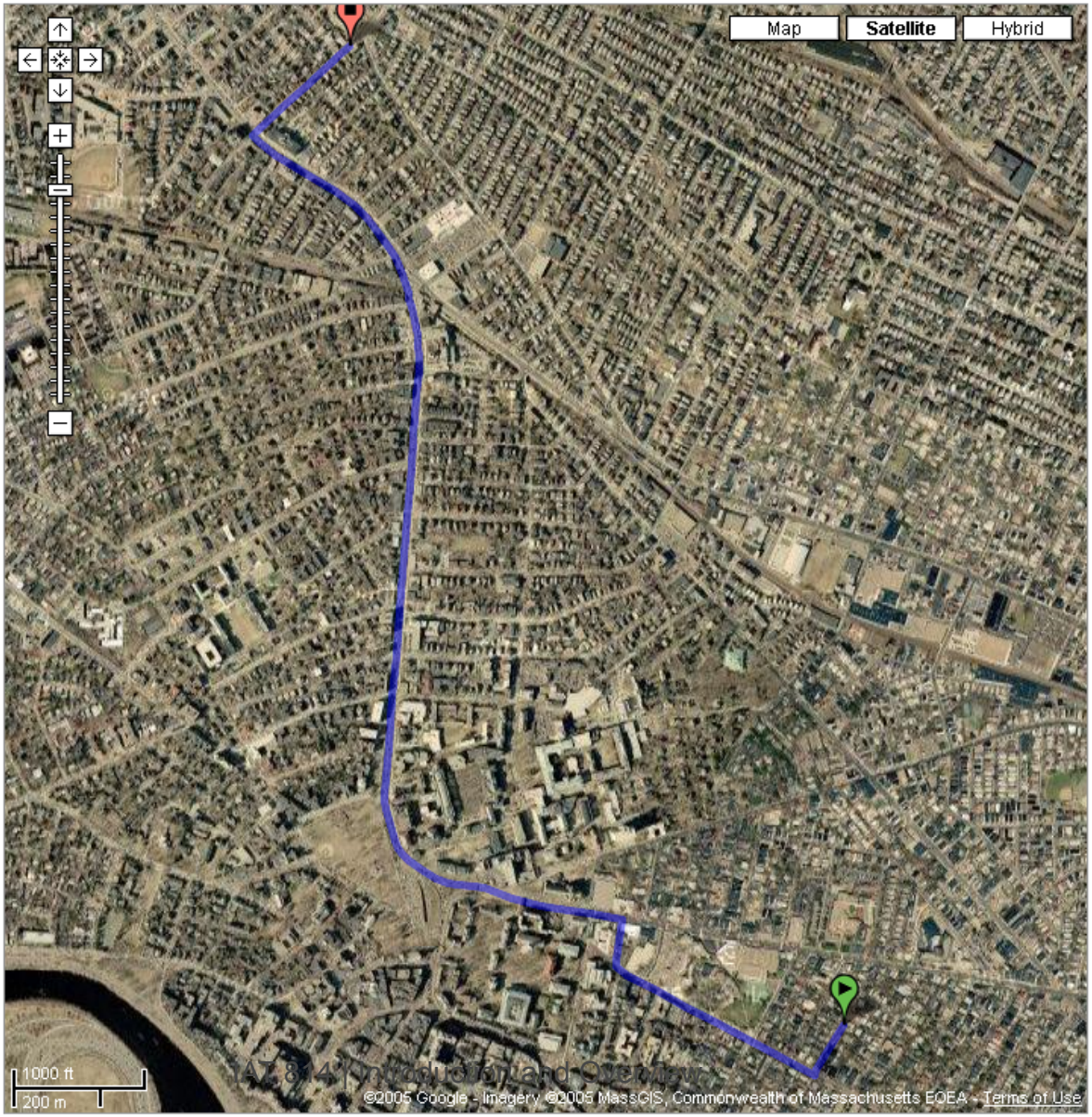


Maps Local Search **Directions**

17 Ellsworth Ave, Cambridge, MA 02139 ⇄ 77 Russell St, Somerville, MA 02144 Search Help

Start address End address

Maps



Print Email Link to this page

Start address:	17 Ellsworth Ave Cambridge, MA 02139
End address:	77 Russell St Somerville, MA 02144
Distance:	2.2 mi (about 3 mins)

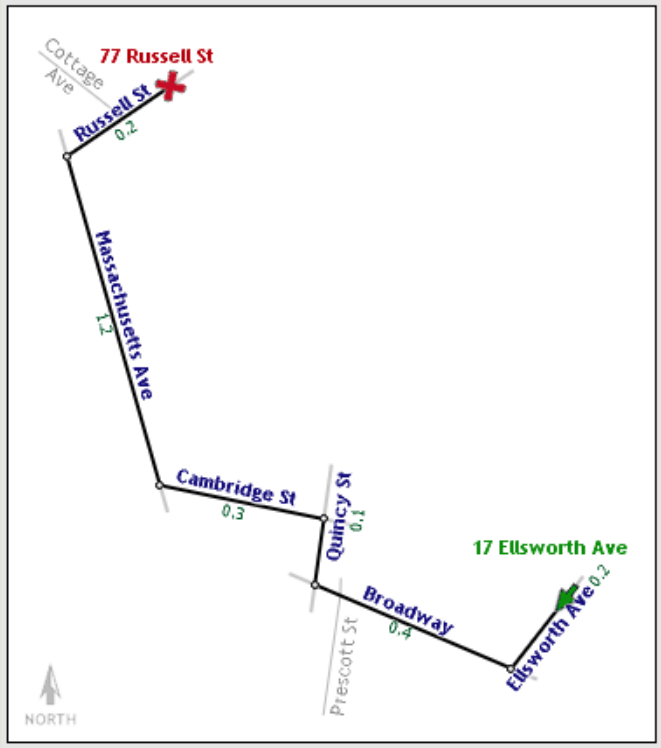
Reverse directions

1.	Head **southwest** from **Ellsworth Ave** - go **0.1 mi**
2.	Turn **right** at **Broadway** - go **0.3 mi**
3.	Turn **right** at **Prescott St** - go **0.1 mi**
4.	Turn **left** at **Cambridge St** - go **0.3 mi**
5.	Bear **right** at **Massachusetts Ave** - go **1.2 mi**
6.	Turn **right** at **Russell St** - go **0.2 mi**

These directions are for planning purposes only. You may find that construction projects, traffic, or other events may cause road conditions to differ from the map results.

The Power of Visualization

The estimated travel time is 5 minutes for 2.16 miles of travel, total of 6 steps.



	Directions	Elapsed Distance
1	Begin at **17 Ellsworth Ave** on **Ellsworth Ave** and go Southwest for 500 feet	0.1
2	Turn right on **Broadway** and go Northwest for 0.4 miles	0.5
3	Turn right on **Quincy St** and go North for 200 feet	0.5
4	Turn left on **Cambridge St** and go West for 0.3 miles	0.8
5	Bear right on **Massachusetts Ave,Mass Ave,RT-2A** and go North for 1.2 miles	2.0
6	Turn right on **Russell St** and go Northeast for 1000 feet to **77 Russell St**	2.2

Line drawing tool by Maneesh Agrawala http://graphics.stanford.edu/~maneesh/

Visualization for Problem Solving

Mystery: what is causing a cholera epidemic in London in 1854?

Visualization for Problem Solving

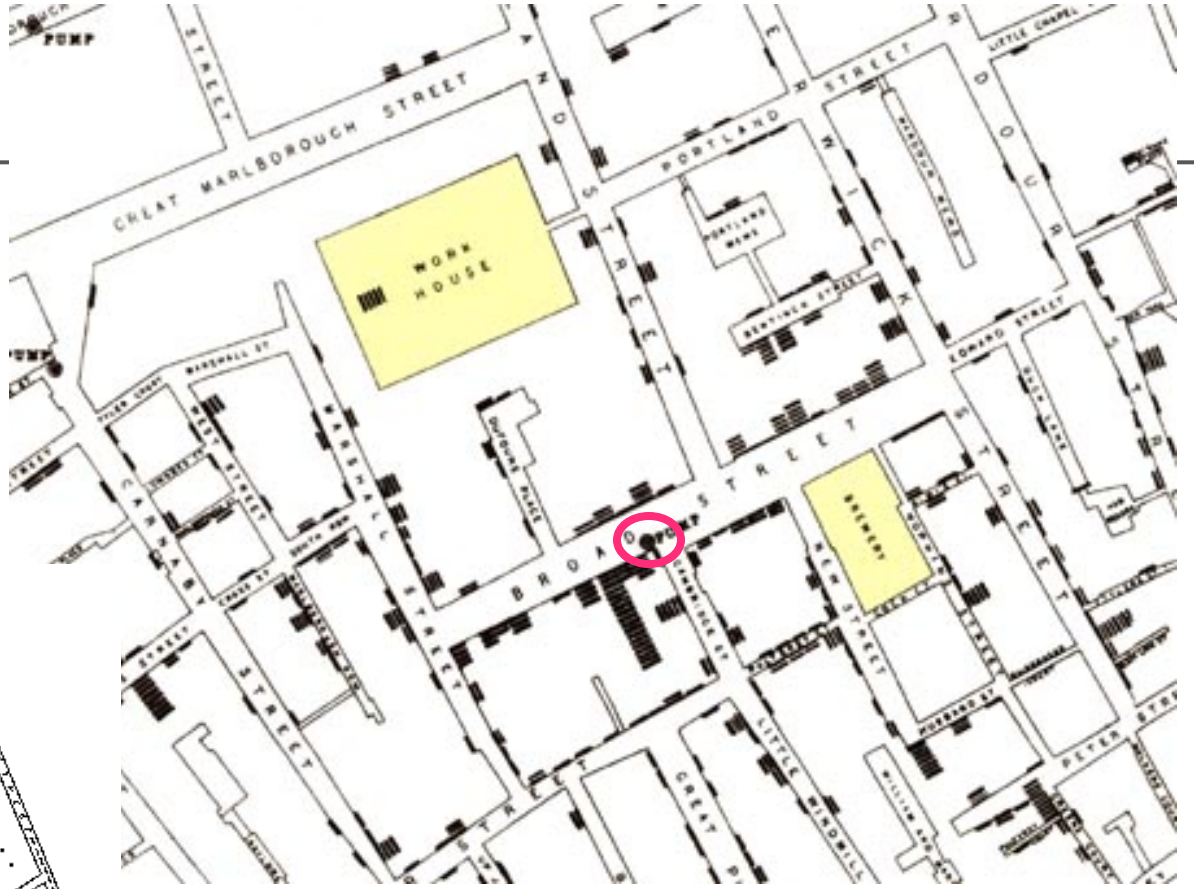
Illustration of John Snow's deduction that a cholera epidemic was caused by a bad water pump, circa 1854.

From Visual Explanations by Edward Tufte, Graphics Press, 1997

Visualization for Problem Solving

Illustration of John Snow's
deduction that a cholera epidemic
was caused by a bad water pump, circa 1854.

Horizontal lines indicate location of deaths.



From Visual Explanations by Edward Tufte, Graphics Press, 1997

Visualization for Eliciting Knowledge from Data

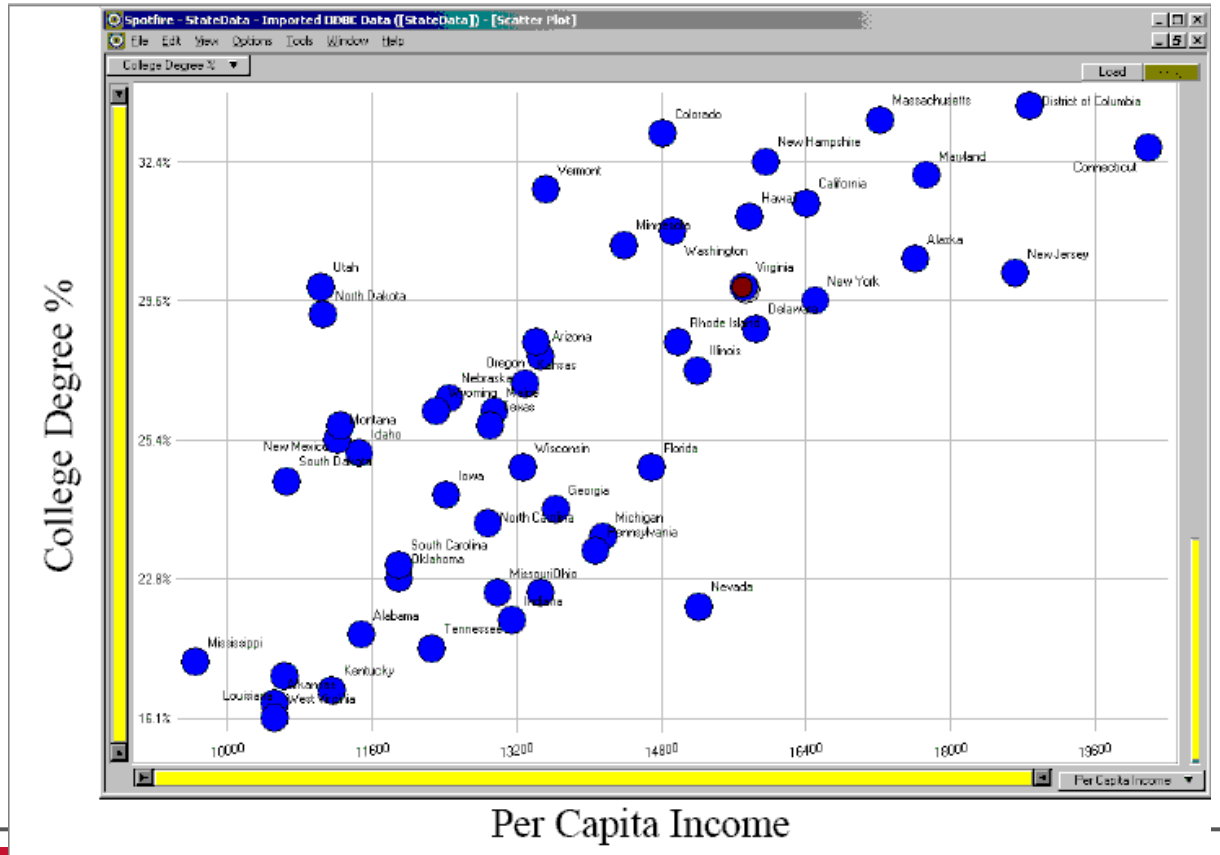
- Which state has highest Income?
- Relationship between Income and Education?
- Outliers?

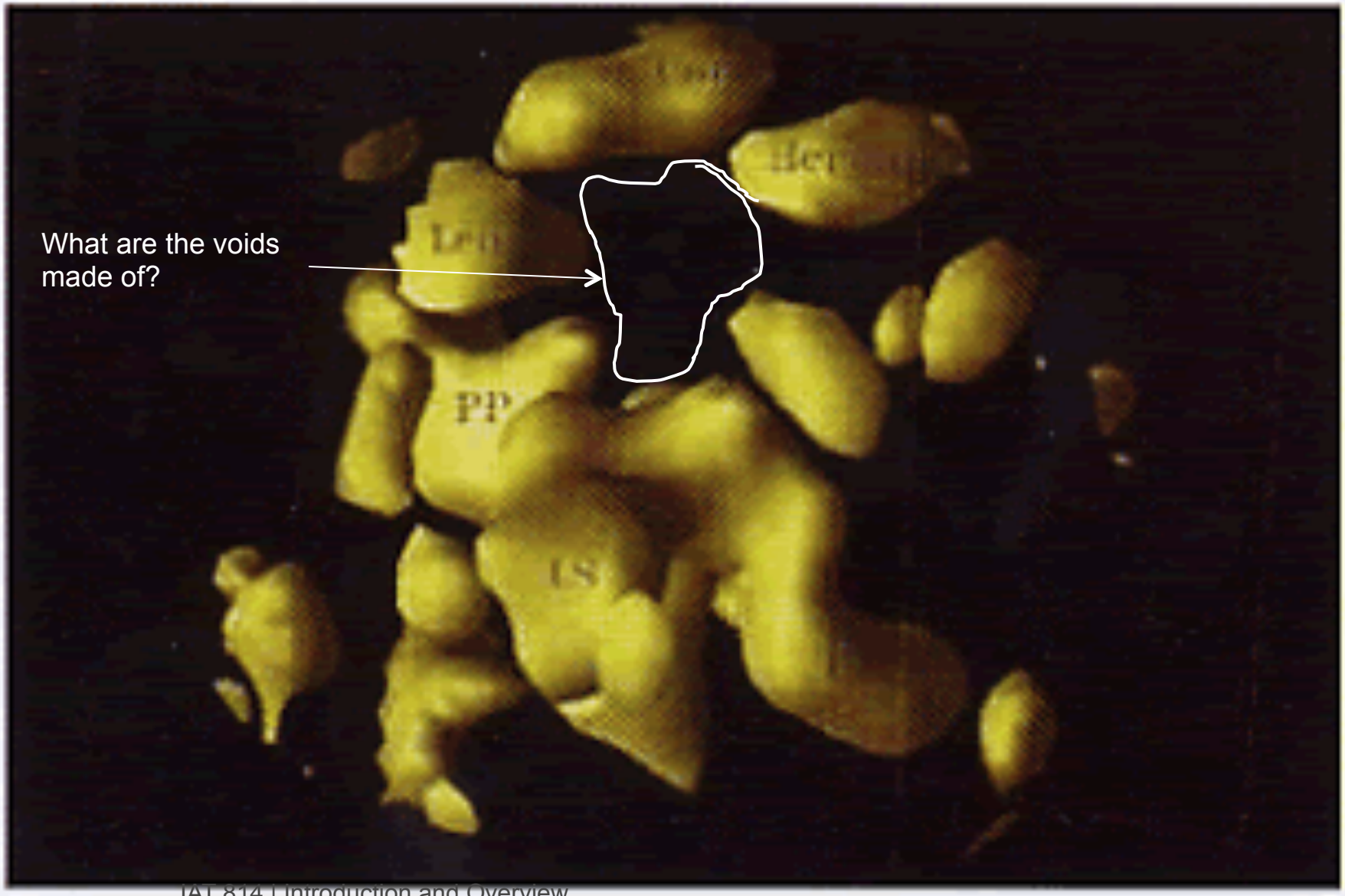
Table - StateData ()

Load | Snap

State	College Degree %	Per Capita Income
Alabama	20.6%	11486
Alaska	30.3%	17610
Arizona	27.1%	13461
Arkansas	17.0%	10520
California	31.3%	16409
Colorado	33.9%	14821
Connecticut	33.8%	20189
Delaware	27.9%	15854
District of Columbia	36.4%	18881
Florida	24.9%	14698
Georgia	24.3%	13631
Hawaii	31.2%	15770
Idaho	25.2%	11457
Illinois	26.8%	15201
Indiana	20.9%	13149
Iowa	24.5%	12422
Kansas	26.5%	13300
Kentucky	17.7%	11153
Louisiana	19.4%	10635
Maine	25.7%	12957
Maryland	31.7%	17730
Massachusetts	34.5%	17224
Michigan	24.1%	14154
Minnesota	30.4%	14389
Mississippi	19.9%	9648
Missouri	22.3%	12989
Montana	25.4%	11213
Nebraska	26.0%	12452
Nevada	21.5%	15214
New Hampshire	32.4%	15959
New Jersey	30.1%	18714
New Mexico	25.5%	11246
New York	29.6%	16501
North Carolina	24.2%	12885
North Dakota	28.1%	11051
Ohio	22.3%	13461
Oklahoma	22.8%	11893
Oregon	27.5%	13418
Pennsylvania	23.2%	14068
Rhode Island	27.5%	14981
South Carolina	23.0%	11897
South Dakota	24.6%	10661
Tennessee	20.1%	12255
Texas	25.5%	12904
Utah	30.0%	11029
Vermont	31.5%	13527
Virginia	30.0%	15713
Washington	30.9%	14923
West Virginia	16.1%	10520
Wisconsin	24.9%	13276
Wyoming	25.7%	12311

Visualization for Eliciting Knowledge from Data

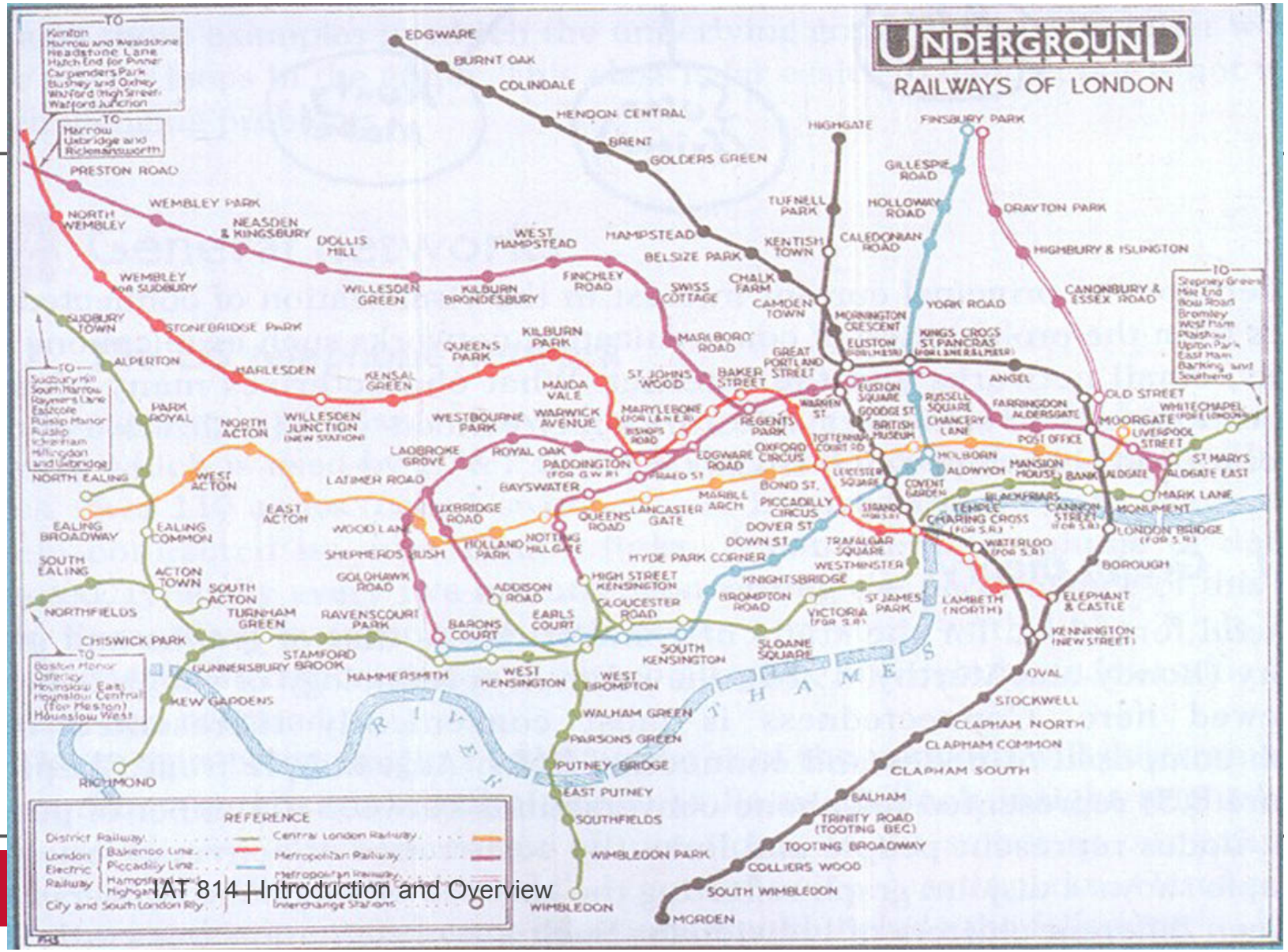



What are the voids made of?
PP

Visualization for Clarification

- London Subway Map Example
- Abstract away details for easier understanding
- Harry Beck's schematic

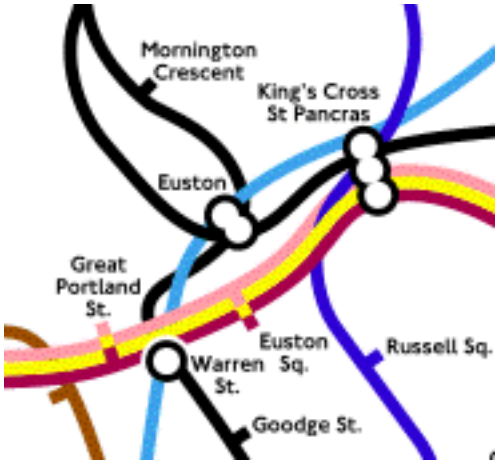
London Underground Map 1927



London Underground Map 1990s

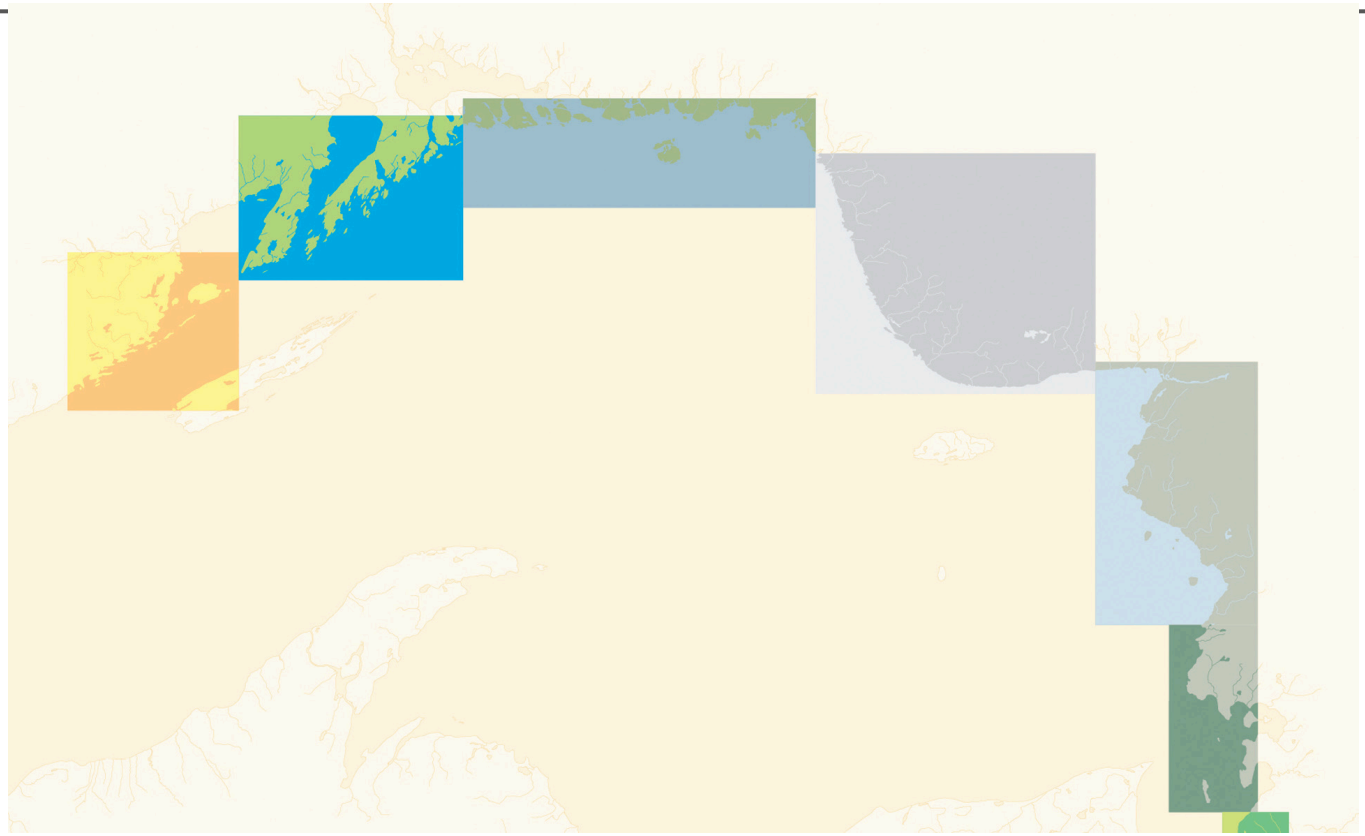
Visualization for Clarification

- Horizontal, vertical and 45° segments
- Key insight: topology and relative location of stations

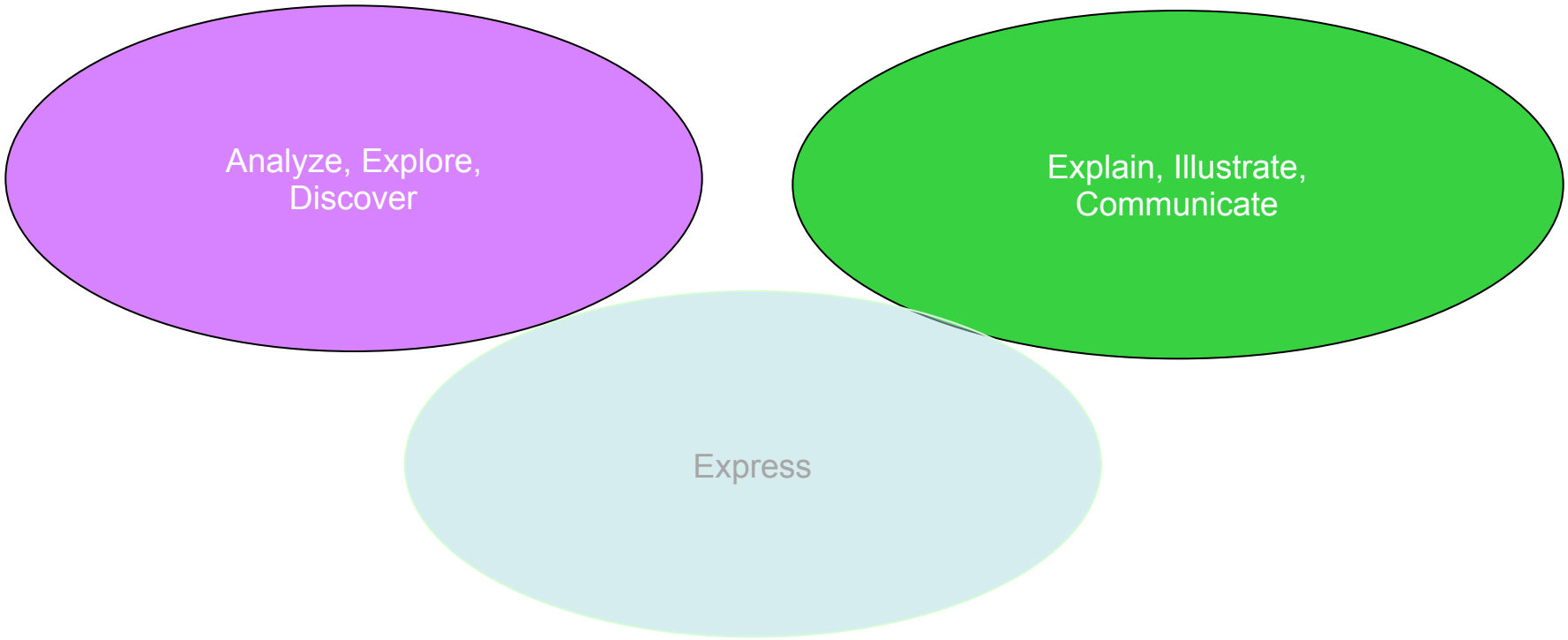


From http://www.ideography.co.uk/

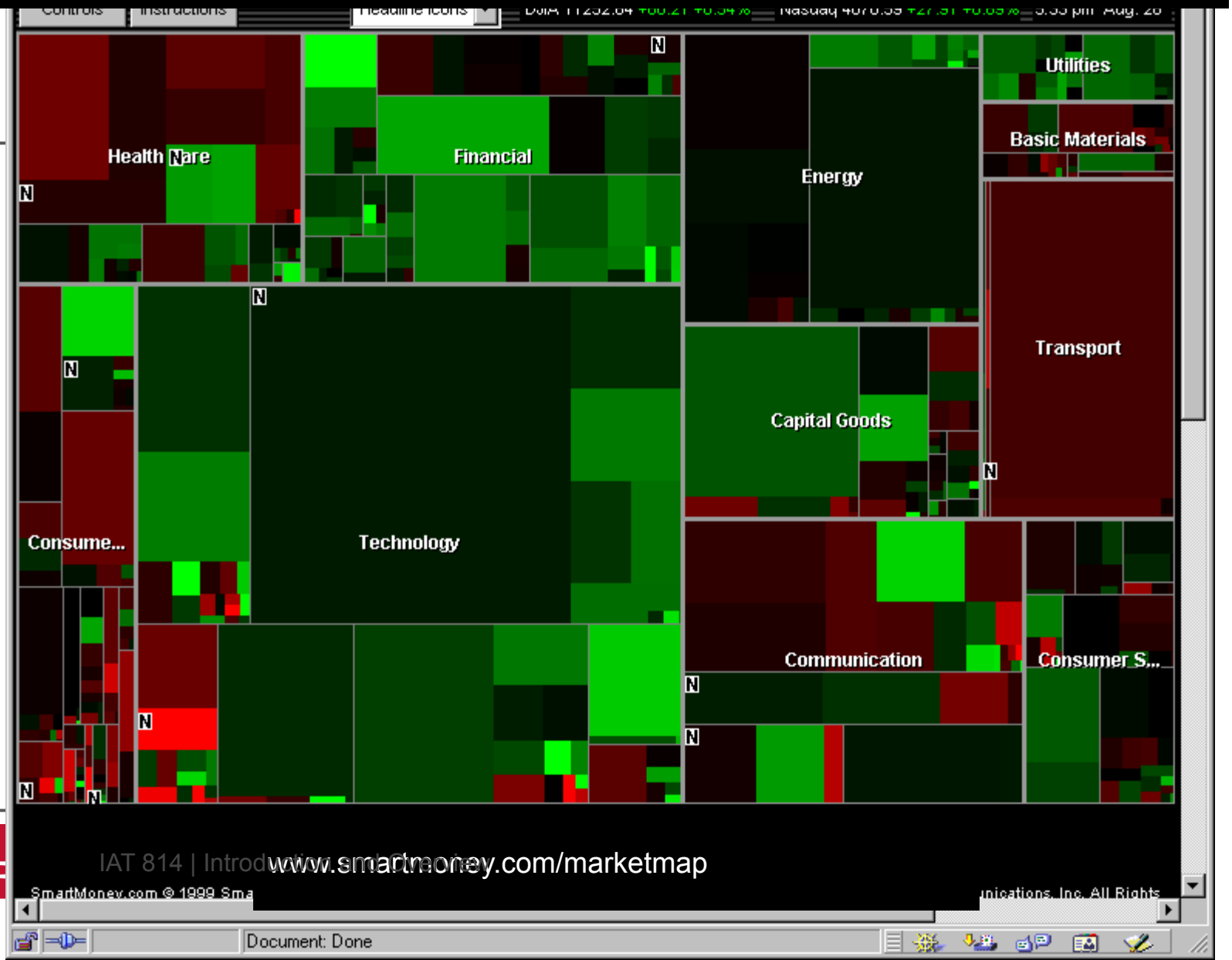
Visualization for telling a story



Visualization: Two Primary Goals

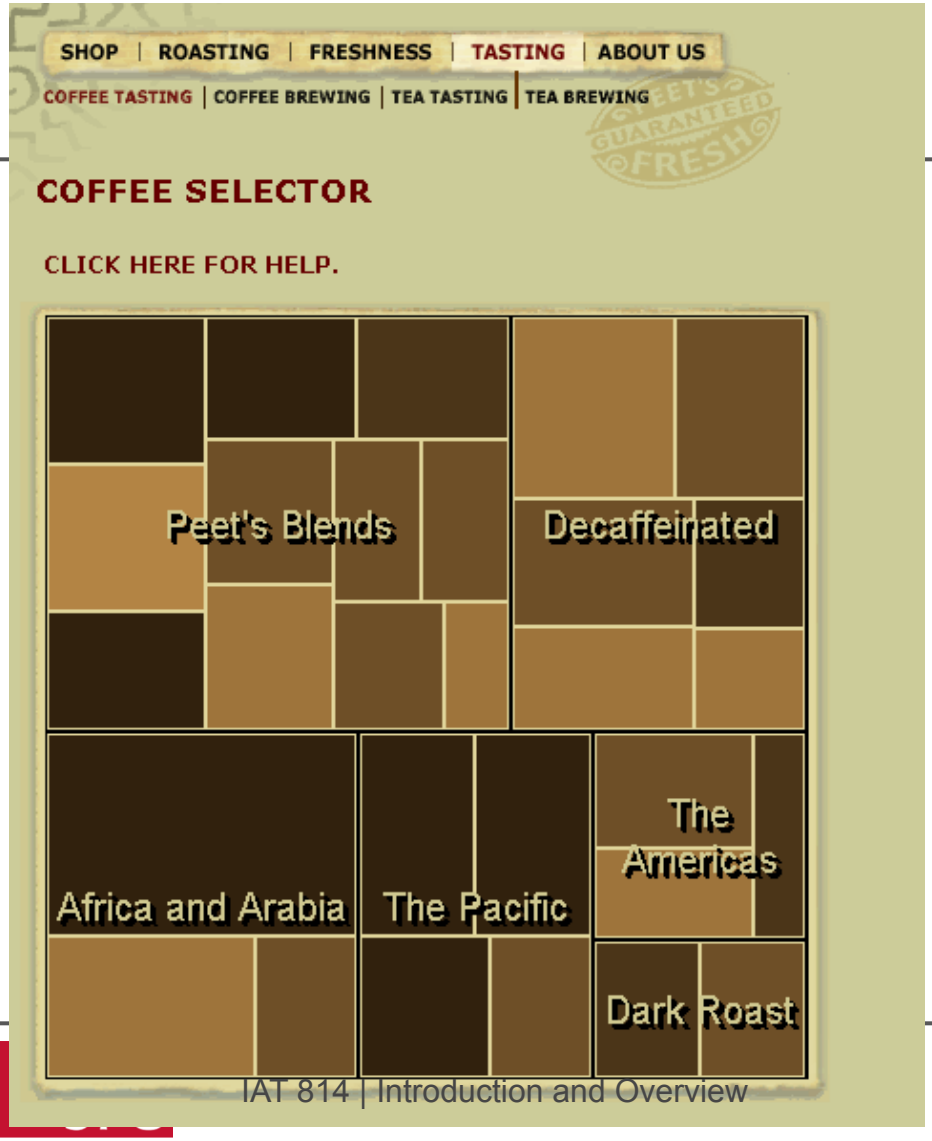


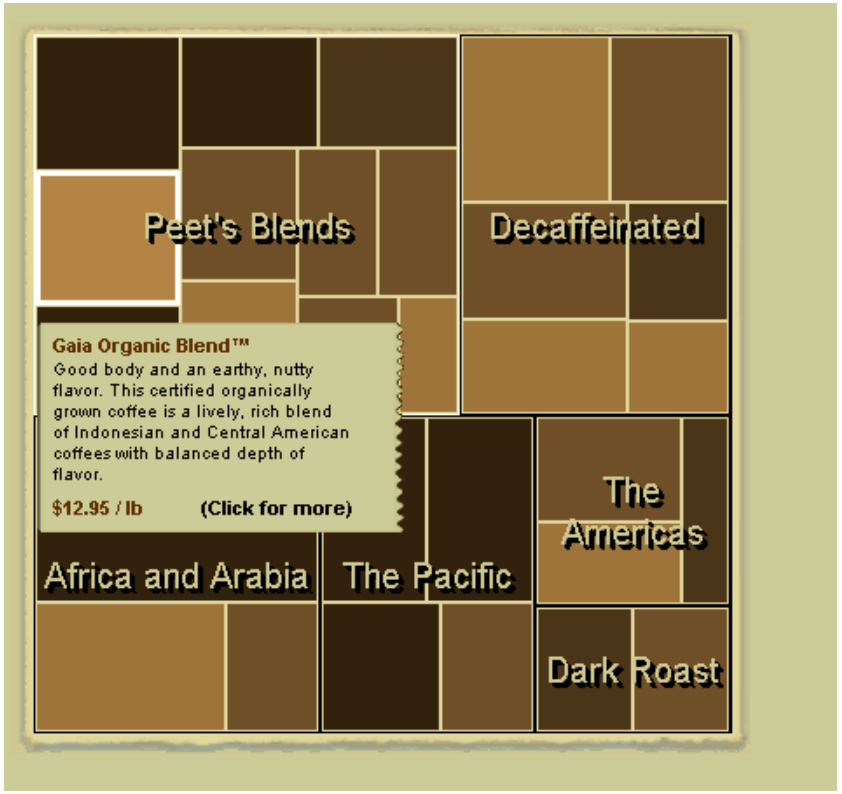
A Good Use of TreeMaps and Interactivity
www.smartmoney.com/marketmap



www.smartmoney.com/marketmap

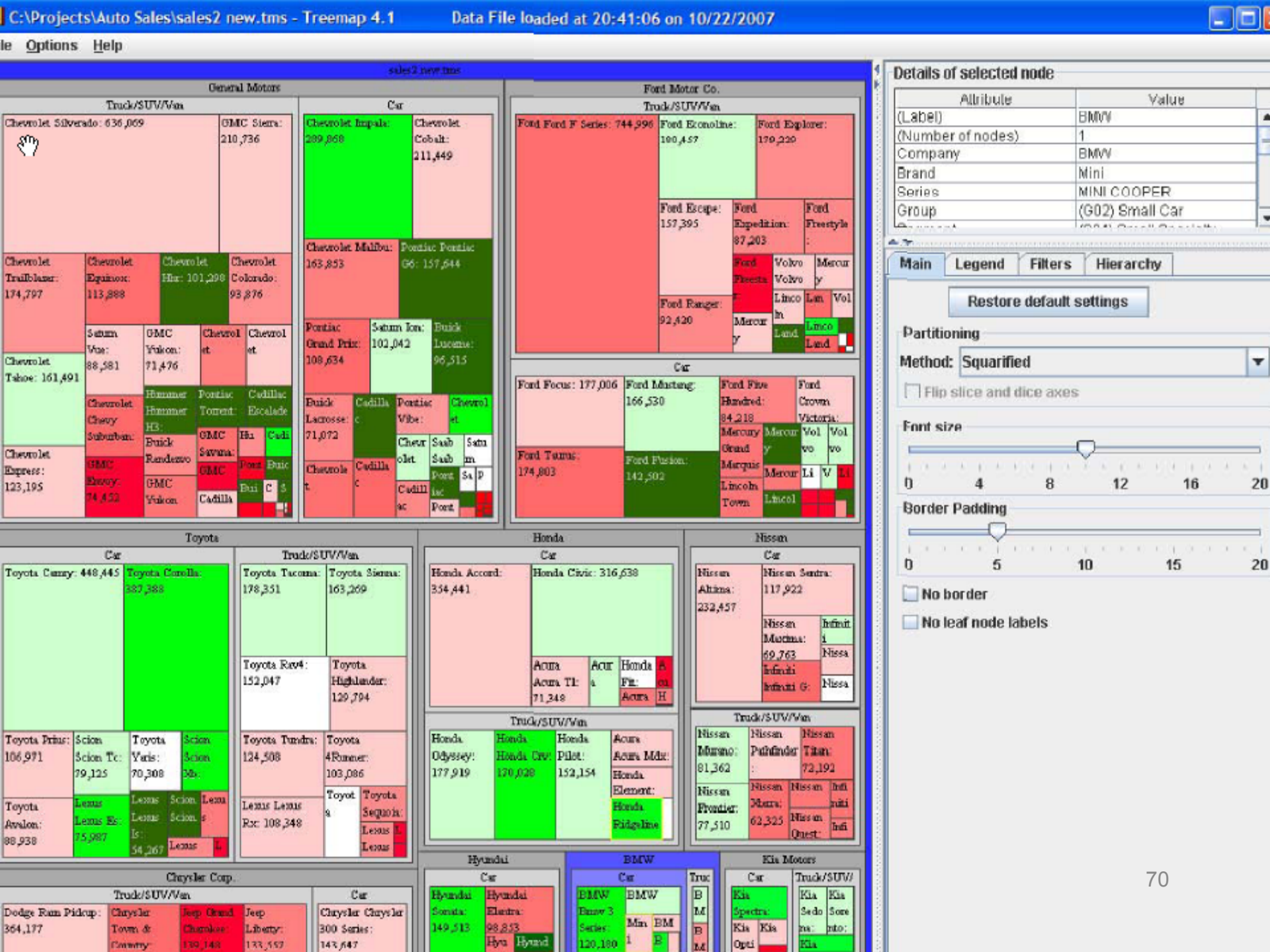
Treemaps in Peets site

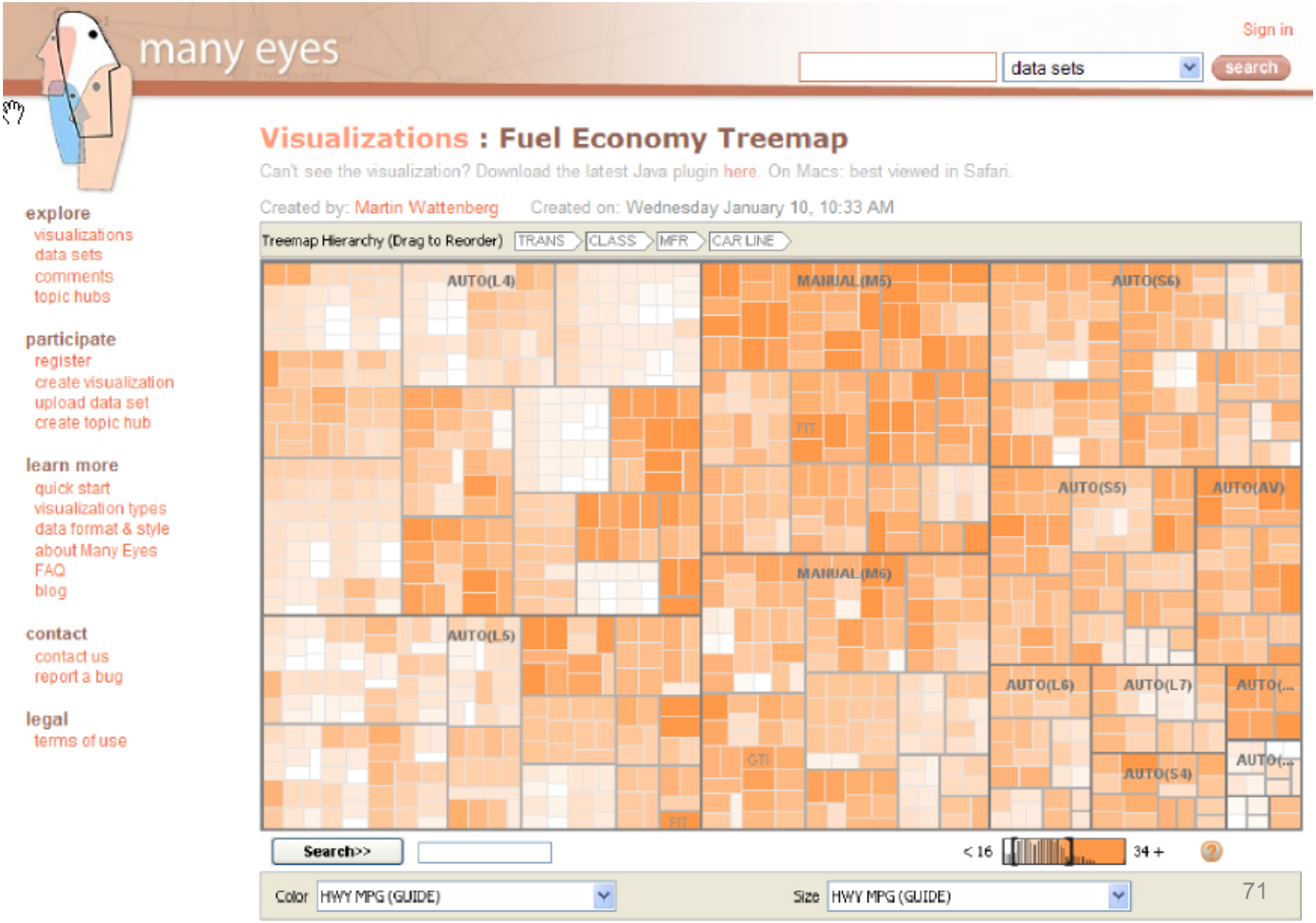




Analysis vs. Communication

- MarketMap's use of TreeMaps allows for sophisticated analysis
- Peets' use of TreeMaps is more for presentation and communication
- This is a key contrast


C:\Projects\Auto Sales\sales2 new.tms - Treemap 4.1
Data File loaded at 20:41:06 on 10/22/2007
le Options Help
sales2 new.tms
General Motors
Truck/SUV/Van
Chevrolet Silverado: 636,069
GMC Sierra: 210,736
Chevrolet Trailblazer: 174,797
Chevrolet Equinox: 113,888
Chevrolet Hhr: 101,298
Chevrolet Colorado: 93,876
Chevrolet Tahoe: 161,491
Saturn Vue: 88,581
GMC Yukon: 71,476
Chevrolet Chevy Suburban:
Hummer H3:
Pontiac Torrent:
Cadillac Escalade
Buick Rendezvo
GMC Savana:
Chevrolet Express: 123,195
GMC Envoy: 74,452
GMC Yukon
Cadilla
Car
Chevrolet Impala: 209,868
Chevrolet Cobalt: 211,449
Chevrolet Malibu: 163,853
Pontiac Pontiac G6: 157,644
Pontiac Grand Prix: 108,634
Saturn Ion: 102,042
Buick Lucerne: 96,515
Buick Lacrosse: 71,072
Cadilla c
Pontiac Vibe:
Chevrol et
Chevrolet
Saab Saab
Cadillac
Ford Motor Co.
Truck/SUV/Van
Ford Ford F Series: 744,996
Ford Econoline: 100,457
Ford Explorer: 170,220
Ford Escape: 157,395
Ford Expedition: 87,203
Ford Freestyle :
Ford Ranger: 92,420
Volvo Volvo
Mercur y
Linco ln
Land
Car
Ford Focus: 177,006
Ford Mustang: 166,530
Ford Five Hundred: 84,218
Ford Crown Victoria:
Ford Taurus: 174,803
Ford Fusion: 142,502
Mercury Grand Marquis
Lincoln Town
Toyota
Car
Toyota Camry: 448,445
Toyota Corolla: 387,388
Toyota Prius: 106,971
Scion Scion Tc: 79,125
Toyota Yaris: 70,308
Toyota Avalon: 88,938
Lexus Lexus Es: 75,987
Truck/SUV/Van
Toyota Tacoma: 178,351
Toyota Sienna: 163,269
Toyota Rav4: 152,047
Toyota Highlander: 129,794
Toyota Tundra: 124,508
Toyota 4Runner: 103,086
Lexus Lexus Rx: 108,348
Toyot a
Toyota Sequoia:
Honda
Car
Honda Accord: 354,441
Honda Civic: 316,638
Acura Acura Tl: 71,348
Truck/SUV/Van
Honda Odyssey: 177,919
Honda Honda Crv: 170,028
Honda Pilot: 152,154
Acura Acura Mdx:
Honda Element:
Honda Ridgeline
Nissan
Car
Nissan Altima: 232,457
Nissan Sentra: 117,922
Nissan Maxima: 69,763
Infiniti Infiniti G:
Truck/SUV/Van
Nissan Murano: 81,362
Nissan Pathfinder :
Nissan Titan: 72,192
Nissan Frontier: 77,510
Nissan Xterra: 62,325
Nissan Quest:
Chrysler Corp.
Truck/SUV/Van
Dodge Ram Pickup: 364,177
Chrysler Town & Country:
Jeep Grand Cherokee:
Jeep Liberty:
Car
Chrysler Chrysler 300 Series:
Hyundai
Car
Hyundai Sonata: 149,513
Hyundai Elantra: 98,853
Hyundai
BMW
Car
BMW
BMW Bmw 3 Series: 120,180
Kia Motors
Car
Kia Spectra:
Kia Opti
Truck/SUV/
Kia Sedona:
Kia Sorento:
Details of selected node
Attribute
Value
(Label)
BMW
(Number of nodes)
1
Company
BMW
Brand
Mini
Series
MINI COOPER
Group
(G02) Small Car
Main
Legend
Filters
Hierarchy
Restore default settings
Partitioning
Method:
Squarified
Flip slice and dice axes
Font size
0
4
8
12
16
20
Border Padding
0
5
10
15
20
No border
No leaf node labels


many eyes
Sign in
data sets
search
Visualizations : Fuel Economy Treemap
Can't see the visualization? Download the latest Java plugin here. On Macs: best viewed in Safari.
Created by: Martin Wattenberg
Created on: Wednesday January 10, 10:33 AM
explore
visualizations
data sets
comments
topic hubs
participate
register
create visualization
upload data set
create topic hub
learn more
quick start
visualization types
data format & style
about Many Eyes
FAQ
blog
contact
contact us
report a bug
legal
terms of use
Treemap Hierarchy (Drag to Reorder)
TRANS
CLASS
MFR
CAR LINE
AUTO(L4)
MANUAL(M5)
AUTO(S6)
FIT
AUTO(S5)
AUTO(AV)
MANUAL(M6)
AUTO(L5)
AUTO(L6)
AUTO(L7)
AUTO(...
AUTO(S4)
GTI
Search>>
< 16
34 +
Color
HWY MPG (GUIDE)
Size
HWY MPG (GUIDE)

Truck Sales Slip, Tripping Up Chrysler

Over the past few years, Chrysler executives said they were following the lead of Toyota and Honda, focusing on vehicles that met the needs of their customers. But as American consumers turned away from large trucks and S.U.V.'s in 2006, Chrysler continued to churn out big vehicles, which are now sitting unsold at dealerships across the country.

SALES CHANGE '05 TO '06

◄TRUCKS, VANS, S.U.V.'S | CARS►

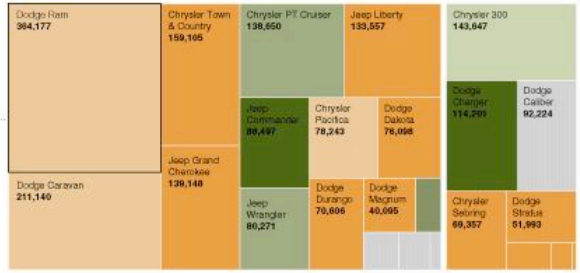
Chrysler Group –7.0%

Trucks/vans/S.U.V.'s 1.6 million

Cars 0.5 million

Pickups, minivans and S.U.V.'s made up 76 percent of Chrysler's sales, which left it vulnerable when consumers shifted to cars.

Dodge Ram



General Motors –8.7%

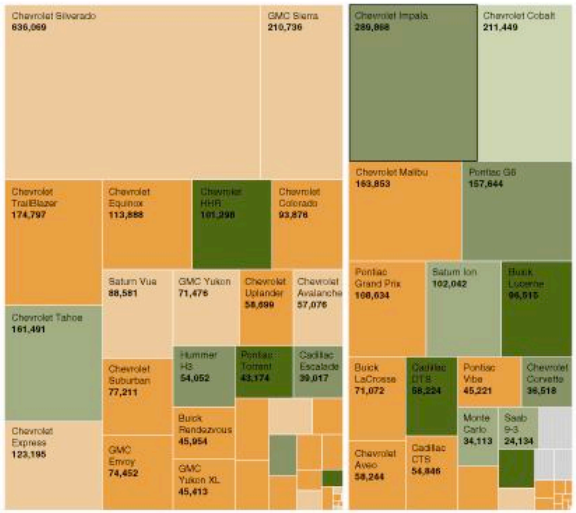
Trucks/vans/S.U.V.'s 2.5 million

Cars 1.6 million

G.M. introduced new versions of its large S.U.V.'s in late 2005, hoping they would bolster sales. Instead, sales of big vehicles were hurt when gas prices climbed. One of the few standouts was the Chevrolet HHR, new in 2005.

Chevrolet Impala

The Chevrolet Impala, with or without flashing lights, did well in 2006, when a redesign came out.



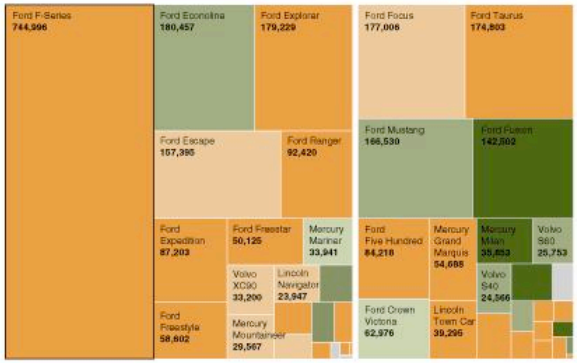
Ford –8.3%

Trucks/vans/S.U.V.'s 1.8 million

Cars 1.1 million

Even the country's best-selling vehicles, the F-Series, slumped in 2006, with sales dropping 13 percent. One of Ford's bright spots was the new Fusion sedan, which made its debut in late 2005 and sold well in its first full year.

Ford F-Series



◄TRUCKS, VANS, S.U.V.'S | CARS►

Toyota +12.5%

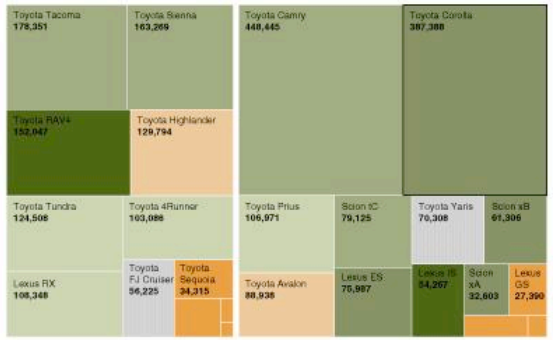
Trucks/vans/S.U.V.'s 1.1 million

Cars 1.5 million

Toyota rolled out a new version of the Camry, and once again it was the country's best-selling car.

Toyota Corolla

Corolla sales also jumped, along with gas prices. Toyota could not escape the decline in sales of supersized S.U.V.'s like its Sequoia.



Honda +3.2%

Trucks/vans/S.U.V.'s 0.7 million

Cars 0.8 million

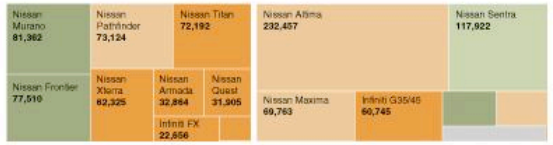
Like the Corolla, the small Honda Civic did well. But the Accord stalled. Buyers, it seems, are waiting for the new version to be released this year.

Honda Accord

Nissan –5.3%

Trucks/vans/S.U.V.'s 0.5 million

Cars 0.6 million



BMW +2.1%

Trucks/vans/S.U.V.'s 0.1 million

Cars 0.3 million

Mercedes-Benz +10.3%

Trucks/vans/S.U.V.'s 0.1 million

Cars 0.2 million

Mercedes-Benz, owned by DaimlerChrysler, had a comeback in 2006, thanks to a new version of its flagship S-Class. BMW sales were helped by a new version of its 3 Series sport sedan.

Sources: Ward's AutoInfoBank; Edmunds

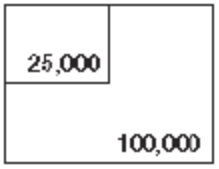
Amanda Cox and Hannah Fairfield/ The New York Times

Amanda Cox and Hannah Fairfield/The New York Times

lead of Toyota
ıt as American
ontinued to
the country.

READING THE CHART

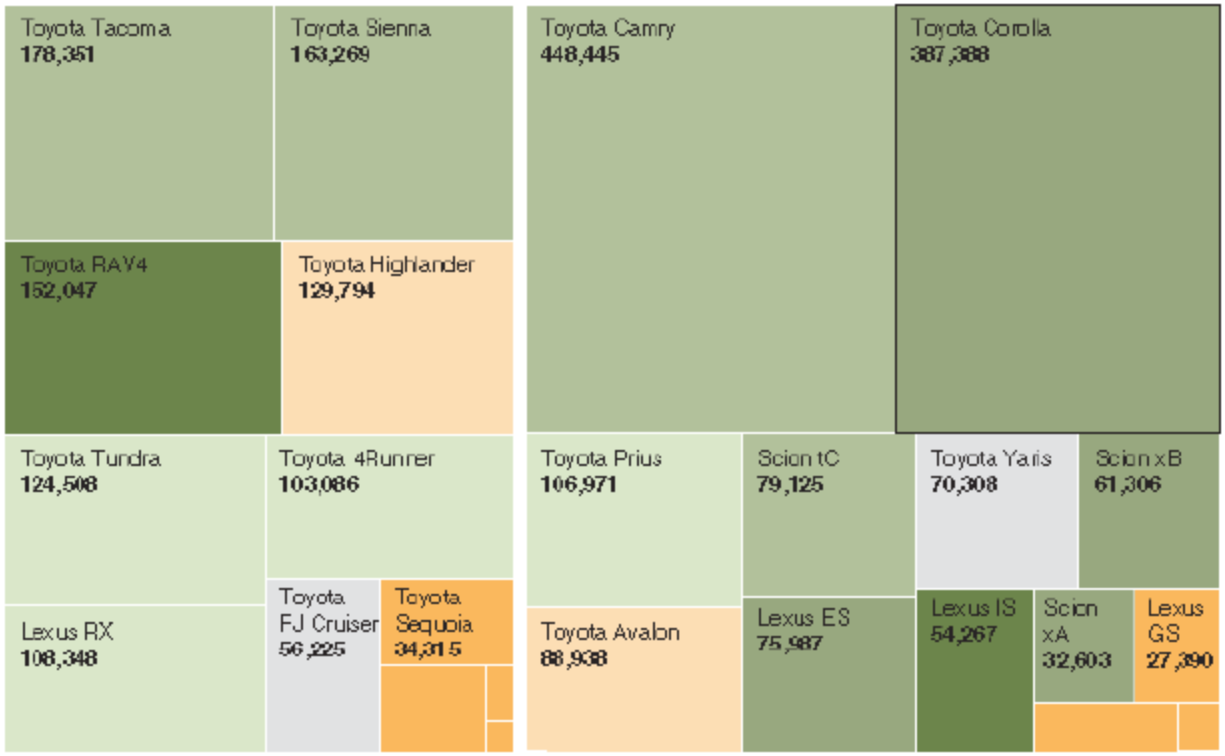
Boxes are scaled proportionally according to number of cars sold in 2006



Change in sales from 2005 to 2006

Many of these vehicles were introduced in 2005.

◀TRUCKS, VANS, S.U.V.'S | CARS▶



Toyota **+12.5%**

Trucks/vans/S.U.V.'s 1.1 million

Cars 1.5 million

Toyota rolled out a new version of the Camry, and once again it was the country's best-selling car.

Toyota Corolla

Corolla sales also jumped, along with gas prices. Toyota could not escape the decline in sales of supersized S.U.V.'s like its Sequoia.

Amanda Cox, Heather Fairfield, NY Times

Other Taxonomies of Goals

- Others:
  - Analysis
  - Monitoring
  - Planning
  - Communication
- Tufte:
  - Description
  - Exploration
  - Tabulation
  - Decoration

- Others:
  - Aid to thinking
  - Problem solving/Decision making
  - Insight
  - Clarifying
  - Entertainment / Art

Ideas from this slide from Stone & Zellweger

New twists

- Implicit vs explicit
- Pragmatic vs artistic
- Ambient vs focused
- Casual vs expert …

Another way to think about it

- Answer this question: Do you know the answer?
  - If yes,
    - Presentation, communication, education
  - If no,
    - Exploration, analysis
    - Problem solving, planning,
    - Aid to thinking, reasoning
- Answer this question: Are you the creator or the viewer of the information?
  - Often there is a loop between analysis and presentation

Ideas from this slide from Stone & Zellweger

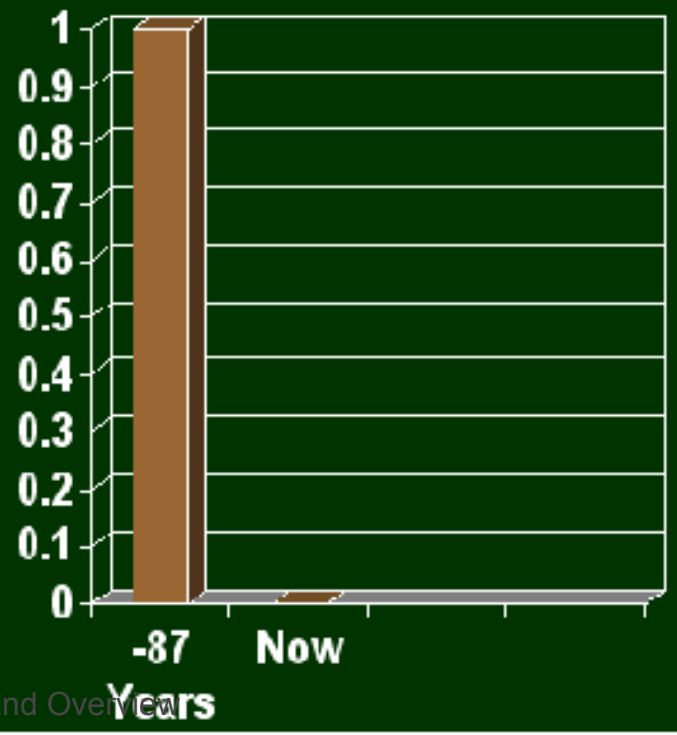
Open Issues

- Does visualization help?
  - The jury is still out
  - Still supplemental at best for text collections
    - A correlation with spatial ability
    - Learning effects: with practice ability on visual display begins to equal that of text
- Does visualization sell?
  - Value of vis tools has exploded
  - Data become more ubiquitous
- Evaluation of GOOD visualizations critical

Utility

- Have we made advances in communication with computer assisted visualization?
  - Two of my favourite examples

Organizational Overview



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home back next

Presentation in the extreme

- Joh Cleese uses infovis to explain an issue of language

Assignment 1: Vis critiques

- Find two examples of visualization used in **practice**
  - One good, one bad
  - Example sources
    - Journal (Journal of Applied Optics, ...)
    - Science magazine (Nature, Science, Scientific American, ...)
    - News Magazine or newspaper (Newsweek, The Economist, NY Times, USA Today, ...
  - **Not** from a vis paper, design textbook, design blog etc.
- Make a Canvas submission with with critique
- 5-8 min presentation