

CNAM - spécialité Informatique  
NSY116 - Multimédia et IHM - 2007-8

# Visualisation d'information

Pierre Cubaud [cubaud@cnam.fr](mailto:cubaud@cnam.fr)

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**plan de l'exposé :**

1. Introduction
2. Représentation
3. Présentation
4. Bibliographie, logiciels

# 1. Introduction

- Exemples d'application
- Définition du sujet
- Exemples de techniques

## Un exemple :

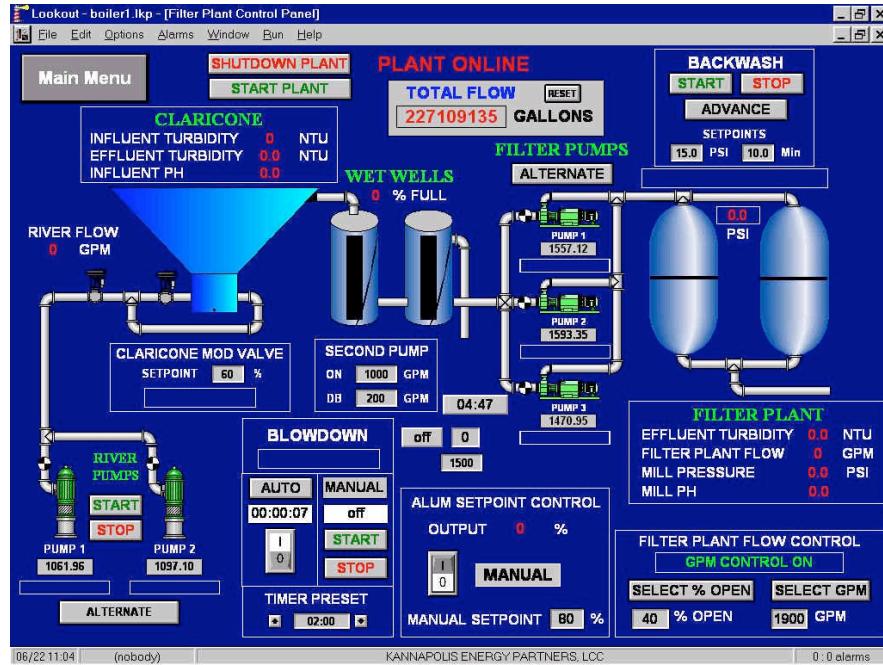
choisir dans une grande masse d'informations

The image consists of two side-by-side panels. The left panel is a newspaper clipping from 'Le Monde' dated December 2007, page 5. It features a large orange box containing the number '4%' and the text 'de l'alimentation'. Below this, there is a column of text about Danone's price increases. The right panel is an advertisement for the Sony Ericsson W910i mobile phone. It features a black smartphone displaying a circular interface with various emotion-related words like 'Rapide', 'Triste', 'Joyeuse', 'Lente', 'Creer', 'Ajouter', and 'Retour'. The background of the ad shows several stylized orange bubbles containing small human figures. The text at the top reads 'J' la musique qui me ressemble' and 'Choisissez votre musique et faites vos playlists\* selon votre humeur avec la fonction SensMe™ du nouveau mobile Walkman™ W910i.' The Sony Ericsson logo is visible at the bottom of the phone screen.

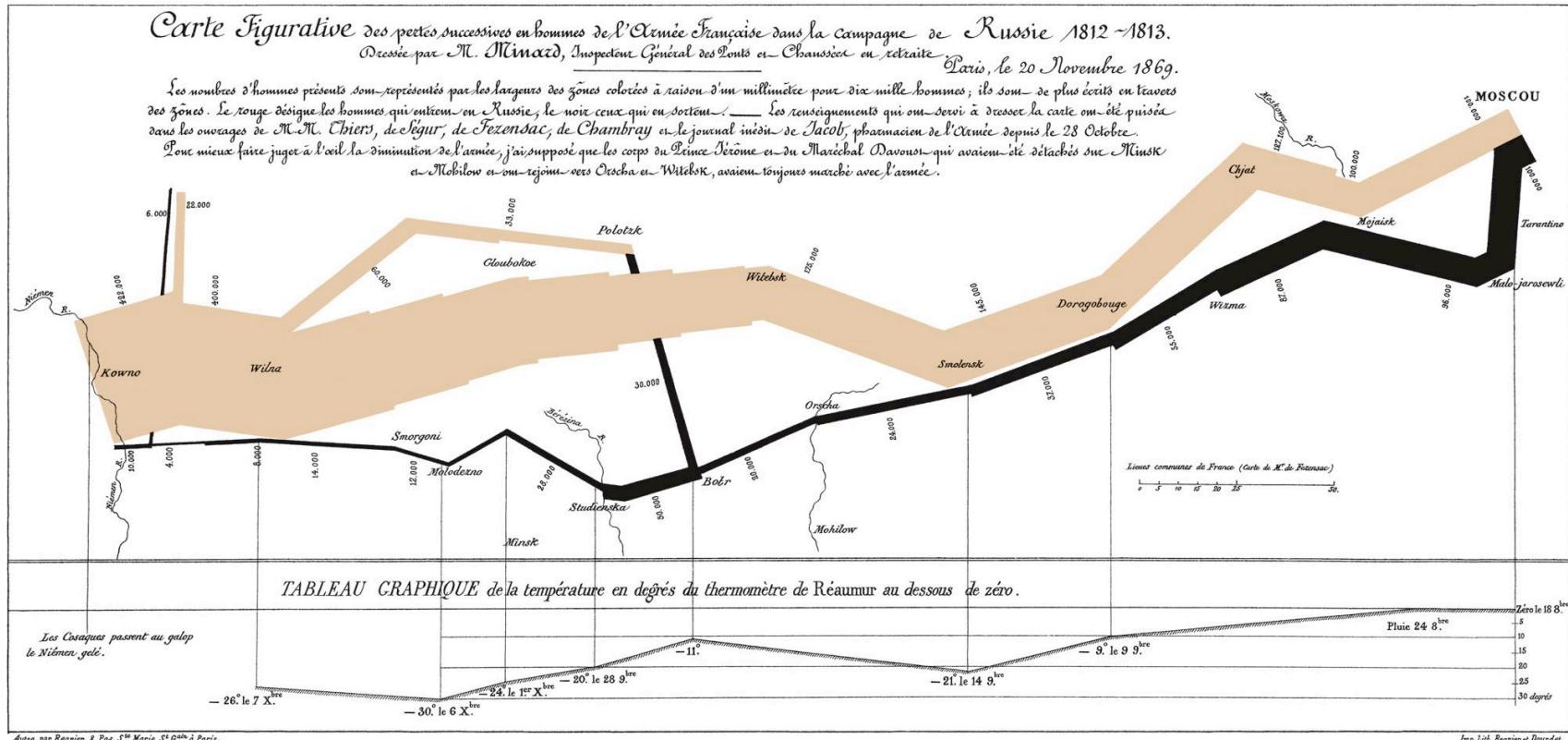


« cover flow » Apple Ipod Touch

## Autre exemple : piloter un processus complexe



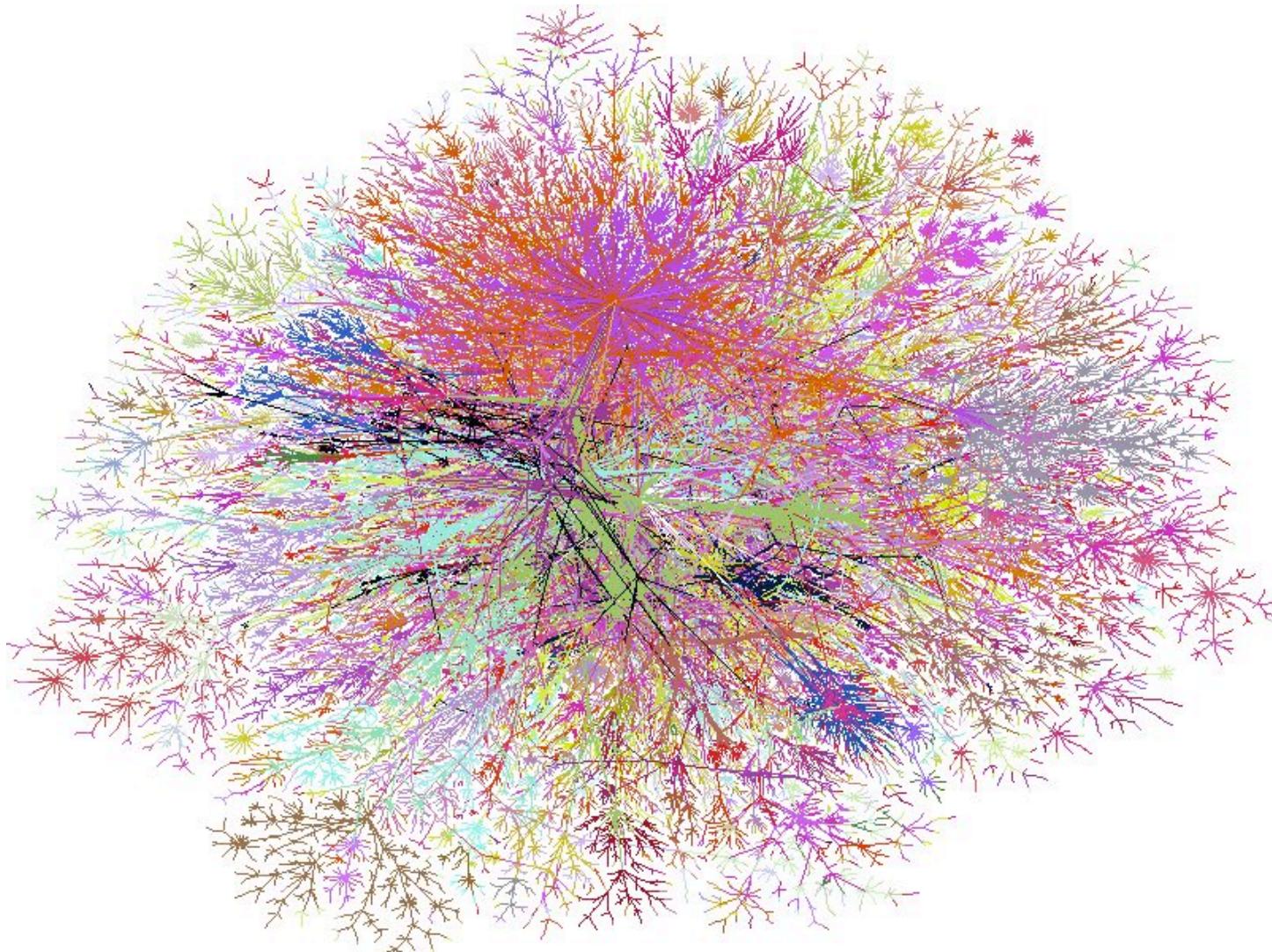
## Autre exemple : comprendre un phénomène



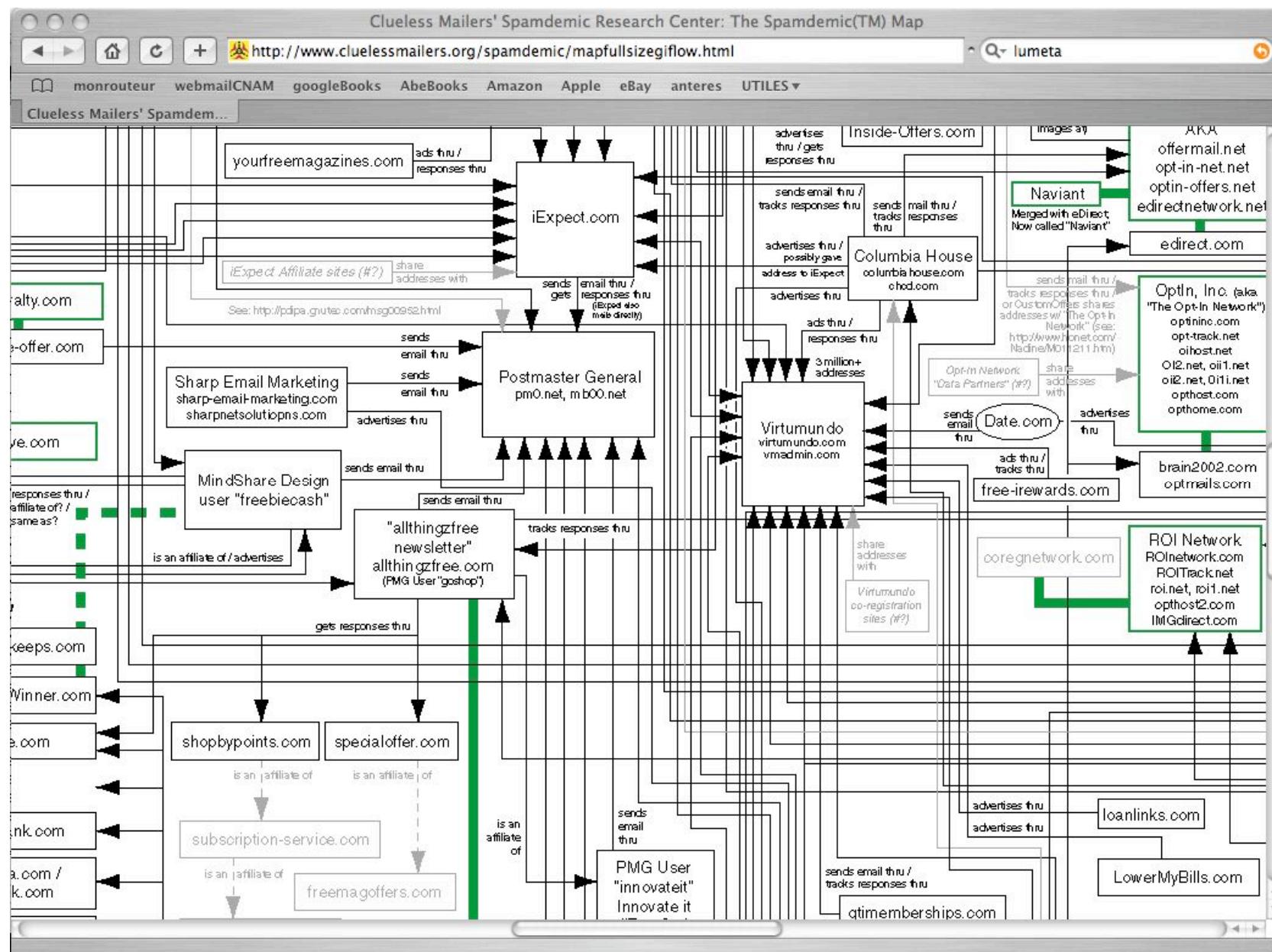
Edward R. Tufte (1992). The Visual Display of Quantitative Information

Minard (1869) : carte augmentée par des flots  
 « graphics reveals data » (Tufte)

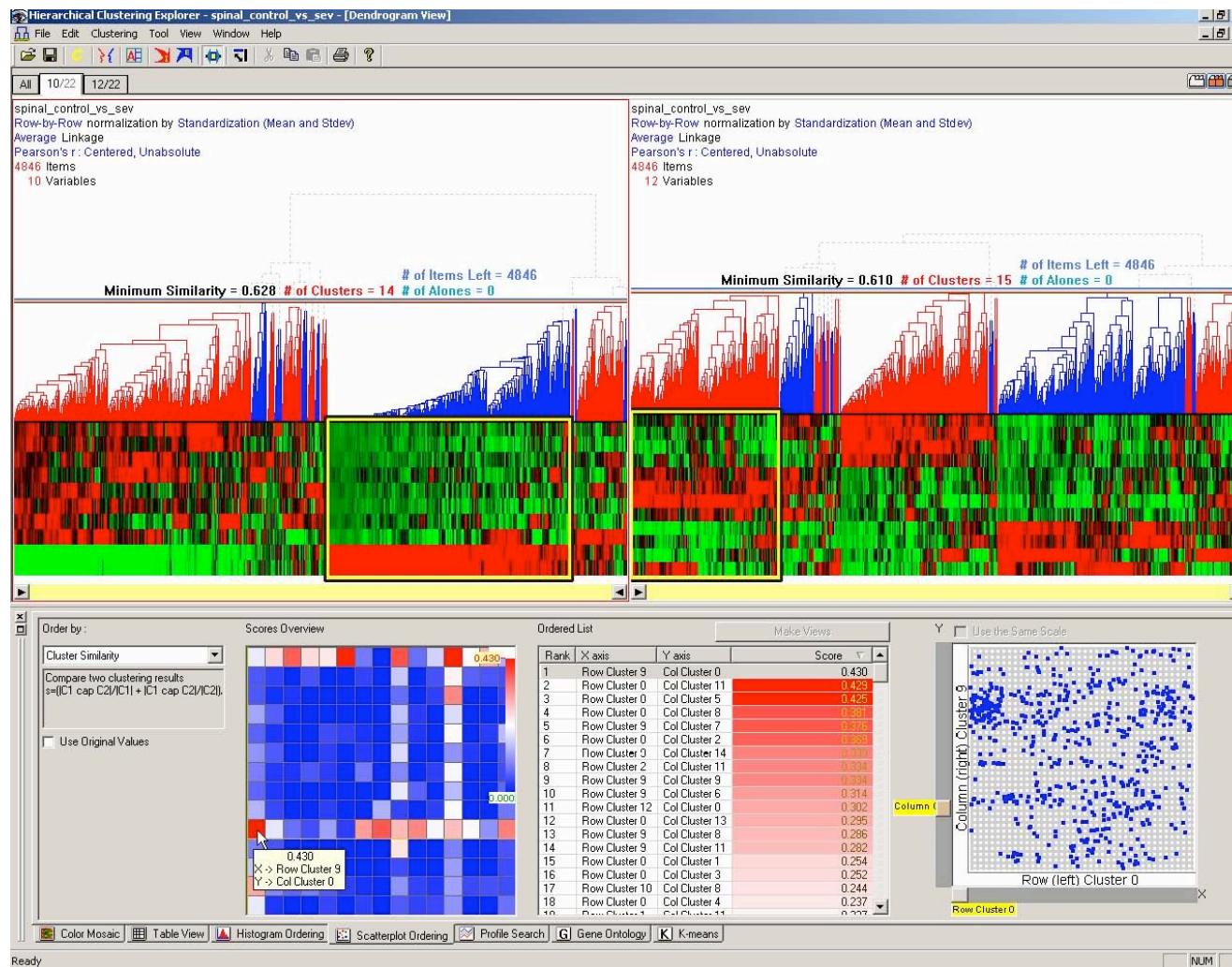
cybergéographie



Lumeta (revue Nature)



# génétique :



# définition du sujet

"using vision to think" (Card et al.)

Compact graphical presentation and user interface for

- manipulating large numbers of items
- possibly extracted from far larger datasets

Enables users to make

- discoveries,
  - decisions, or
  - explanations
- about
- patterns (trend, cluster, gap, outlier...),
  - groups of items, or
  - individual items.

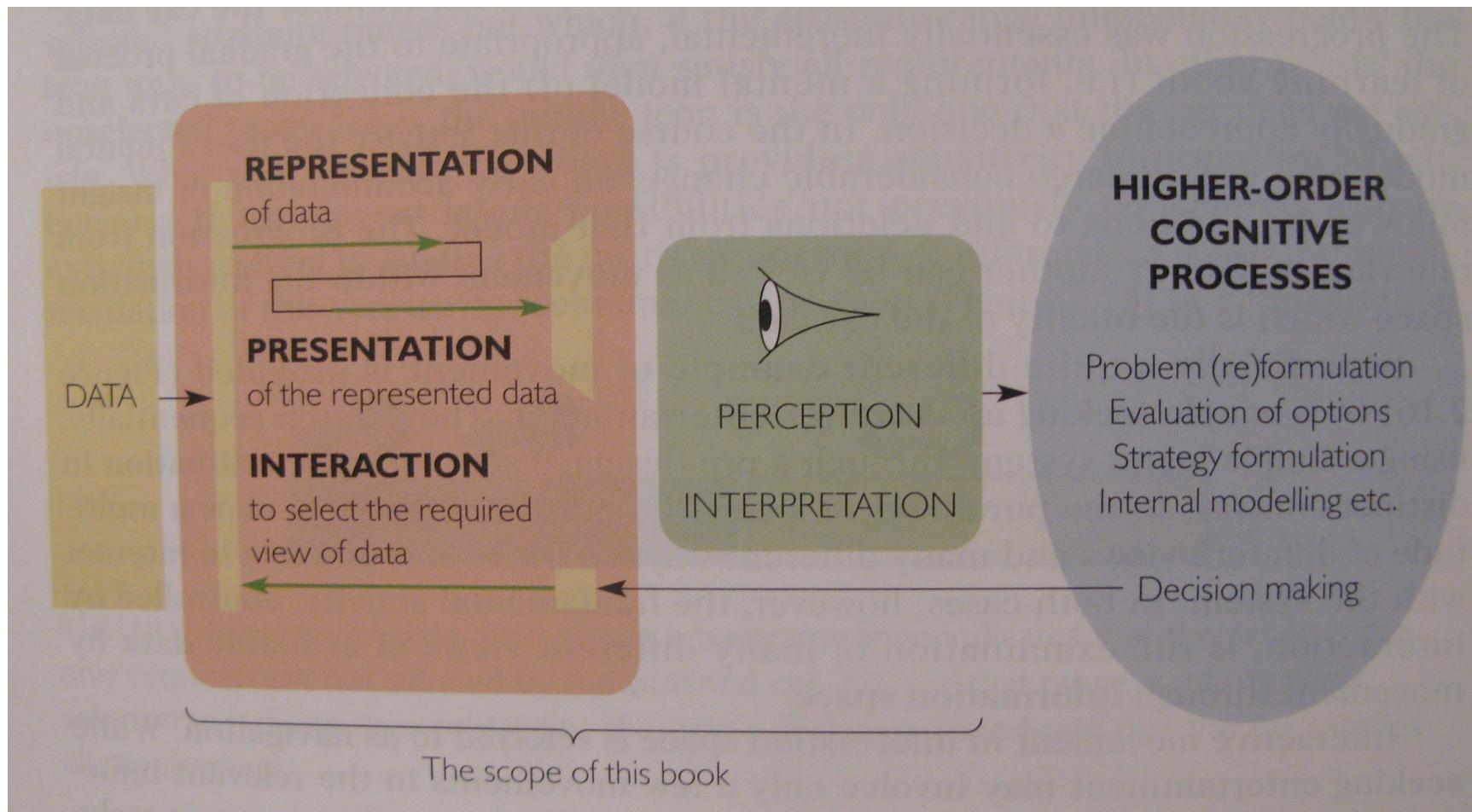
[Plaisant, 2001]

Visual representations of the semantics, or meaning, of information. In contrast to scientific visualization, information visualization typically deals with nonnumeric, nonspatial, and high-dimensional data.

[Chen, 2005]

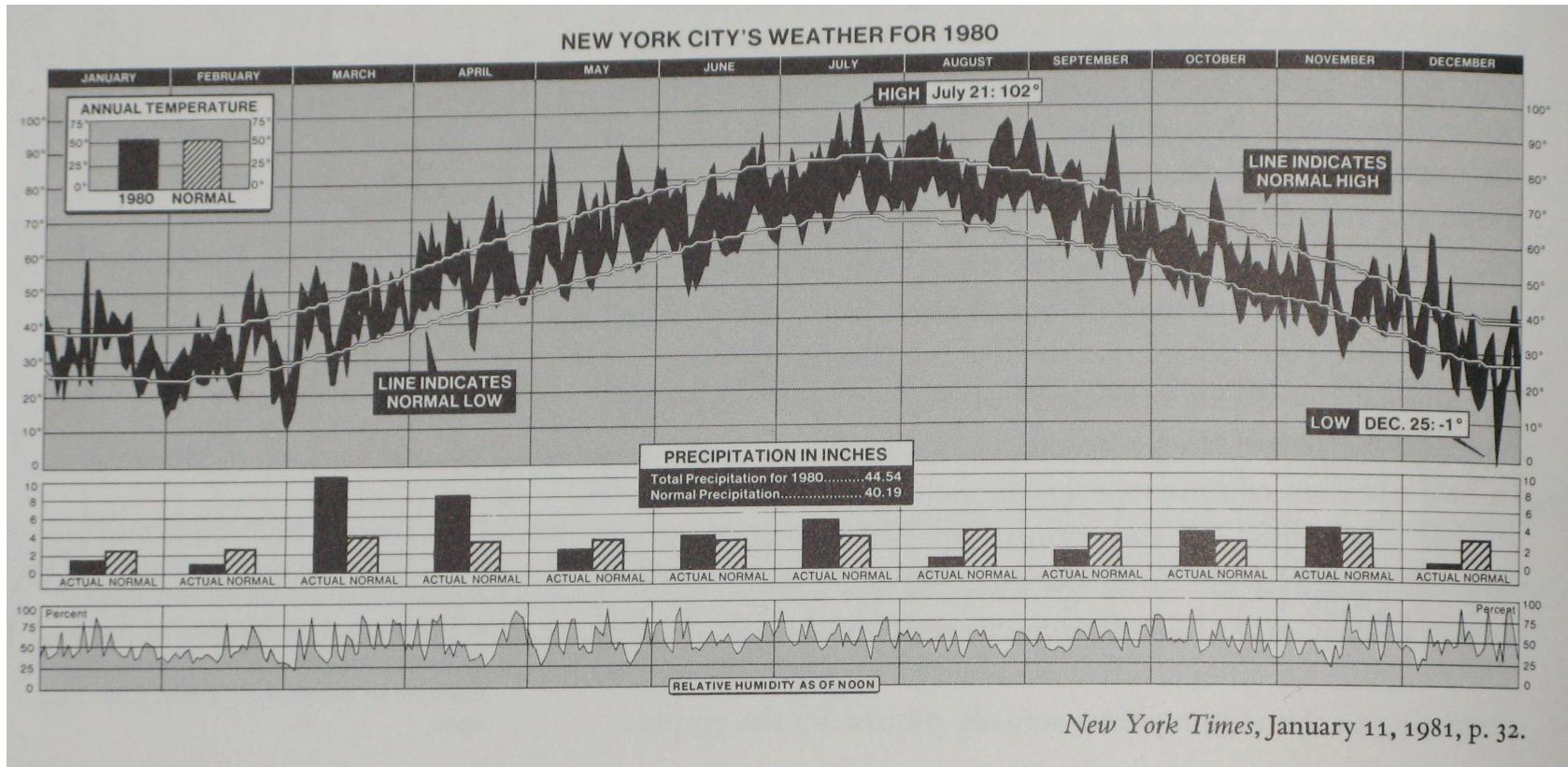
Information visualization (InfoVis) produces (interactive) visual representations of abstract data to reinforce human cognition and perception; thus enabling the viewer to gain knowledge about the internal structure of the data and causal relationships in it.

[http://www.infovis-wiki.net/index.php/Information\\_Visualization](http://www.infovis-wiki.net/index.php/Information_Visualization)



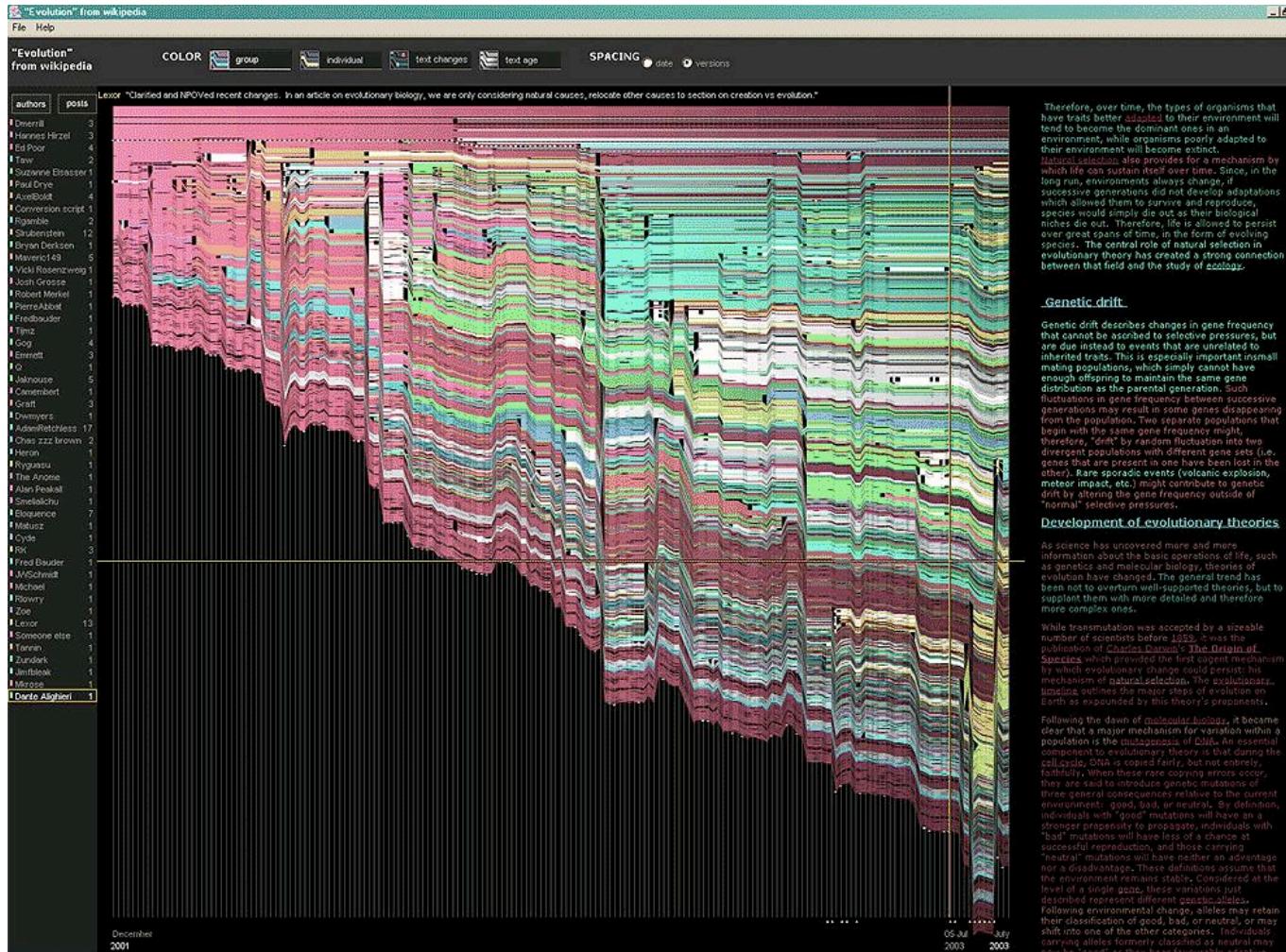
[Spence] p.26

# Un schéma pour 1888 nombres



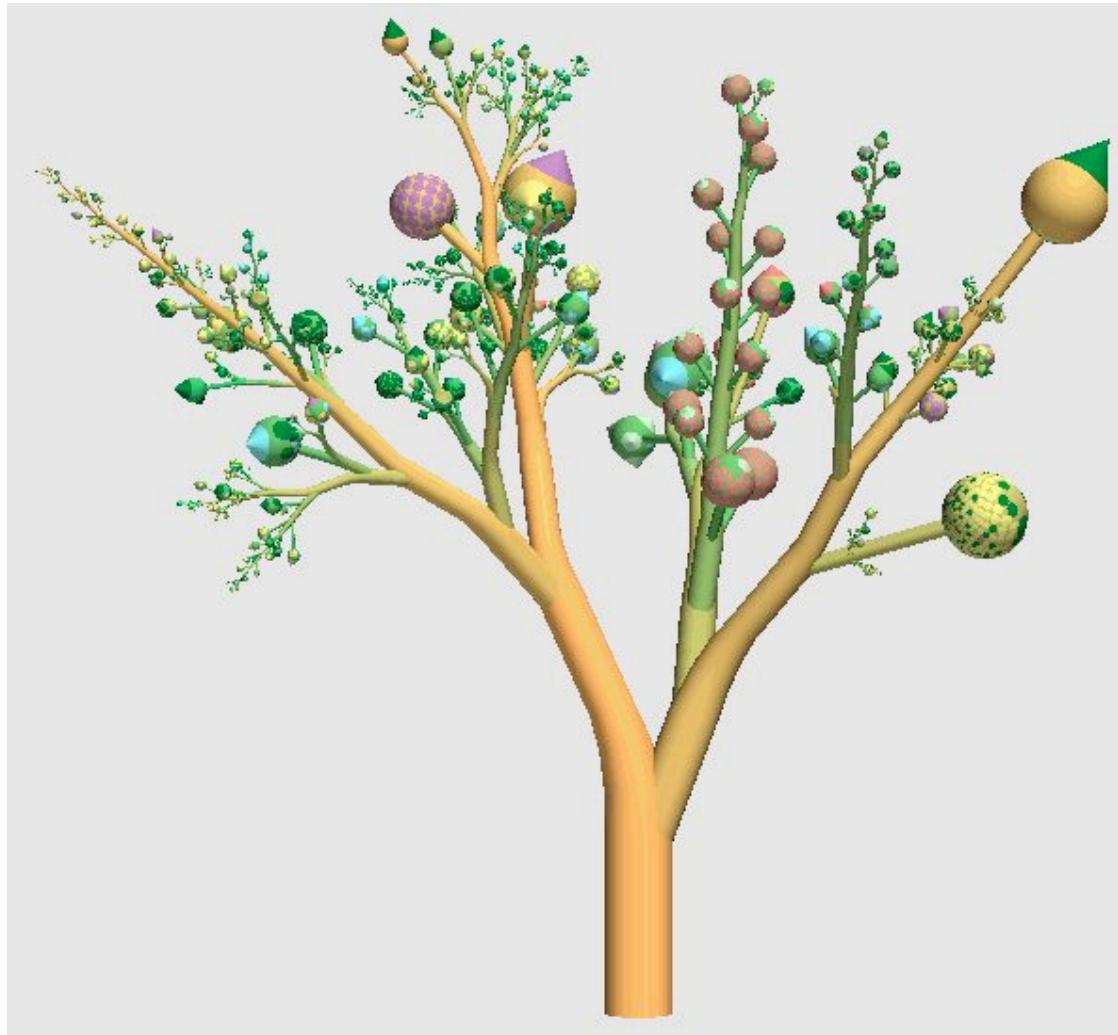
The graphics (...) tells a story [Tufte, Visual display ... p.30]

# Si + de données, une interaction indispensable (zoom, etc.)



versions de l'article "evolution" sur Wikipedia  
[http://www.research.ibm.com/visual/projects/history\\_flow/](http://www.research.ibm.com/visual/projects/history_flow/)

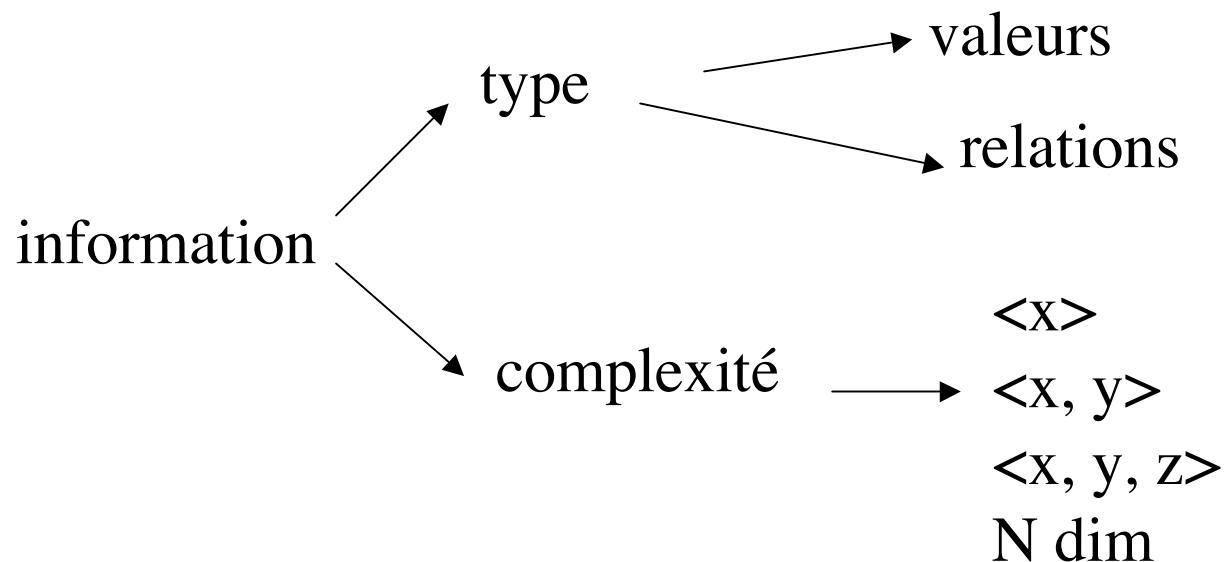
## Représenter l'abstrait ? une usabilité à évaluer...



<http://www.infovis-wiki.net/index.php?title=Image:Boom.gif>

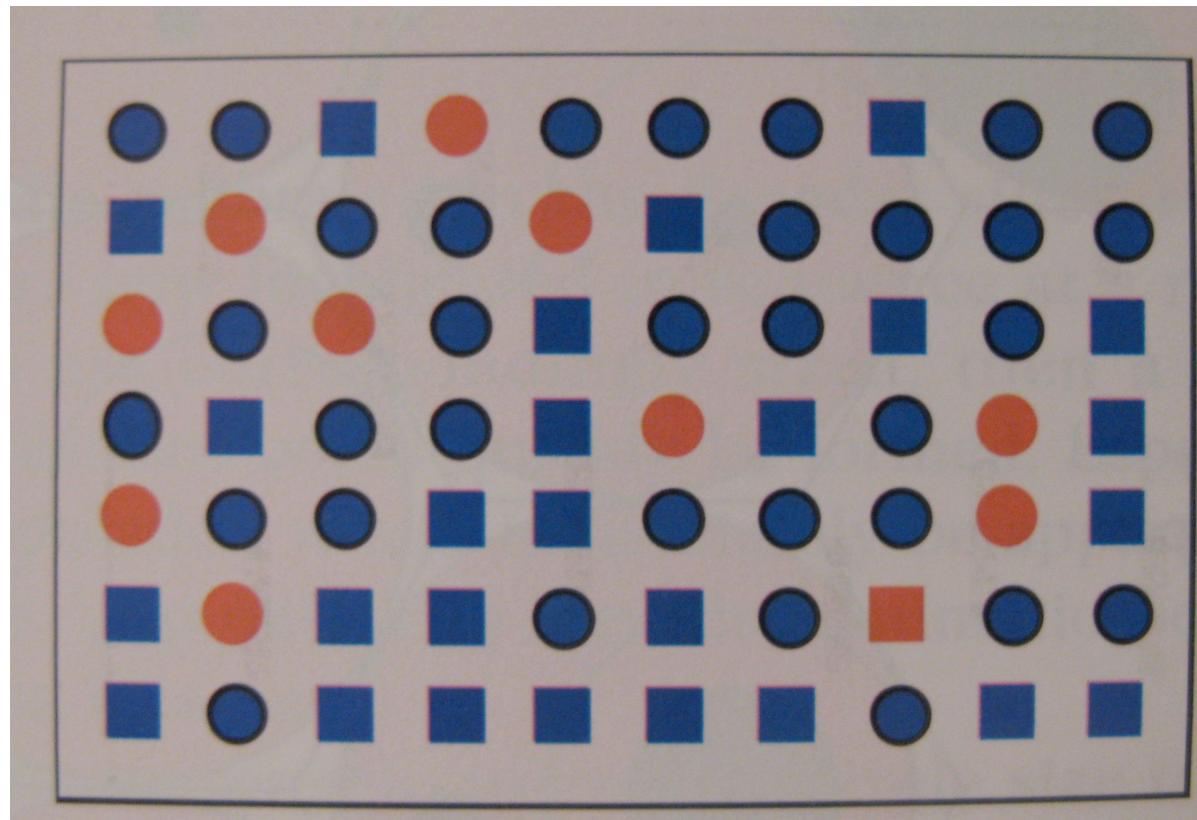
## 2. Représentation

Taxonomie de [Spence]



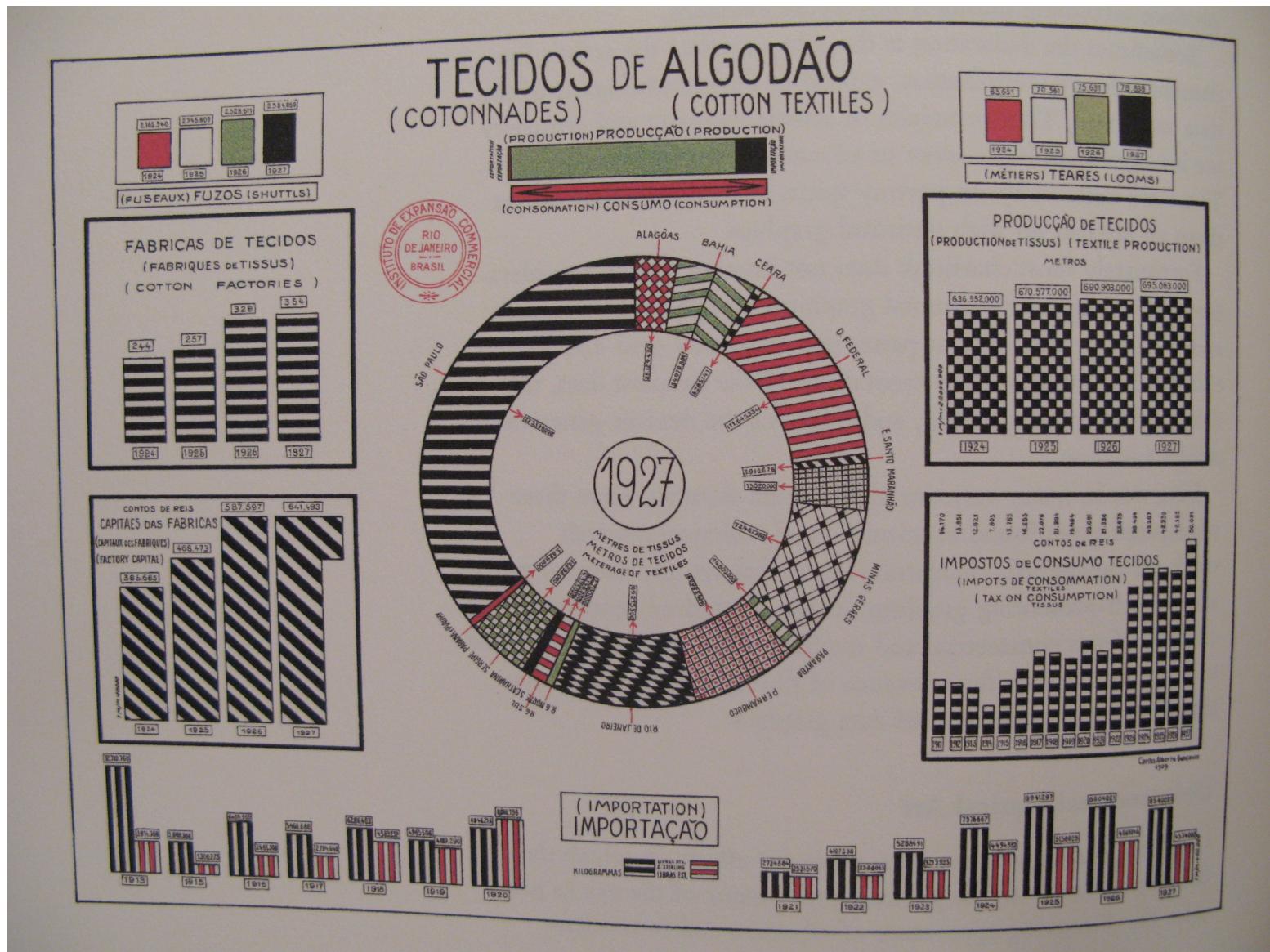
PB : cas d'une photo ? d'un texte ?

## 2.1 Codage des valeurs



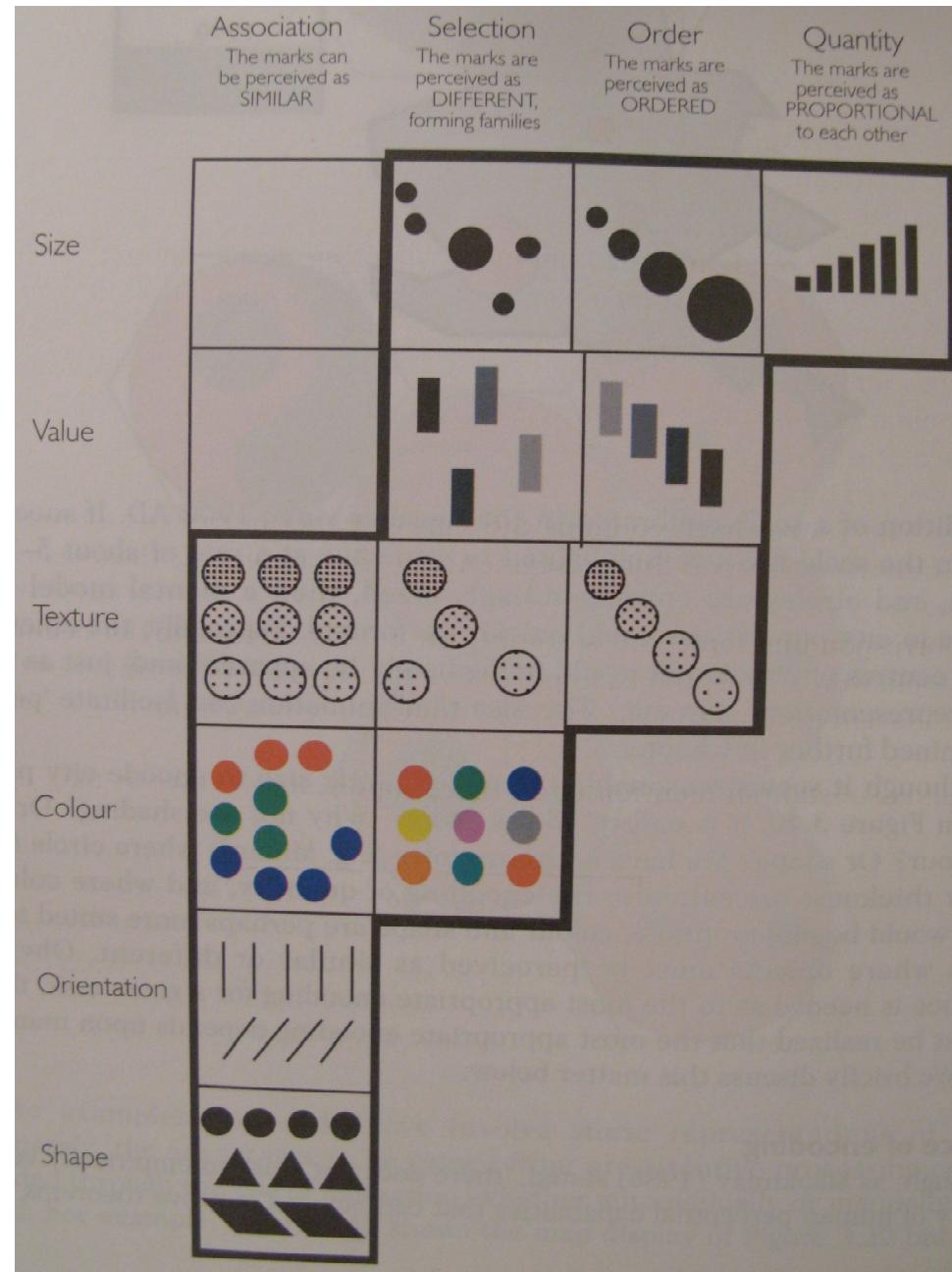
Éviter l'aveuglement au changement ?

# Un schéma raté.... [Tufte, Visual p.108]

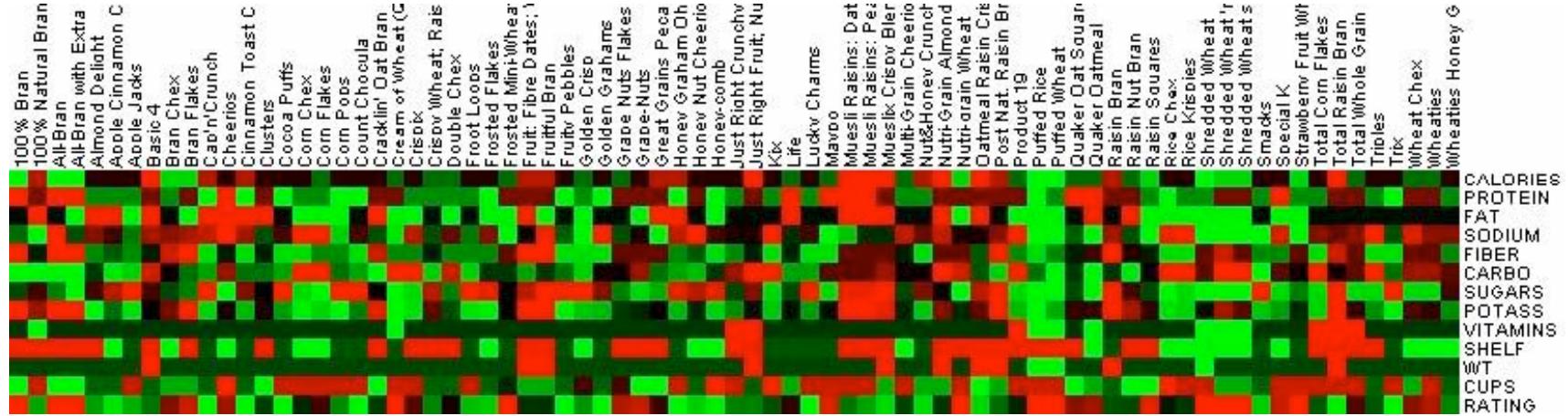


# Les « variables rétinienennes » de J. Bertin (1962)

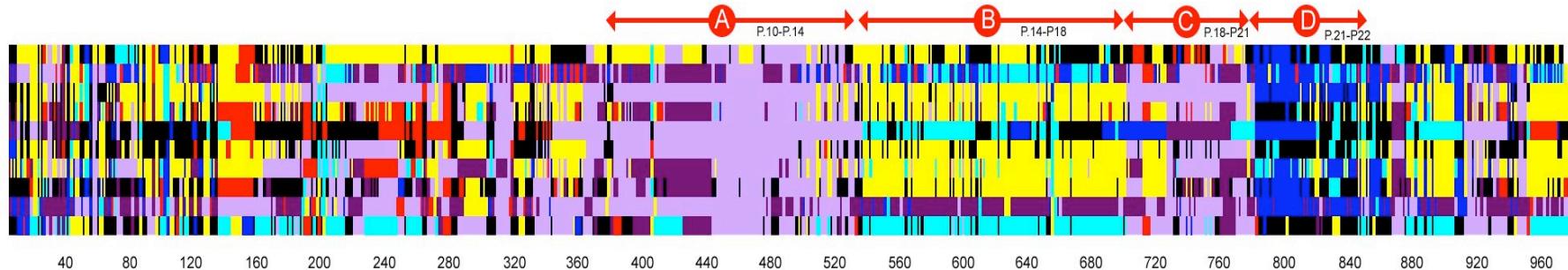
Taille  
Valeur  
Grain  
Couleur  
Orientation  
Forme



# Matrices ordonnables (Bertin, 70')

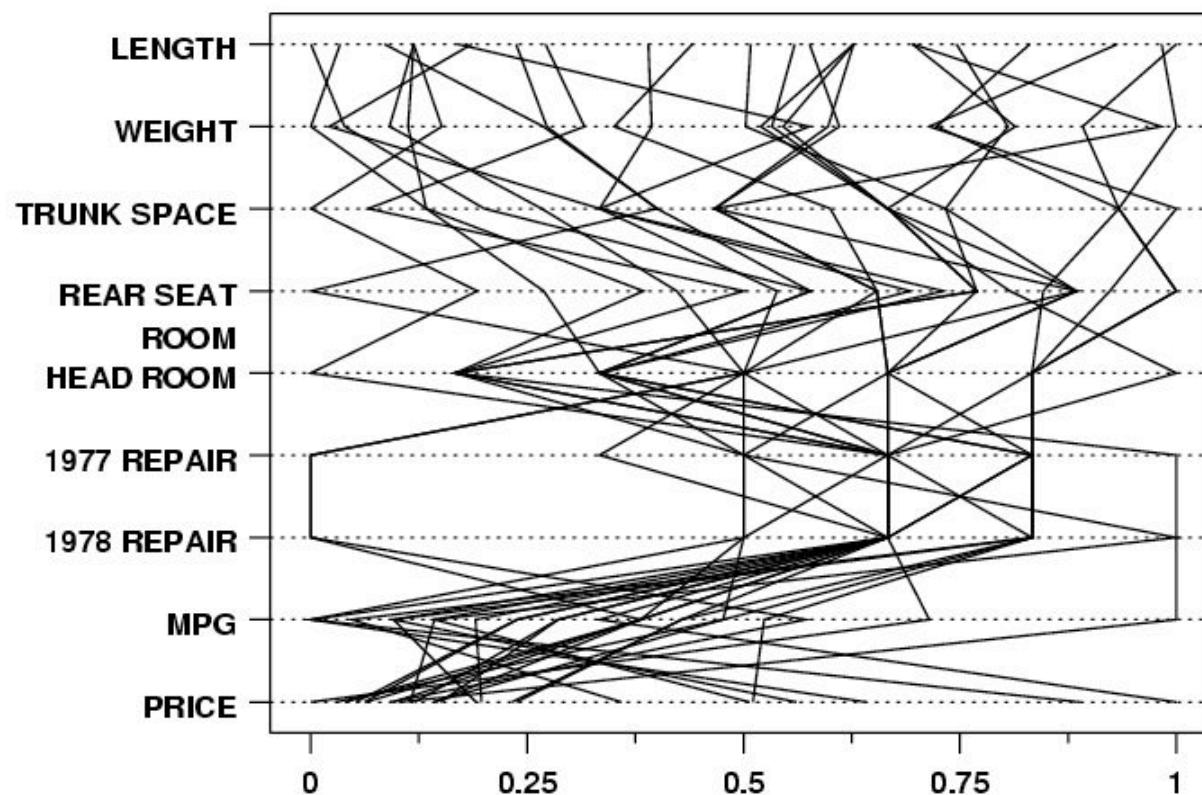


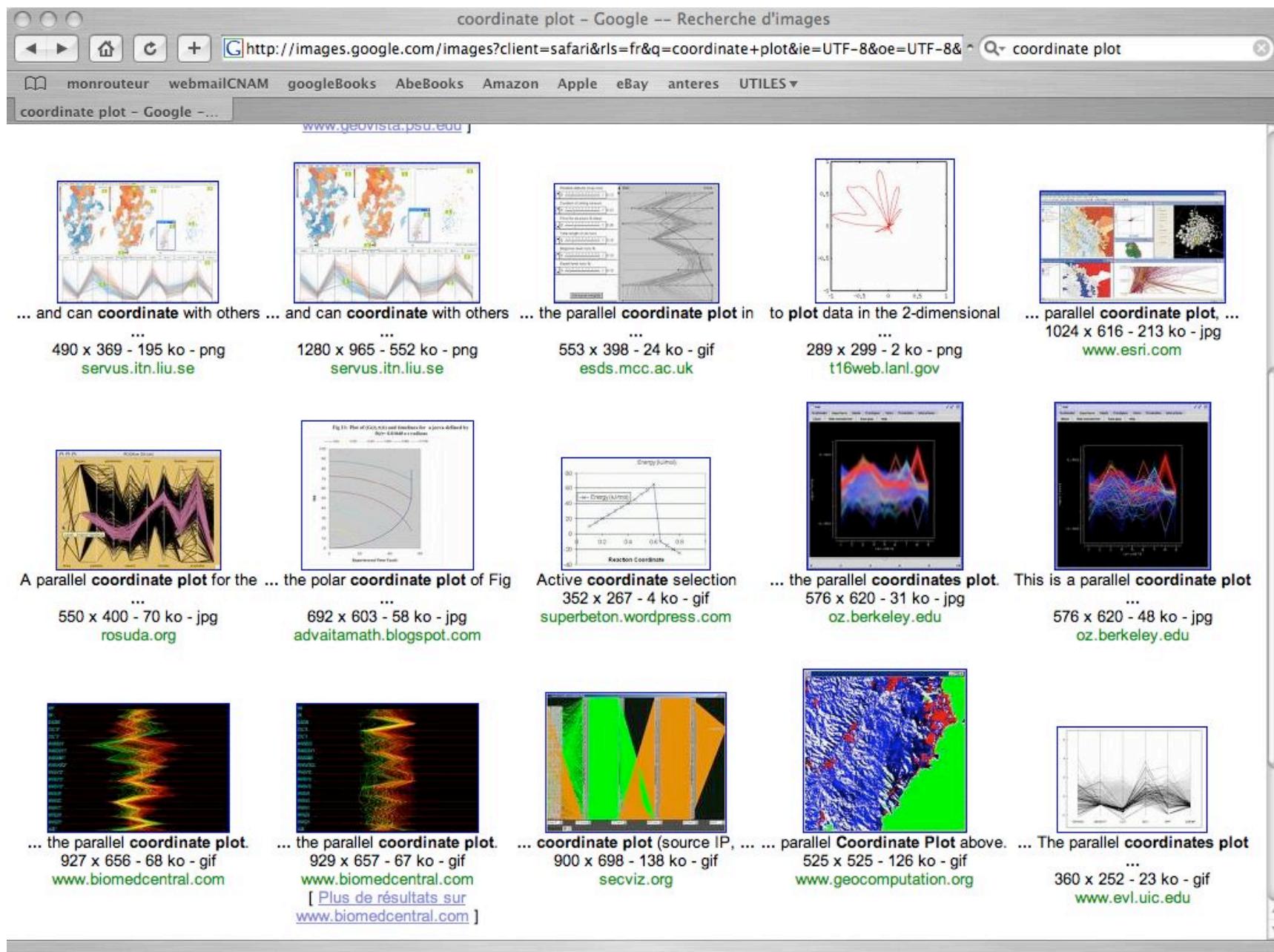
<http://hcil.cs.umd.edu/trs/2005-20/2005-20.html>



Hsu & Cubaud, HCI'2009

## (parallel) coordinate plot :





# Diagramme en étoile (star plot)

Google™ "star plot" Recherche d'images Rechercher sur le Web Images – Recherche avancée Préférences

Images Afficher Toutes les tailles Résultats 1 - 20 sur un total d'environ 2 280 000 pour star plot (0,28 secondes)

Essayez avec cette orthographe : [starpot](#)

« Afficher tous les résultats de recherche pour star plot »

In this star plot, ...  
560 x 438 - 28 ko - gif  
[start1.jpl.nasa.gov](http://start1.jpl.nasa.gov)

Star plot of selected peak ratios  
253 x 248 - 7 ko - gif  
[www.humble-inc.com](http://www.humble-inc.com)

... analysis using star plot  
380 x 280 - 4 ko - gif  
[www.itl.nist.gov](http://www.itl.nist.gov)

FIG: Star plot of crime rates in US ...  
504 x 505 - 9 ko - gif  
[www.math.yorku.ca](http://www.math.yorku.ca)

... assignment key for star plot.  
342 x 316 - 4 ko - gif  
[www.math.yorku.ca](http://www.math.yorku.ca)

Parallel coordinates.  
426 x 309 - 52 ko - png  
[www.cscs.ch](http://www.cscs.ch)

Rys.11 Star plot dla danych AUTO.  
376 x 370 - 9 ko - gif

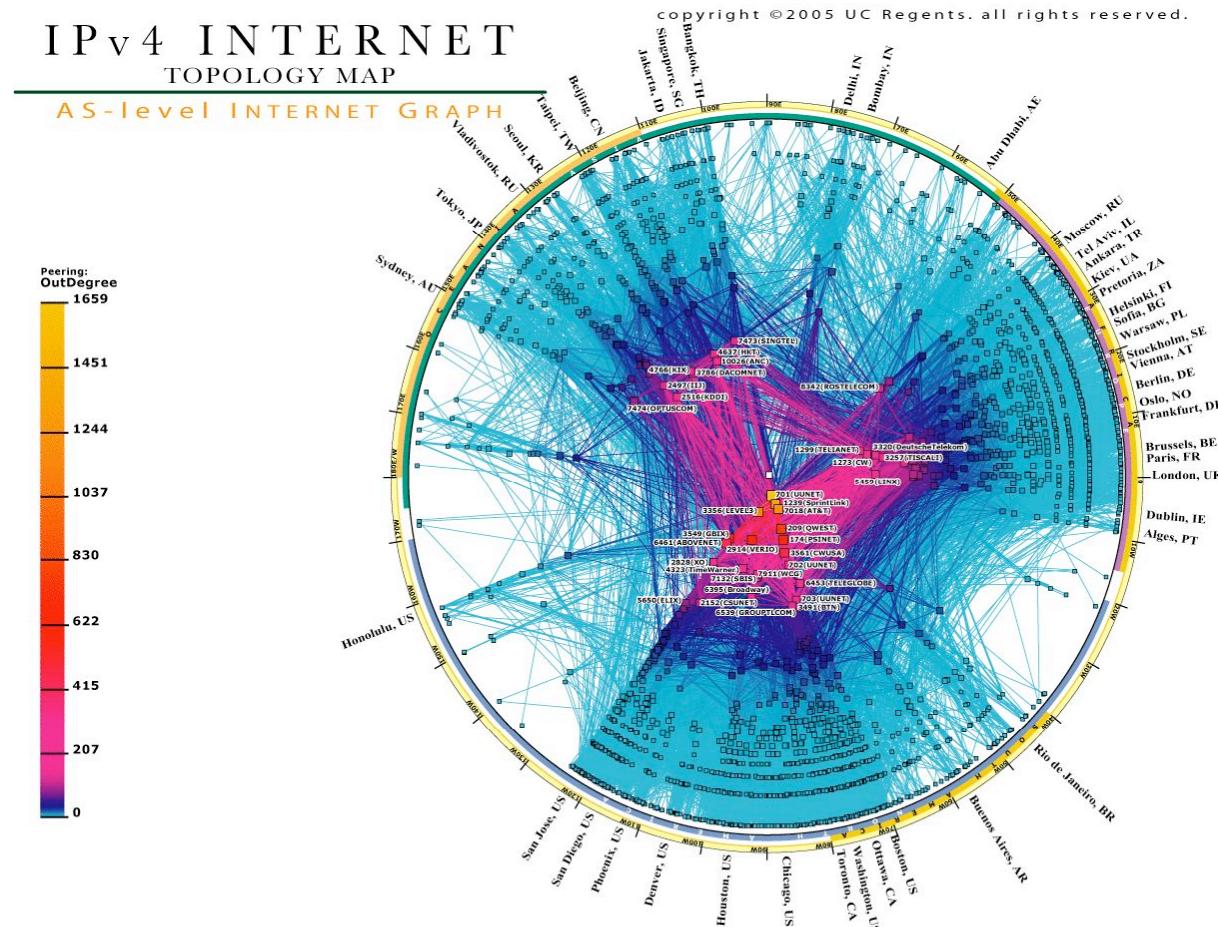
SOM representatives star plot  
600 x 400 - 9 ko - png  
[addictedtor.free.fr](http://addictedtor.free.fr)

... 1:5, main = "Star plot"  
600 x 600 - 8 ko - png  
[zoonek2.free.fr](http://zoonek2.free.fr)

Graphiques étoilés (star plots or ...  
600 x 600 - 13 ko - png  
[zoonek2.free.fr](http://zoonek2.free.fr)

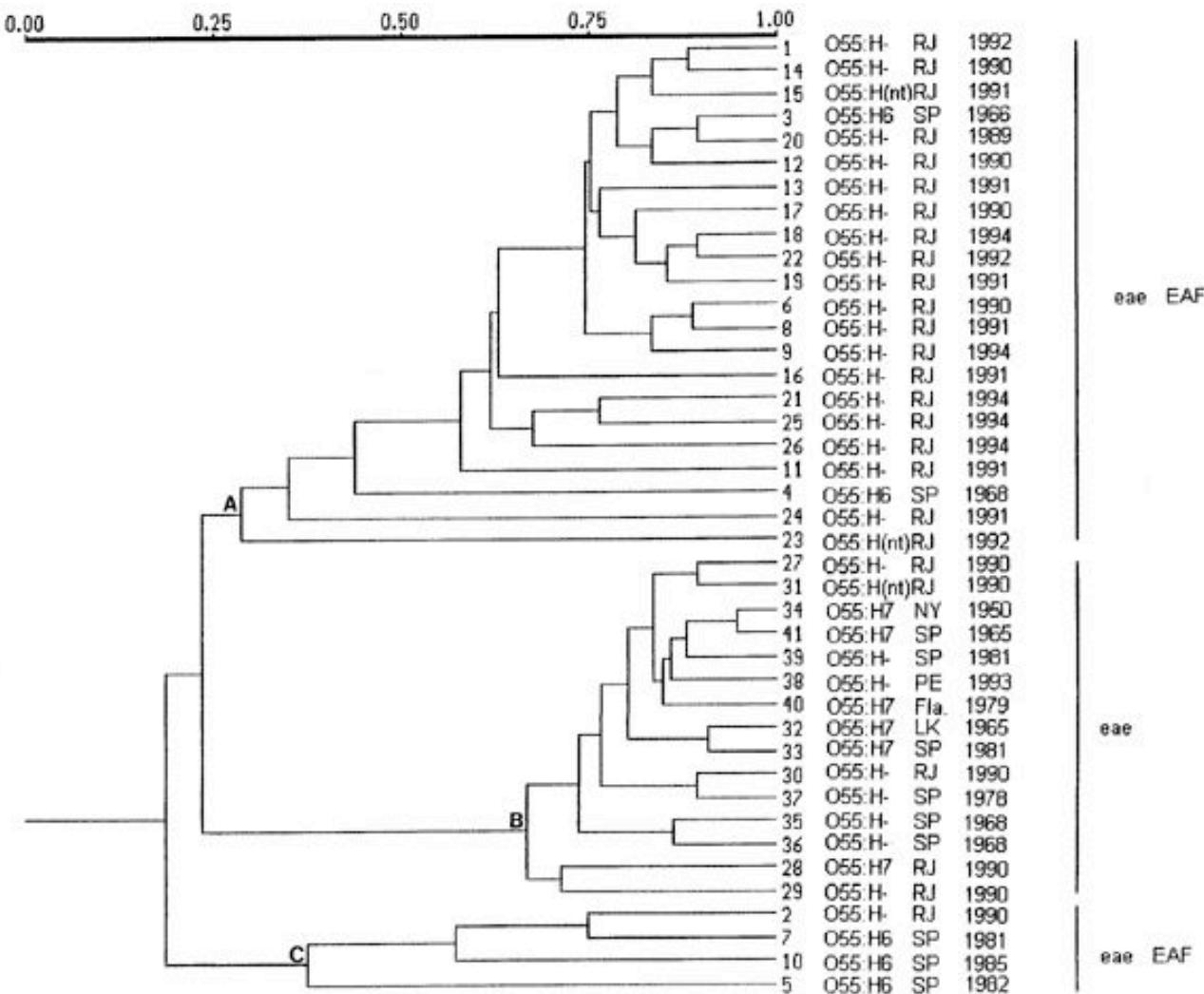
## 2.2 Encodage des relations

Une relation = une droite

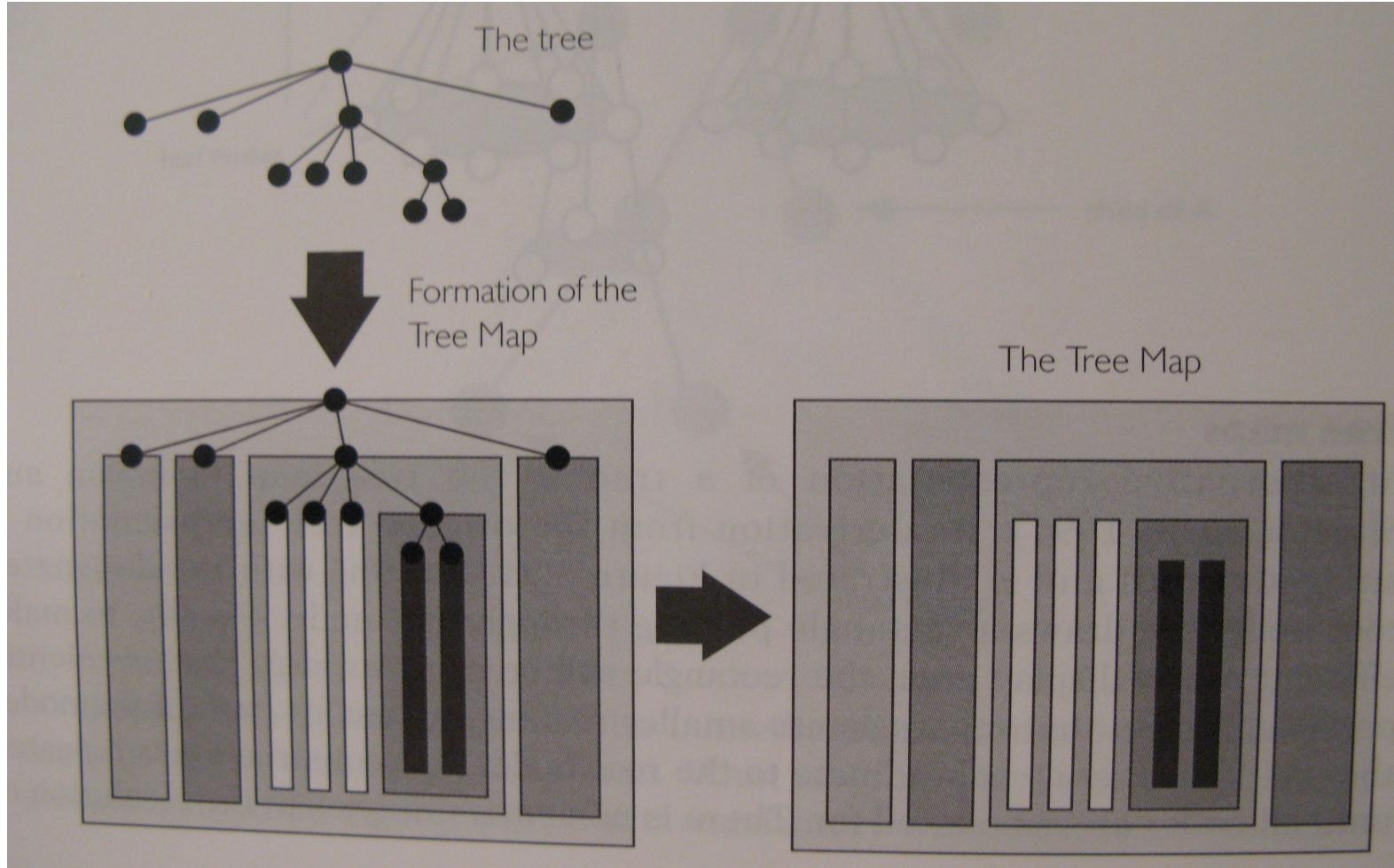


CAIDA : routage dans l'internet

# Dendogrammes



## Tree-maps (Johnson & Schneiderman, 1991)



[Spence p. 86]

# Exemple : newsmap

newsmap

<http://marumushi.com/apps/newsmap/newsmap.cfm>

EDINFOVIZ LIVRE3D-EN-FRANCE Deptinfo seologer monrouteur webmailCNAM googleBooks AbeBooks Amazon Apple eBay UTILES

newsmap

+ about + permalink + SELECT ALL COUNTRIES AUSTRALIA AUSTRIA CANADA FRANCE DEUTSCHLAND INDIA ITALIA NEW ZEALAND ESPANA U.K.  U.S.

**US**

## Gaza conflict complicates Obama quest for peace

Price details unclear in murky Russia-Ukraine deal

Pakistan gives probe team 10 days

North Korea Claims To Have Weaponized Plutonium; Threatens to ...

Somali Islamists execute "spy" for Ethiopians

Osama bin Laden by MJ Akbar

Israel eyes expanded Egyptian force at Gaza border

Six Guantanamo Bay detainees released

Venezuela's Chavez urges tear gas against protests

Hezbollah behind Lebanon rocket strikes in north

World Leaders Ramp Up Gaza Diplomacy

In Zimbabwe, Deal Likely to Fly or Fall This Week

Abandoned & at Sea: Migrants Stranded in Mediterranean

Alas! and Lo: The Last Days of the New York Stock Exchange

Ganda flees unsafe near Pakistan border; CIA chief

40 pc child marriages in India: UNICEF

## Black Boxes in Hand, Full Story Emerges

The Past as a Guide for Obama's Inaugural Address

Most see Bush presidency as a failure, poll shows

## No breakup at Citigroup

Bedlam breaks out at Circuit City

At confirmation, two views of Holder emerge

New tack for King Day celebration in SF

Another decision on Michelle Obama's plate

Congress goes along with Obama for now

Obama honors war dead at Arlington, attends church

Obama's view on role of America's promise

Will Obama's race help or hurt black America?

Obama for young readers

Official mom: Insurance help is critical

UnitedHealth Group settles class-action suit over database, Ingenix

Health Buzz: Goya's Whirlwind, McDonald's and Other Health News

Health Highlights: Jan. 18, 2009

Health Highlights: Jan. 17, 2009

Fox Wins Battle Over 'Watchmen' Adaptation

Who owns Edgar Allan Poe?

My Moody 39-17

The IPad: The Ultimate Study Machine

Sony iPhone Pads \$250 Million Loss

Facelifts ok drops in Mexico

## When a Rock Star CEO Leaves the Stage

US Airways Jet Lifted From Hudson

Chrysler Financial gets federal loan

Intel's Net Plunges as Demand Dries Up

Regulators close Bank of Clark County

Missing money from Wall Street's top hedge fund associate

China's great also-ran: What's next for its auto industry?

Star Tribune Bankruptcy Further Rills Newspaper Waters

China Gold: China Ahead in US Market

Gold bars? may bring new direction to Yachting

Hamm, Phillips agree on 3-year deal, \$20.5M deal

Revenue outing shows fantasy value

Sight dusting of snowflakes possible today

Pittsburgh has little time to dwell on first loss

Alien is taking steps

Top 25 most searched for terms on the Web in 2008

Southie Seeks Cape Paul Hoban

General Motors' GMX: GM's New Brand

Highly anticipated return of the NBA's first team

## Familiarity Breeds Contempt in Steelers-Ravens Showdown

St. Louis seems upbeat after Rams hired Steve Spagnuolo

Wake Forest pulls away from Clemson to remain undefeated

Carroll: Bartz may bring new direction to Yachting

Hamm, Phillips agree on 3-year deal, \$20.5M deal

Revenue outing shows fantasy value

Sight dusting of snowflakes possible today

Pittsburgh has little time to dwell on first loss

Alien is taking steps

Top 25 most searched for terms on the Web in 2008

Southie Seeks Cape Paul Hoban

General Motors' GMX: GM's New Brand

Highly anticipated return of the NBA's first team

## NY Rangers

Dolce Blue: Double-tap to bring home Hispanic to a 2008 draft of stars

**U.S.**

LIVE NOW

Sunday January 18, 2009 21:51

ARCHIVED MON TUE WED THU FRI YEST. TODAY

LESS THAN 10 MINUTES AGO  WORLD  NATION  BUSINESS  TECHNOLOGY  SPORTS  ENTERTAINMENT  HEALTH

MORE THAN 10 MINUTES AGO

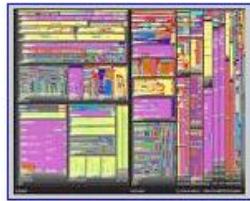
MORE THAN 1 HOUR AGO

LAYOUT:  SQUARIFIED  STANDARD

## Images Afficher Toutes les tailles

« Afficher tous les résultats de recherche pour treemaps

Résultats 1 - 20 sur un total d'environ 3 010 pour treemaps (0,10 secondes)



This toolkit includes treemaps, ...  
895 x 715 - 763 ko - jpg  
[www.cs.umd.edu](http://www.cs.umd.edu)



Treemaps are a family of algorithms ...  
400 x 400 - 15 ko - gif  
[www.cs.umd.edu](http://www.cs.umd.edu)  
[ Plus de résultats sur [www.cs.umd.edu](http://www.cs.umd.edu) ]



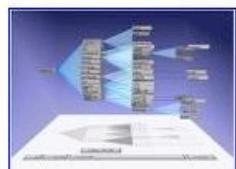
Treemaps enable users to compare ...  
516 x 365 - 25 ko - gif  
[services.alphaworks.ibm.com](http://services.alphaworks.ibm.com)



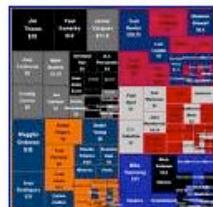
Home  
526 x 328 - 83 ko - png  
[www.cems.uwe.ac.uk](http://www.cems.uwe.ac.uk)



... examples that utilize treemaps.  
554 x 437 - 187 ko  
[sambbiblog.spaces.live.com](http://sambbiblog.spaces.live.com)



... Treemaps and other tree ...  
627 x 461 - 37 ko - jpg  
[www.ifs.tuwien.ac.at](http://www.ifs.tuwien.ac.at)



I'm a pretty big fan of treemaps.  
400 x 399 - 32 ko - gif  
[www.detroitigersweblog.com](http://www.detroitigersweblog.com)



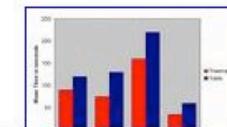
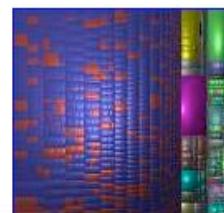
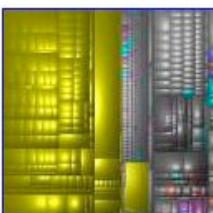
... got a face lift... and treemaps  
400 x 278 - 38 ko - png  
[blog.dotnetwiki.org](http://blog.dotnetwiki.org)



This tool uses treemaps to show a ...  
1021 x 673 - 633 ko - png  
[flardi.net](http://flardi.net)

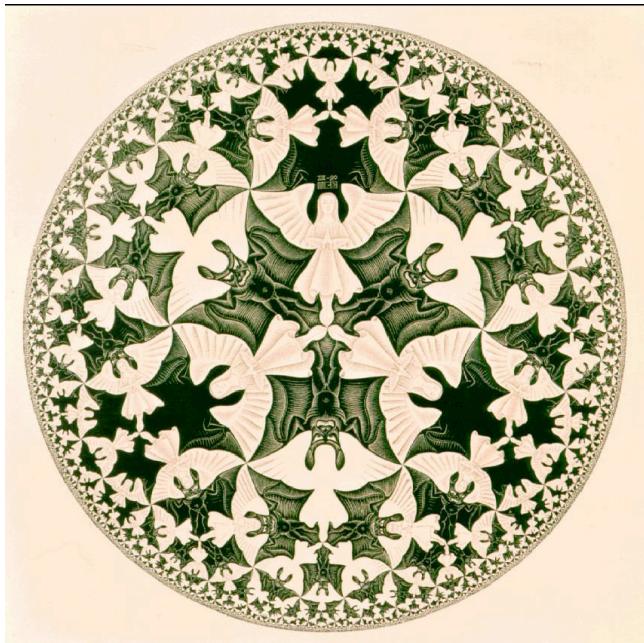


Circular treemaps are used to ...  
800 x 640 - 89 ko - jpg  
[blog.semaphore.net](http://blog.semaphore.net)

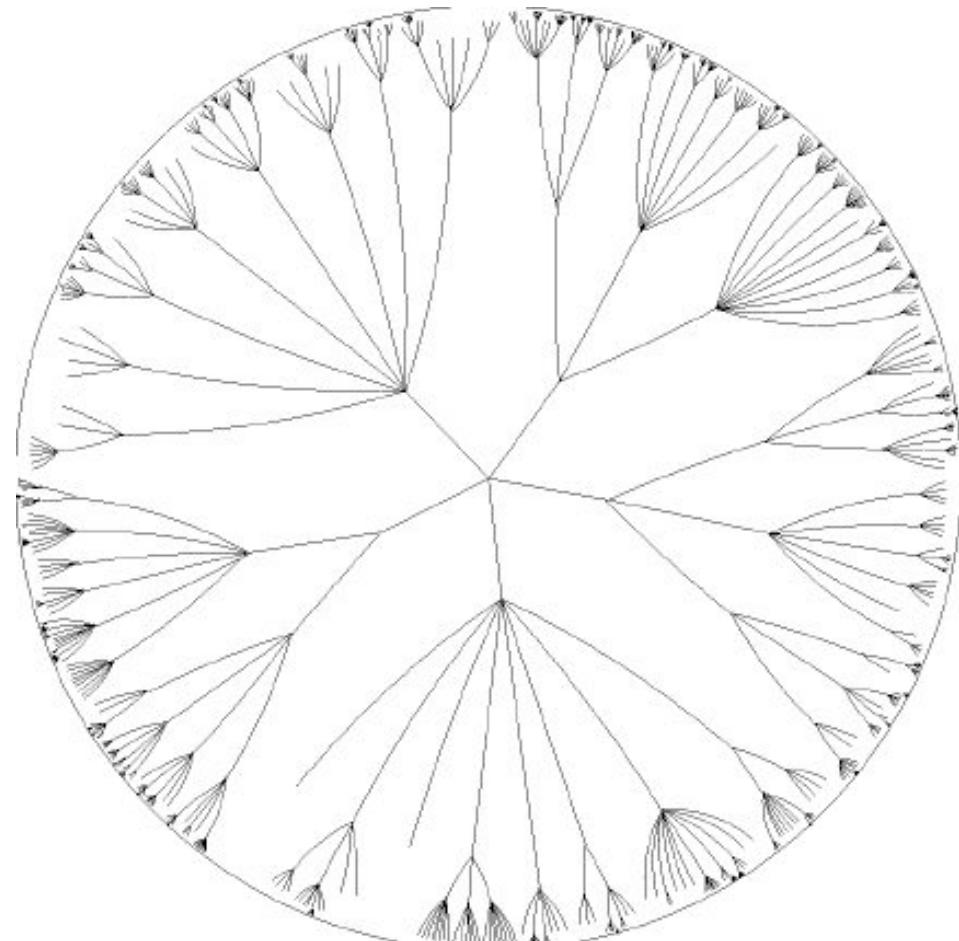


# Arbres hyperboliques (Lamping & Rao, 1995)

Inspiré d'Escher



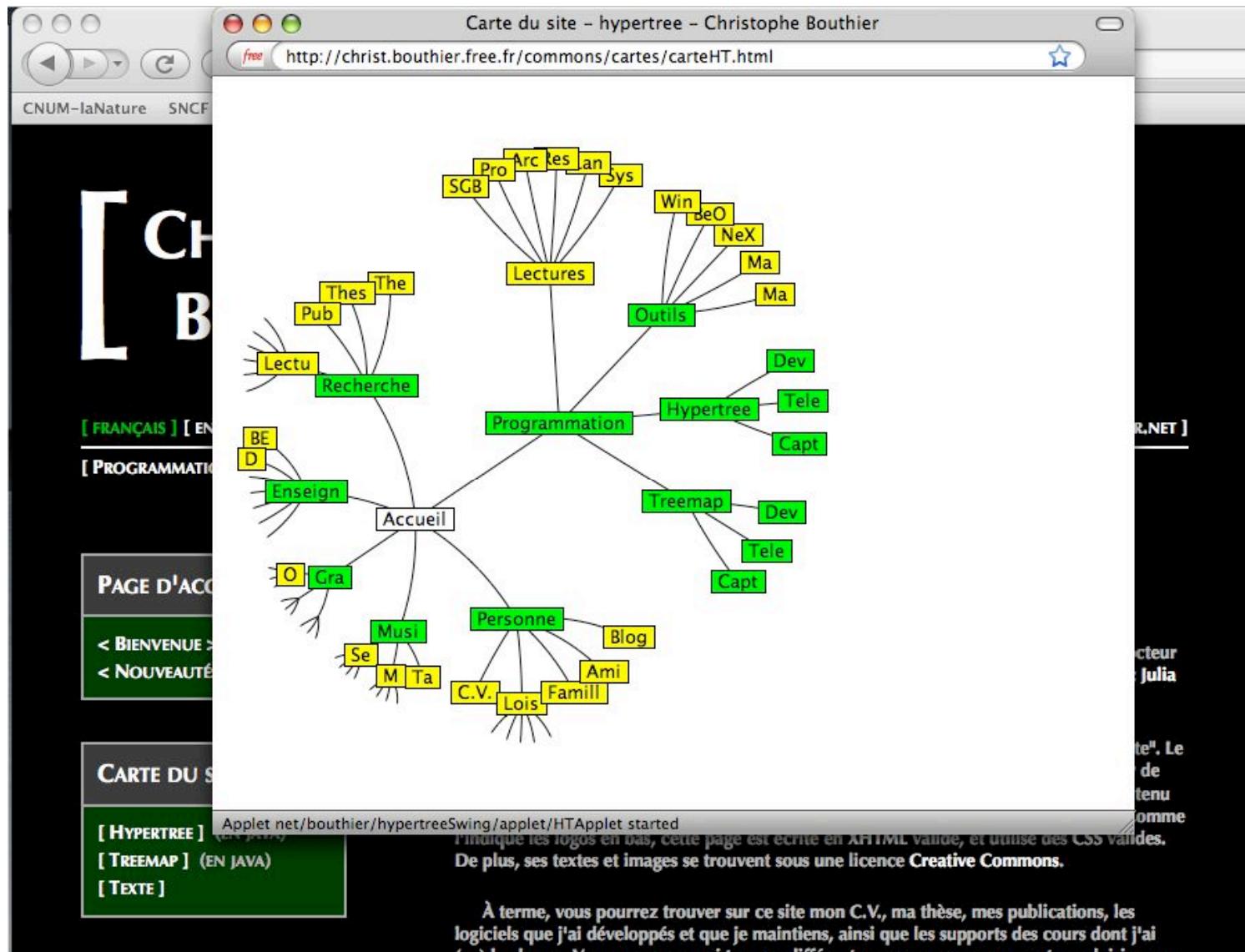
<http://www.mcescher.com/Gallery/recogn-bmp/LW436.jpg>



[http://www.infovis-wiki.net/index.php?title=Image:Hyptree\\_original.jpg](http://www.infovis-wiki.net/index.php?title=Image:Hyptree_original.jpg)

1004 sommets, distrib. Poissonienne du nbre de fils

# Exemple : hypertree



**Images** Afficher Toutes les tailles

Résultats 1 - 20 sur un total d'environ 22 500 pour **hyperbolic trees** (0,18 secondes)

[« Afficher tous les résultats de recherche pour hyperbolic trees](#)

... Abb. 11b: Hyperbolic Trees (2) ... Abb. 11a: Hyperbolic Trees (1)  
 385 x 395 - 10 ko - gif  
[coli.lili.uni-bielefeld.de](http://coli.lili.uni-bielefeld.de)

... 411 x 437 - 12 ko - gif  
 coli.lili.uni-bielefeld.de

Figure 2-15: Hyperbolic tree.  
 336 x 308 - 50 ko - gif  
[www3.sympatico.ca](http://www3.sympatico.ca)

Hyperbolic geometry: Spectacular  
 888 x 964 - 198 ko - png  
[www.infovis.net](http://www.infovis.net)

CGDP - HYPERBOLIC TREE  
 KEY  
 600 x 404 - 31 ko - gif  
[www.flmnh.ufl.edu](http://www.flmnh.ufl.edu)

... are two more hyperbolic tree ...  
 300 x 288 - 111 ko - jpg  
[dd.dynamicdiagrams.com](http://dd.dynamicdiagrams.com)

... Eye or Hyperbolic Tree Viewer  
 is ...  
 400 x 368 - 58 ko - gif  
[www.sorice.com](http://www.sorice.com)

Hyperbolic Tree  
 350 x 339 - 76 ko - png  
[www.indiana.edu](http://www.indiana.edu)

Tree Text: Hyperbolic Tree  
 729 x 743 - 174 ko - jpg  
[www.itl.nist.gov](http://www.itl.nist.gov)

... zum Begriff "Hyperbolic Tree"  
 864 x 804 - 16 ko - png  
[beat.doebe.li](http://beat.doebe.li)

Figure 3.10: Non-tree links  
[Ouvrir "http://images.google.com/imgres?imgurl=http://beat.doebe.li/bibliothek/ref\\_w/w0083...Dhyperbolic%28trees%26svnum%3D1%10%26um%3D1%26hl%3Dr%26client%3Dsa%26ls%3Dfr%26sa%3DN"](http://beat.doebe.li/bibliothek/ref_w/w0083...Dhyperbolic%28trees%26svnum%3D1%10%26um%3D1%26hl%3Dr%26client%3Dsa%26ls%3Dfr%26sa%3DN)

Hyperbolic trees - InfoVis Wiki

An original hyperbolic tree with

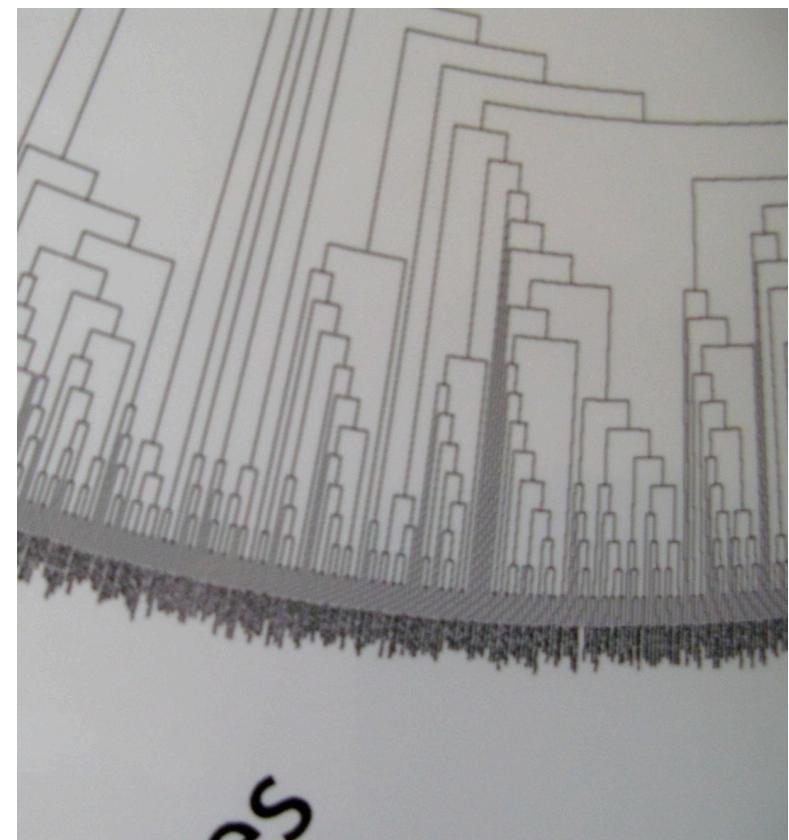
Hyperbolic Tree Visualization

We will use the hyperbolic tree

# 3. Présentation



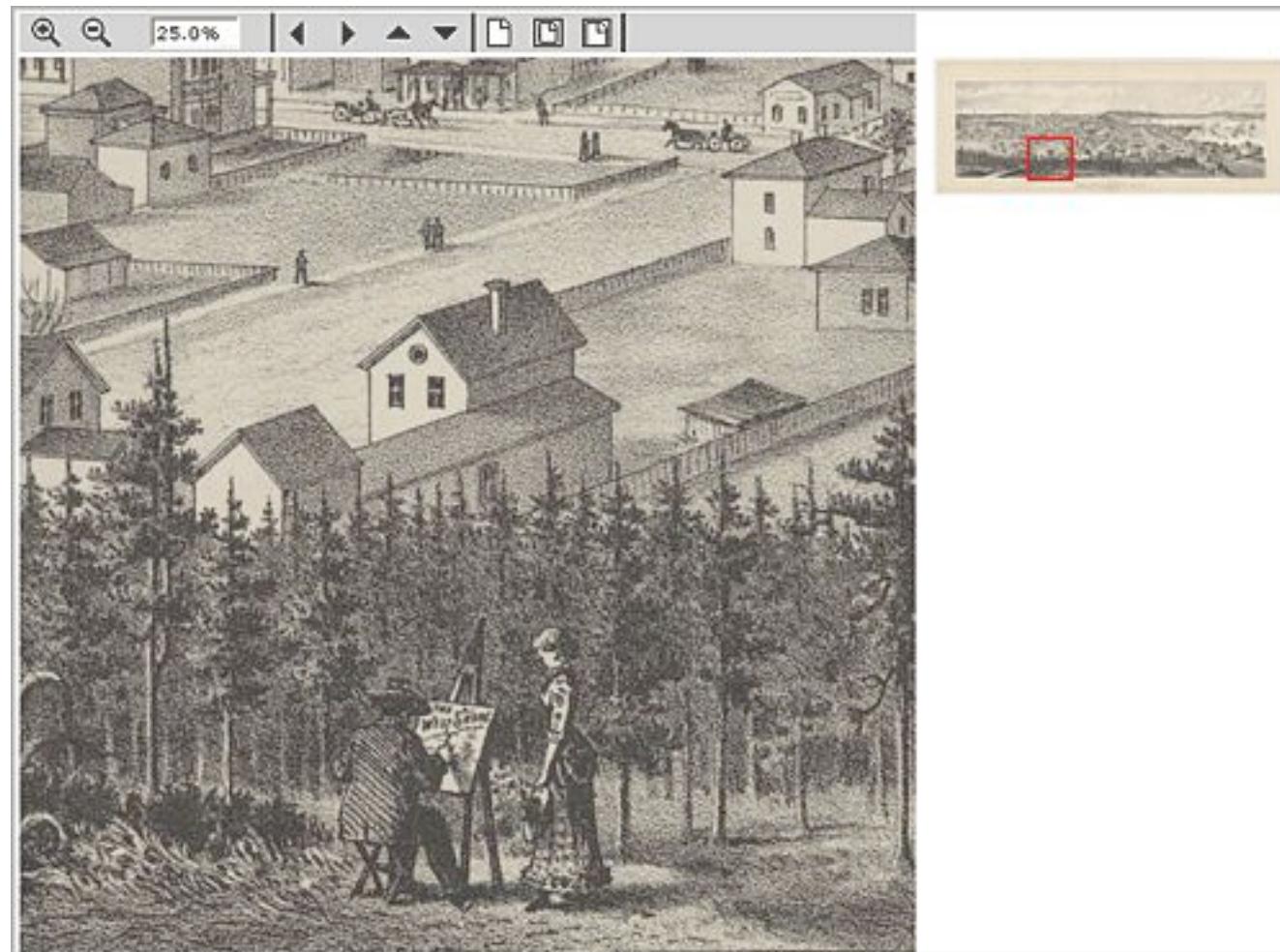
Un exemple : classer les espèces vivantes sur Terre



Panneau 1.50x1m env.

=> noms illisibles....

## Overview/detail



<http://www.oclc.org/americalatina/es/contentdm/about/displaying/seattlemap2.gif>

## Exercice

Citer 5 logiciels qui emploient cette technique :

#1 : acrobat reader (page courante + miniatures sur le côté)

#2 :

#3 :

#4 :

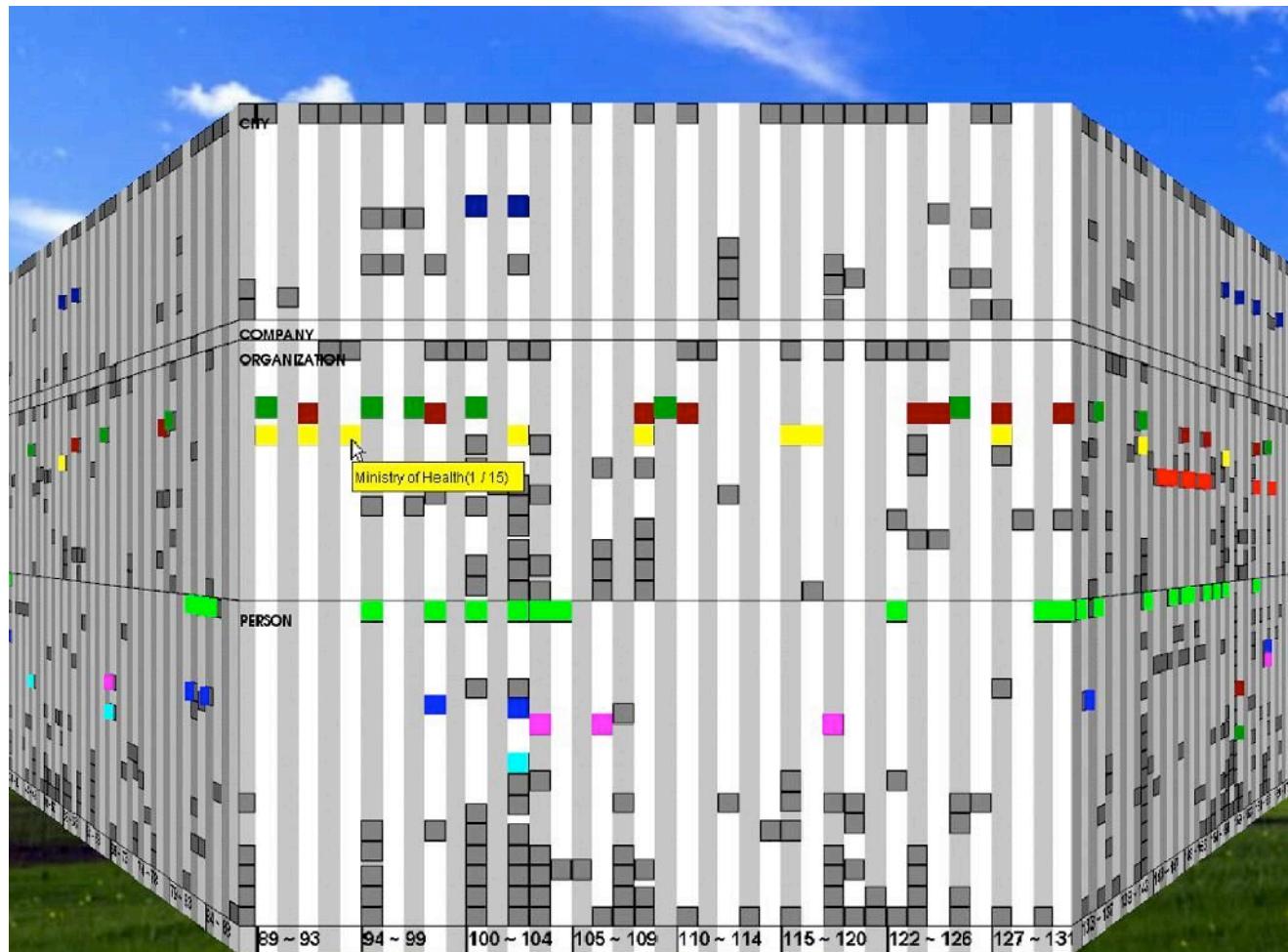
#5 :

## Distortion

Video  
#12



Bifocal display (Spence et al., 1980-2)



Perspective wall (Mackinlay et al. 1991)

# Le dock de MacOSX



Chargement de "LookLOCAL"

<http://looklocal.idelix.com/#mlt=39.868771&mln=-90.738652&mzl>

monrouteur webmailCNAM googleBooks AbeBooks Amazon Apple eBay anteres UTILES ▾

LookLOCAL IDELIX

Live Search Maps Google Maps Yahoo! Local Maps

Beta Help Extras Print Map Email a Friend Link to this Site Feedback IDELIX

**Find a Location**

Location or address: [Within current map view]

Business name or category:

Search

Get Directions

View Traffic Conditions

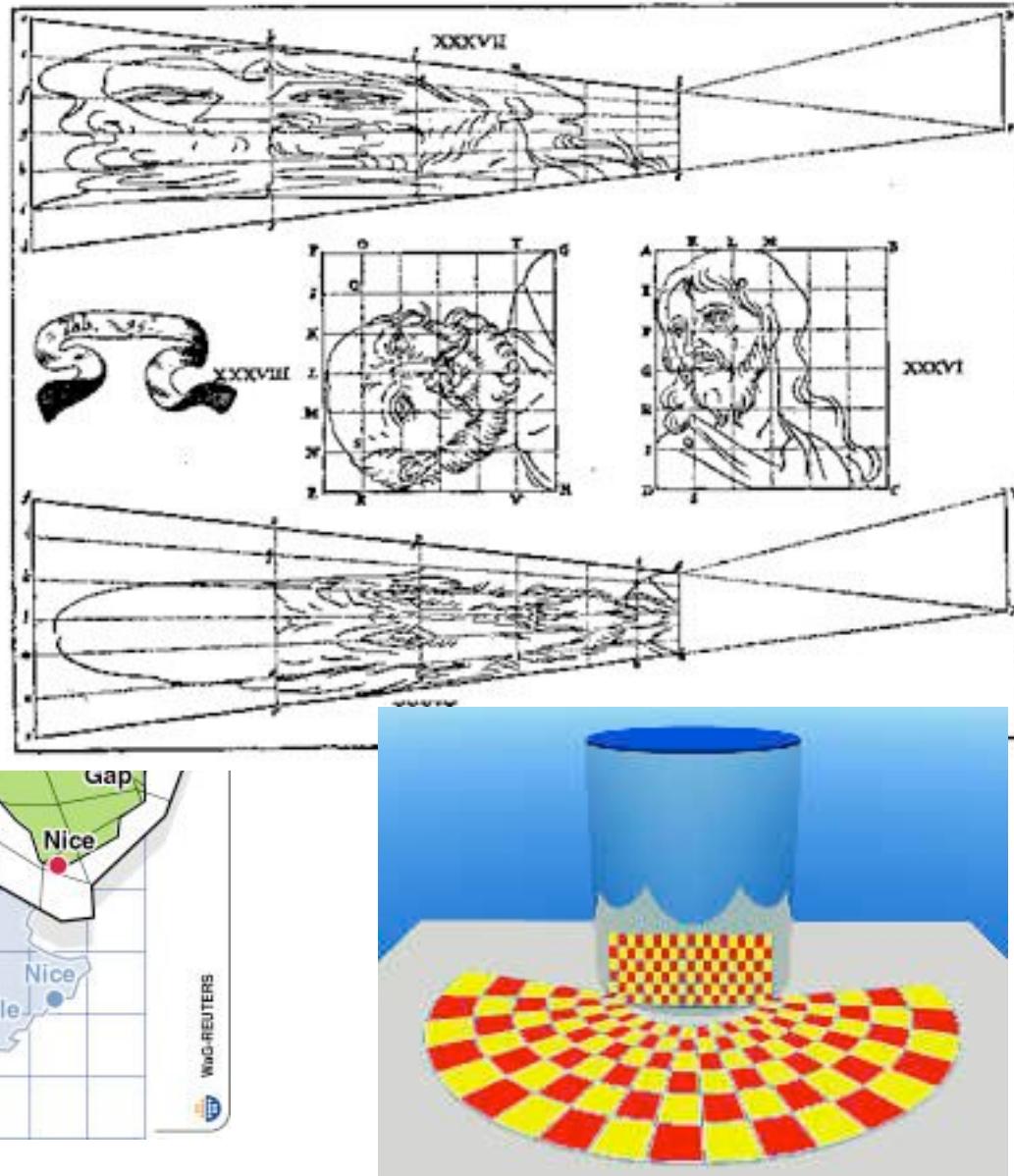
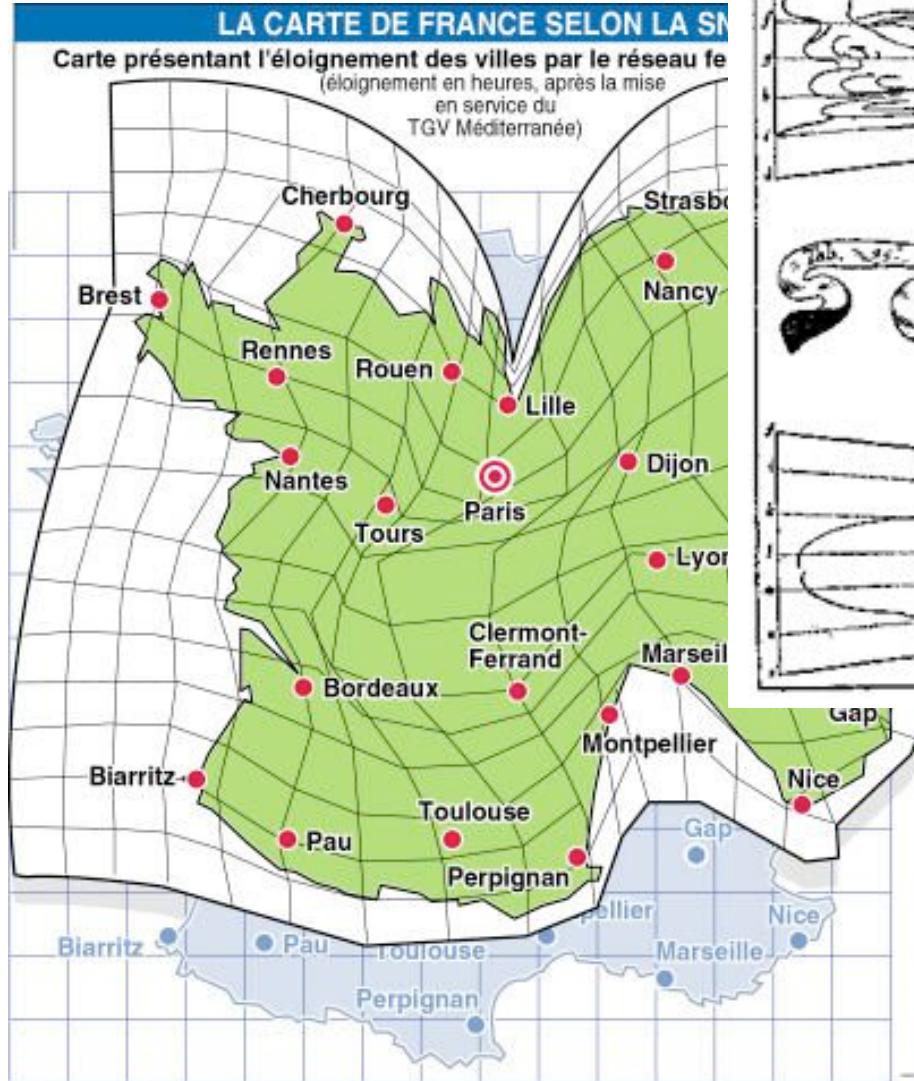
Explore Vacation Spots

LookLOCAL Examples

A screenshot of the LookLOCAL web application. The main interface features a map of the Midwest and Great Lakes region, including parts of Iowa, Missouri, Kansas, Nebraska, South Dakota, North Dakota, Minnesota, Wisconsin, Michigan, Indiana, Ohio, Kentucky, Tennessee, and Mississippi. The map includes major cities like Sioux City, Fort Dodge, Ames, Des Moines, Cedar Rapids, Waterloo, Dubuque, Mason City, Madison, Janesville, Watertown, Sioux City, Fort Dodge, Marshalltown, Ames, Des Moines, Cedar Rapids, Waterloo, Dubuque, Mason City, Madison, Janesville, Watertown, West Bend, Muskegon, Holland, Kalamazoo, South Bend, Gary, Portage, Goshen, Kokomo, Lafayette, Indianapolis, Richmond, Terre Haute, Bloomington, Louisville, Owensboro, Radcliff, Clarksville, Nashville, and Gallatin. A zoomed-in inset map is visible in the center of the map area, showing more detail of the Midwestern states. On the left side of the map, there is a vertical zoom control with up and down arrows and a search bar. On the right side, there are buttons for "Roadmap", "Satellite", and "Hybrid". The top of the page has a navigation bar with links for "Beta", "Help", "Extras", "Print Map", "Email a Friend", "Link to this Site", and "Feedback". The IDELIX logo is located in the top right corner.

IDElix : Application de cartographie sur le web (ou PDA)

# Lien avec les anamorphoses (géographiques ou autres) ?



## Suppression (filtrage)

Furnas : generalized  
fish-eye views (CHI'86)

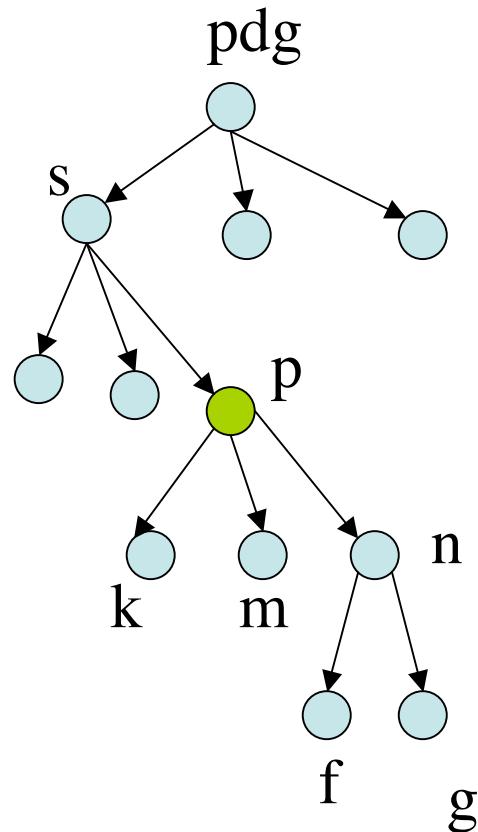
Degree of interest (DOI) =  
Fonction de  
- a priori importance (API)  
- distance au focus courant (D)

Saul STEINBERG  
View of the World from 9th Avenue, 1976.  
Ink, pencil, colored pencil, and watercolor on paper, 28 x 19".  
Cover drawing for The New Yorker, March 29, 1976.

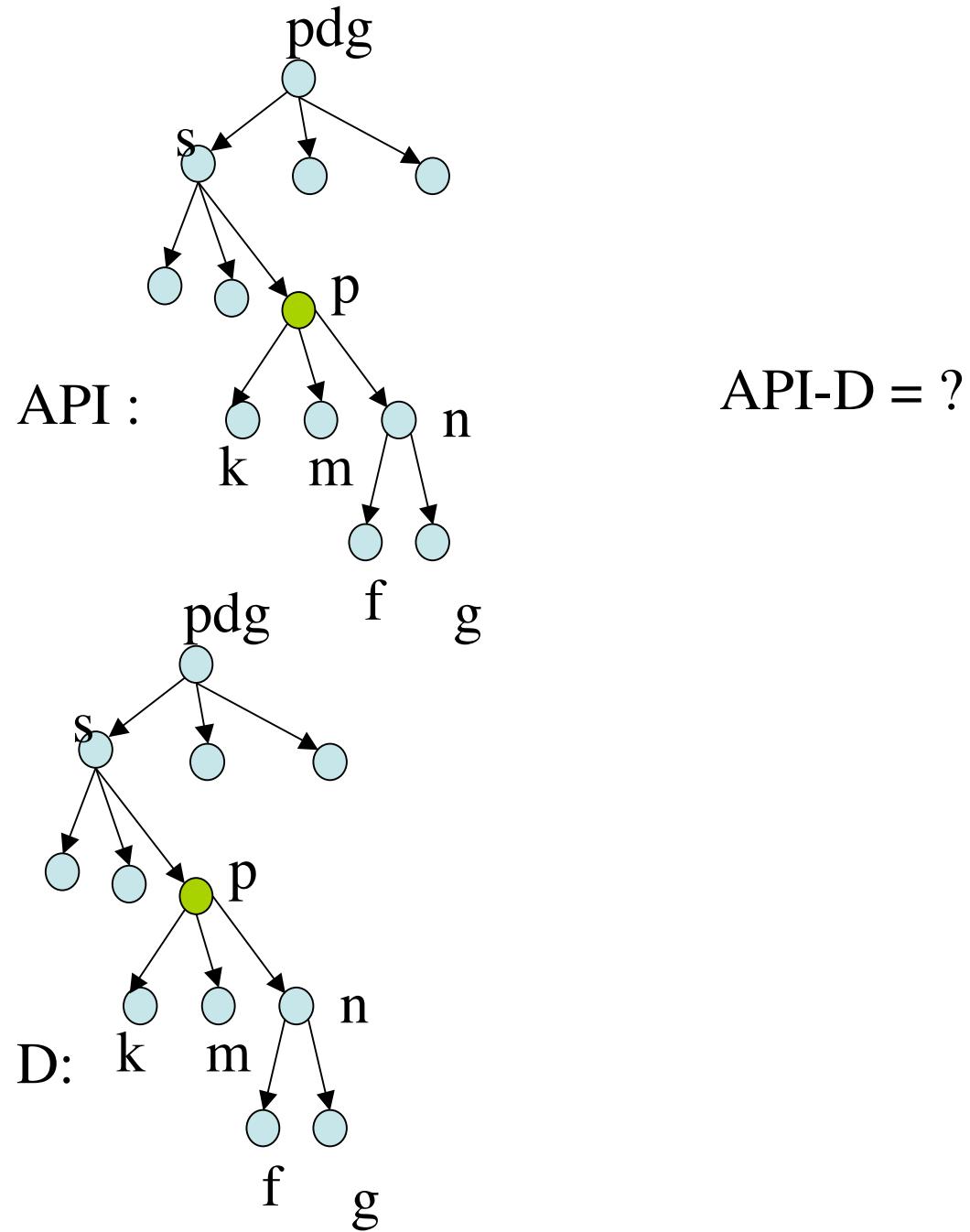
[http://www.saulsteinbergfoundation.org/  
gallery\\_24\\_viewofworld.html](http://www.saulsteinbergfoundation.org/gallery_24_viewofworld.html)



Exemple sur un arbre



Focus en p

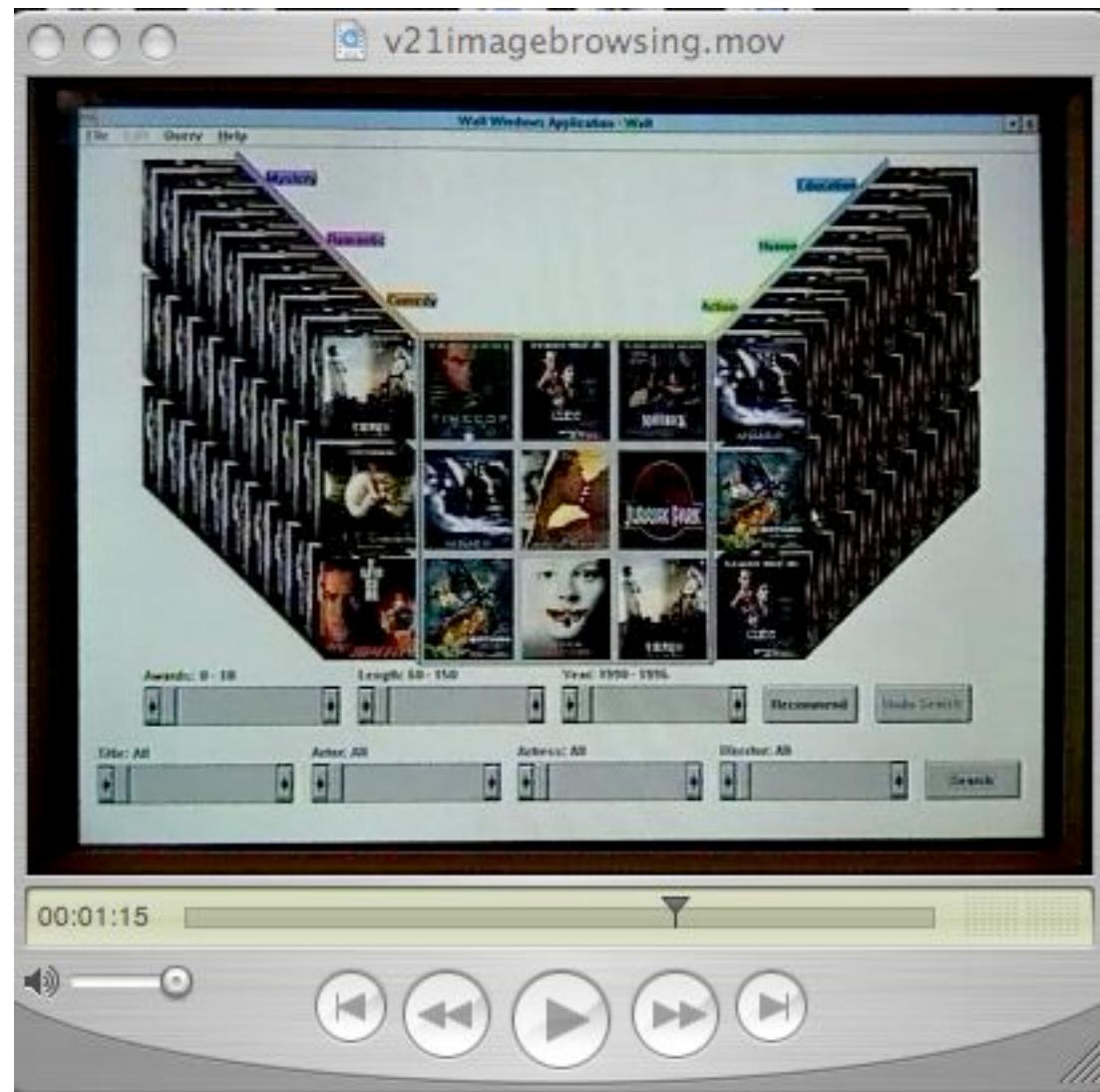


# Rapid Serial Visual Presentation (RSVP)

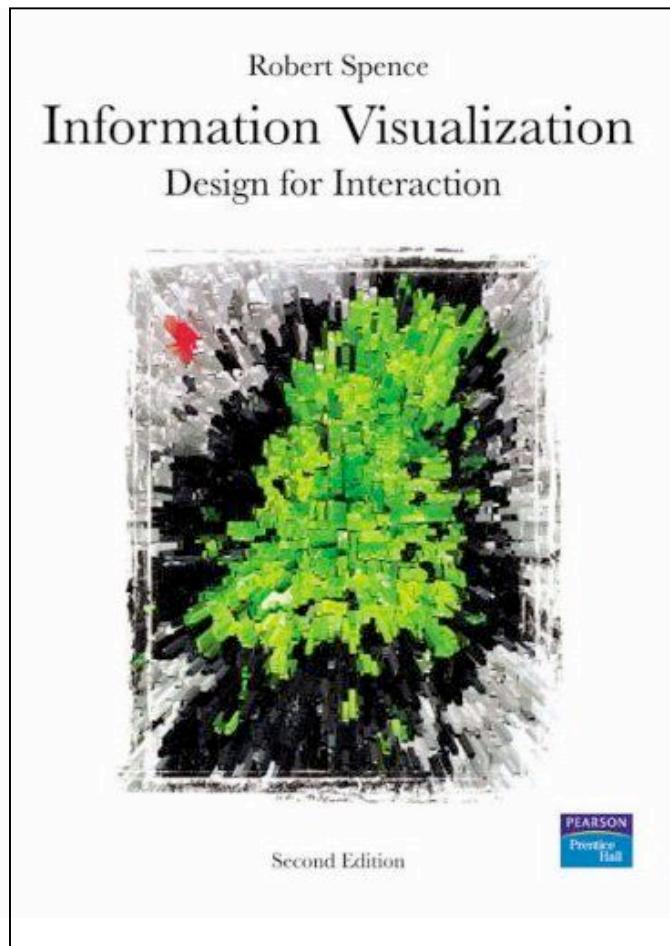
Remplacer  
l'espace par le  
temps

Video#21 Spence

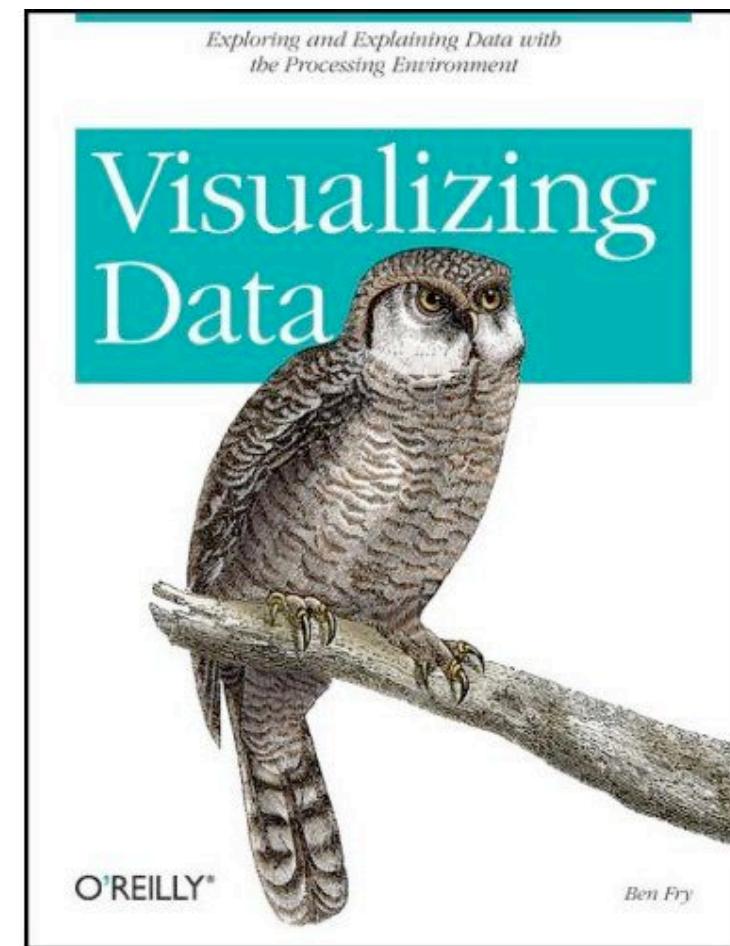
0.1s / image



# 4. Bibliographie et logiciels

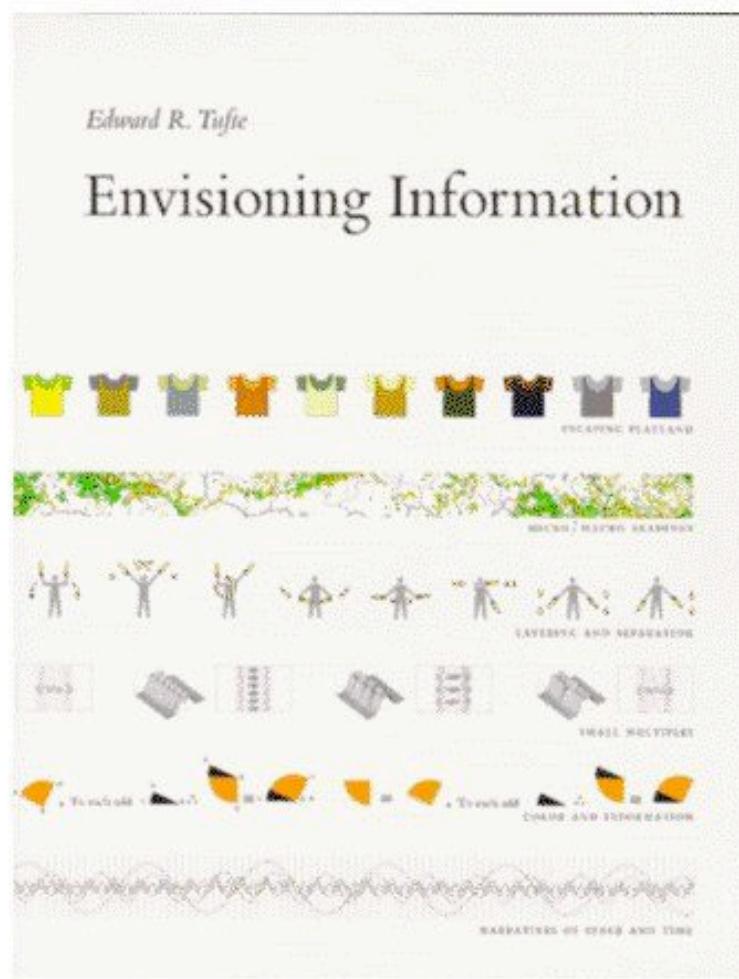
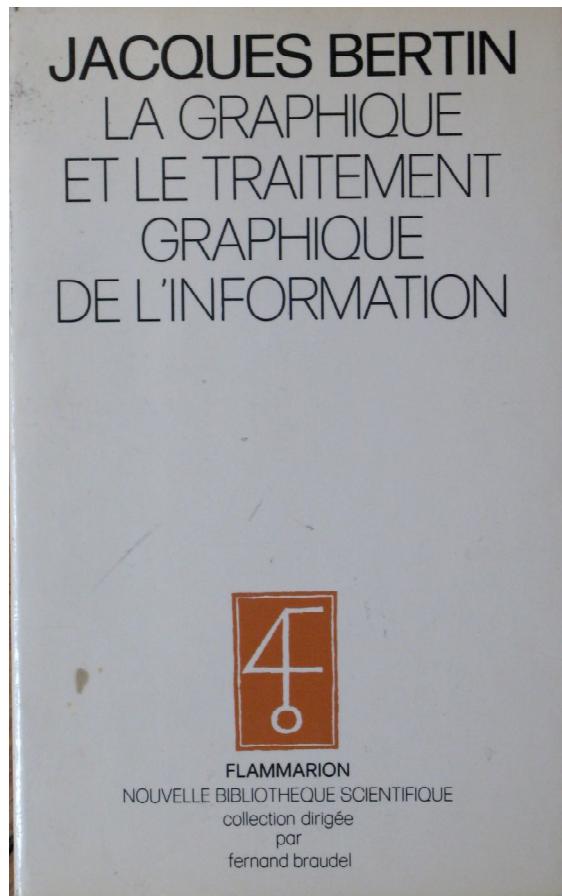


R. SPENCE

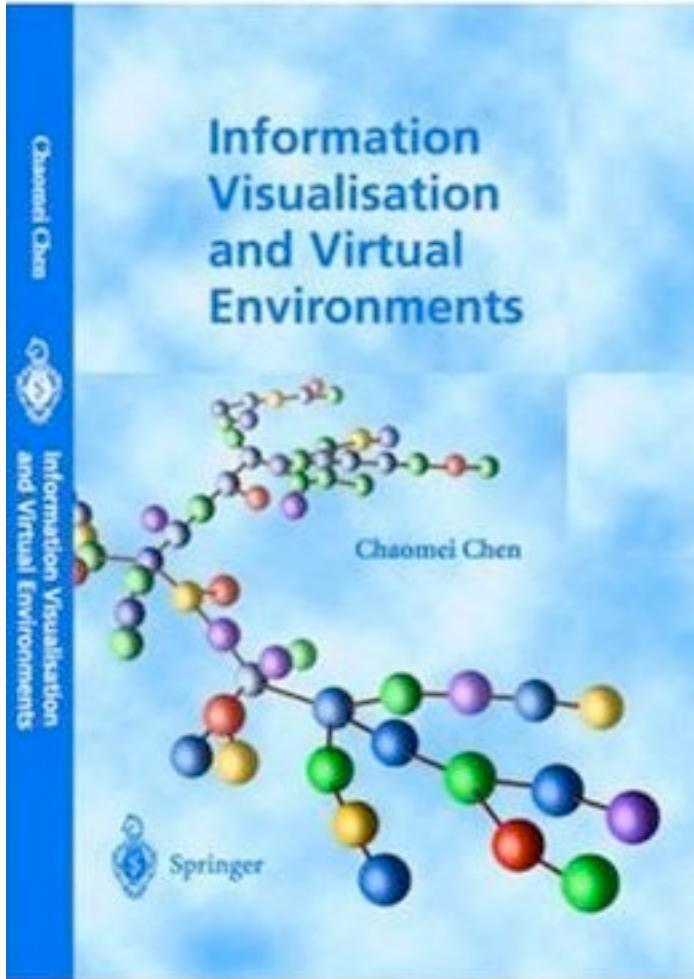


B. FRY (processing)

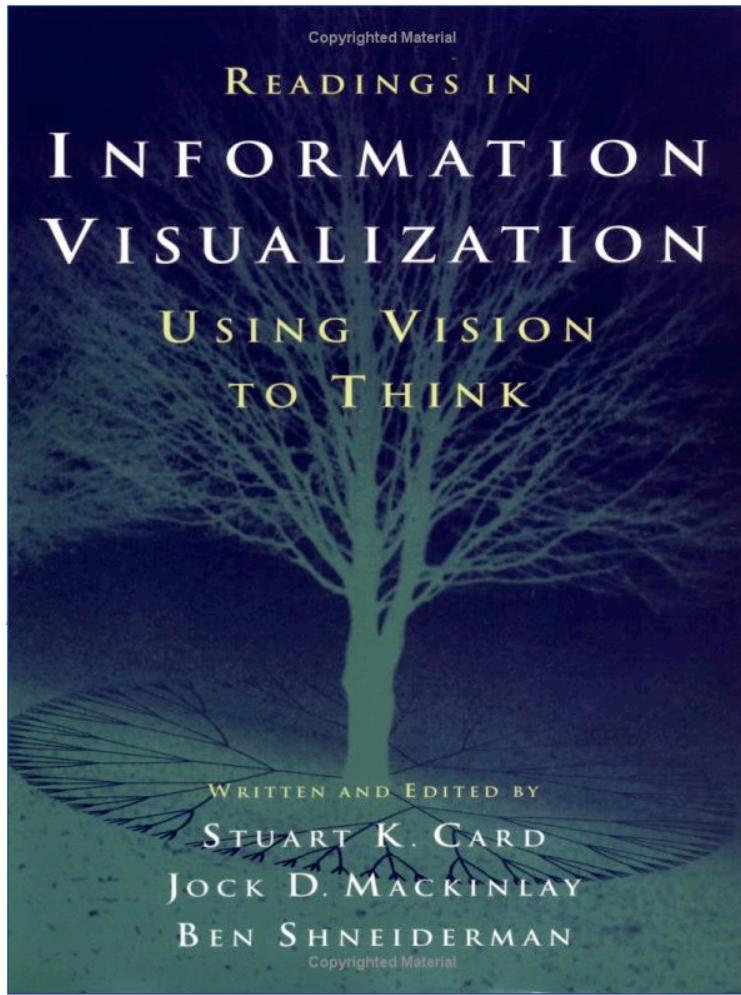
# Les classiques



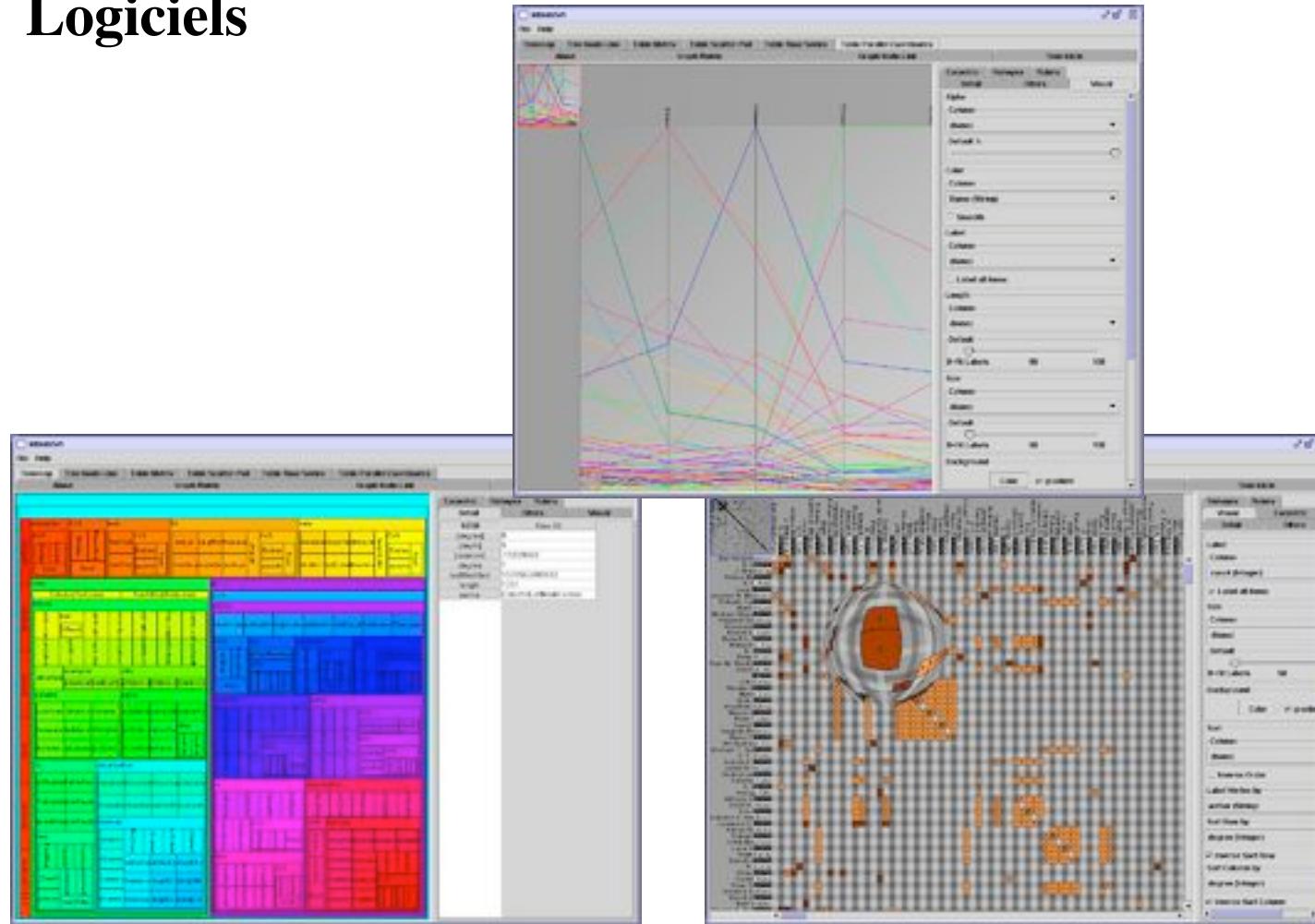
Niveau recherche :



(existe en 2eme ed.)



# Logiciels



The InfoVis Toolkit

<http://ivtk.sourceforge.net/>  
J.D. Fekete (INRIA, 2003-5)

http://www.tableausoftware.com/learning/gallery

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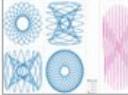
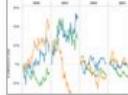
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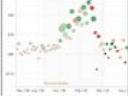
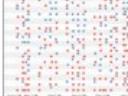
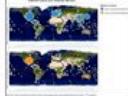
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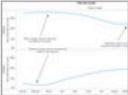
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# Tableau (Jock Mackinlay)

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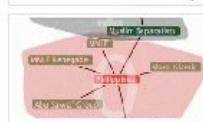
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## the prefuse visualization toolkit

Prefuse is a set of software tools for creating rich interactive data visualizations. The original **prefuse** toolkit provides a visualization framework for the Java programming language. The **prefuse flare** toolkit provides visualization and animation tools for ActionScript and the Adobe Flash Player.

Prefuse supports a rich set of features for data modeling, visualization, and interaction. It provides optimized data structures for tables, graphs, and trees, a host of layout and visual encoding techniques, and support for animation, dynamic queries, integrated search, and database connectivity. Prefuse is written in Java, using the Java 2D graphics library, and is easily integrated into Java Swing applications or web applets. Prefuse is licensed under the terms of a **BSD license**, and can be freely used for both commercial and non-commercial purposes.

The **visualization gallery** and **demonstration video** provide numerous examples of the types of applications that can be built with the prefuse toolkit.

To learn more about prefuse, take a look at the **user's manual** or the **frequently asked questions**. For users of the alpha version of the toolkit, there is also a **porting guide** for migrating to the beta version.

Need help? Visit the **Help Forum on SourceForge.net** (You'll need a SourceForge login to post). Please be sure to include detailed information (e.g., stack traces, source code, etc) if you need debugging help.

If you are interested in tools for ActionScript and Flash, see the **prefuse flare** project instead.

## announcements

**2007.10.22:** We're happy to announce the first alpha release of **prefuse flare**, a new prefuse-based visualization library written in ActionScript 3! Flare brings the visualization capabilities of prefuse to the web and runs in the Adobe Flash Player.

**2007.06.11:** The Toronto Star, Canada's most highly circulated daily, just ran a **story on the prefuse-based DocuBurst visualization!** Congrats to Chris, the author of DocuBurst! Check out the prefuse gallery for DocuBurst and other great visualization projects.

**2007.02.11:** A number of new projects have been added to the **prefuse gallery**. Check them out!

**2006.05.18:** The prefuse.org website has moved to a new server, with better performance and new features. For example, you can now add comments to pages of the user manual. Apologies to any visitors who have encountered 404 errors by using outdated prefuse.sourceforge.net URLs.

**2006.04.16:** Prefuse has now surpassed 10,000 downloads! Thanks to everyone who has contributed to the toolkit along the way.

**2006.03.03:** The prefuse-based **Vizster** visualization appeared on the CBS crime drama **Numb3rs!** Watch the **video clip (WMV, 4.7M)**.

**2006.02.09:** The new **prefuse.org** website launched.

## releases

# Prefuse (UC Berkeley)