CNAM - Département Informatique

RCP216 Ingénierie de la fouille et de la visualisation de données massives

Visualisation d'information (3) Représentations multidimensionelles

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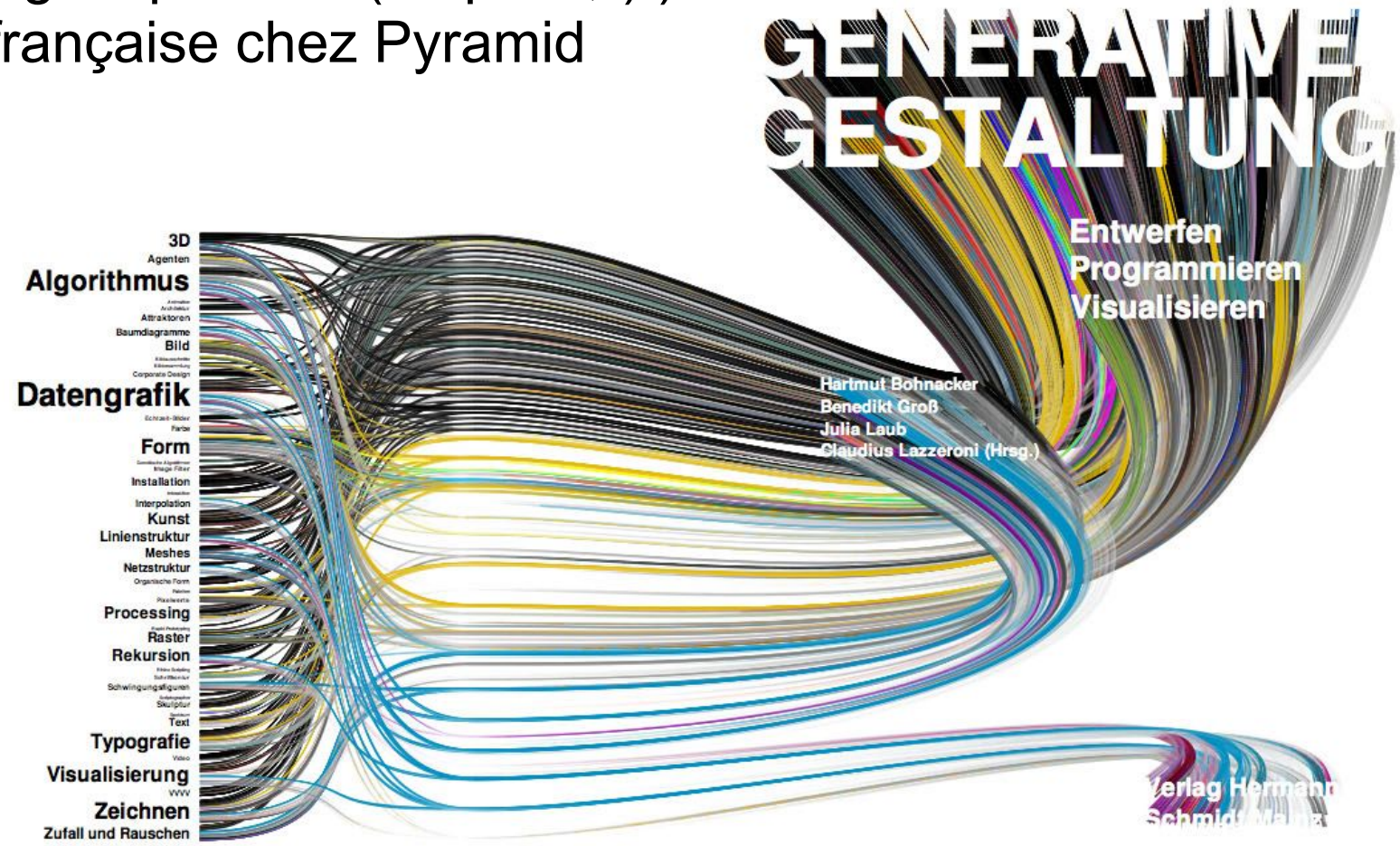
le cnam

Plan de l'exposé

1. de la 1D à la nD et aux graphes
2. Petits multiples
3. Les arbres
4. Les graphes généraux

Un magnifique livre (de plus ;-))
trad. française chez Pyramid



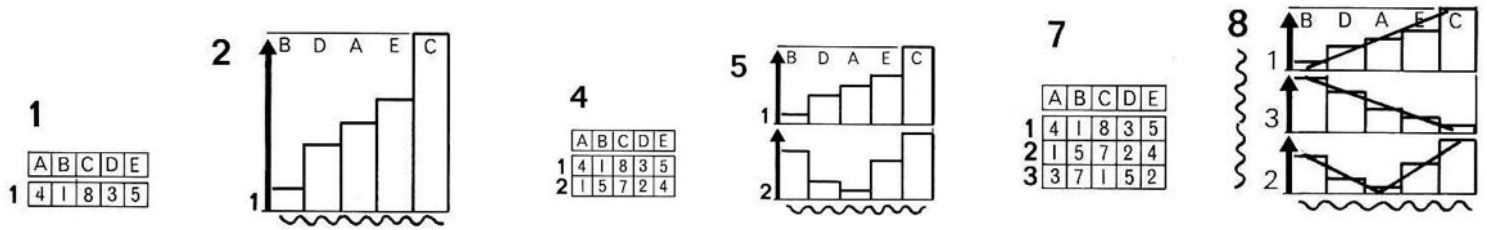
tous les codes du livre : http://www.art-generatif.com/

1. De la 1D à la nD

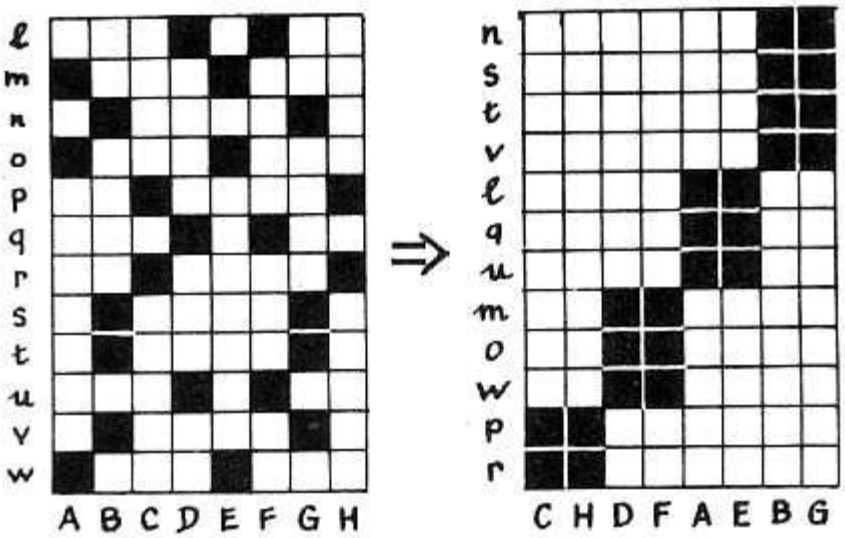
[Bertin2, p25]

Une barrière infranchissable

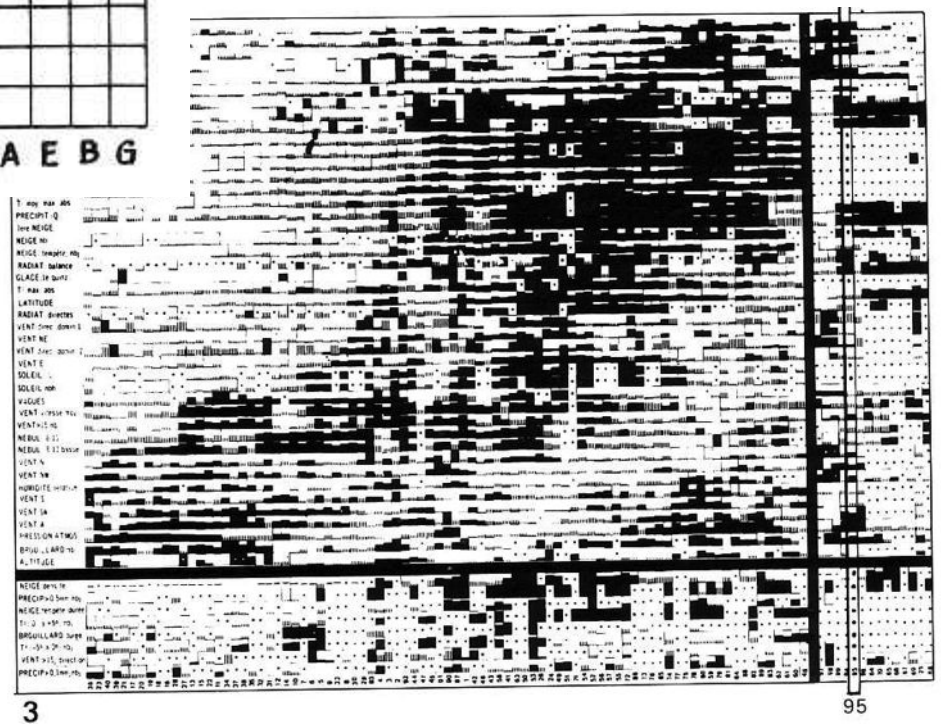
Jusqu'à trois lignes, un tableau de données peut être directement construit en une seule image. C'est un *diagramme de corrélation*. Il place les objets en z. Mais l'image n'a que trois dimensions. Cette barrière est infranchissable. En conséquence, au-delà de trois lignes, il n'y a que deux manières de transcrire l'information exhaustive :
- construire plusieurs diagrammes et perdre les relations d'ensemble;
- placer les objets en x et les caractères en y c'est-à-dire *construire une matrice*. Les relations d'ensemble sont découvertes grâce aux manipulations.



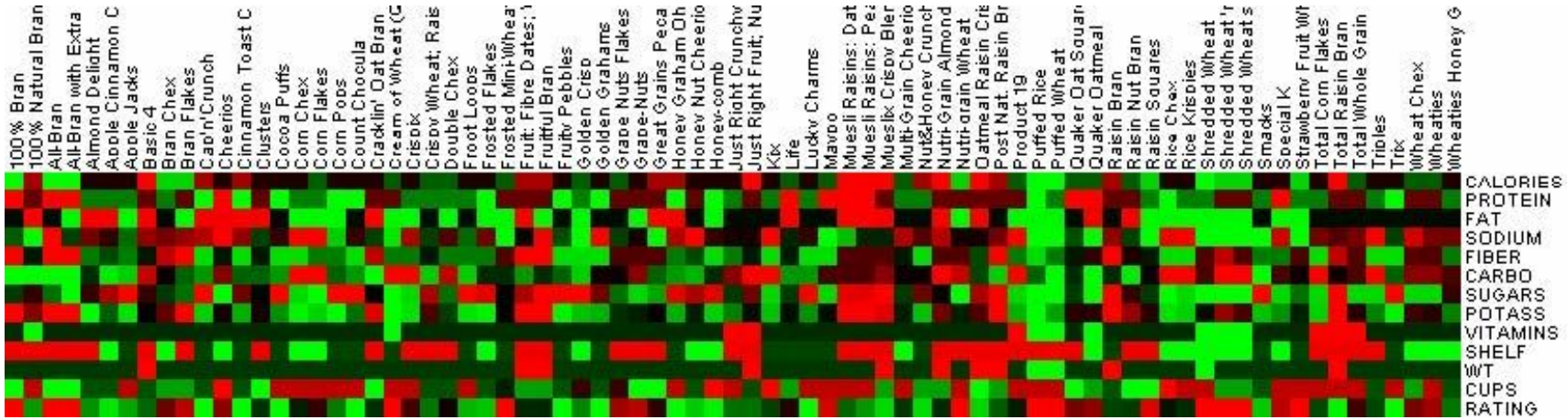
Matrices ordonnables (Bertin, 70’)



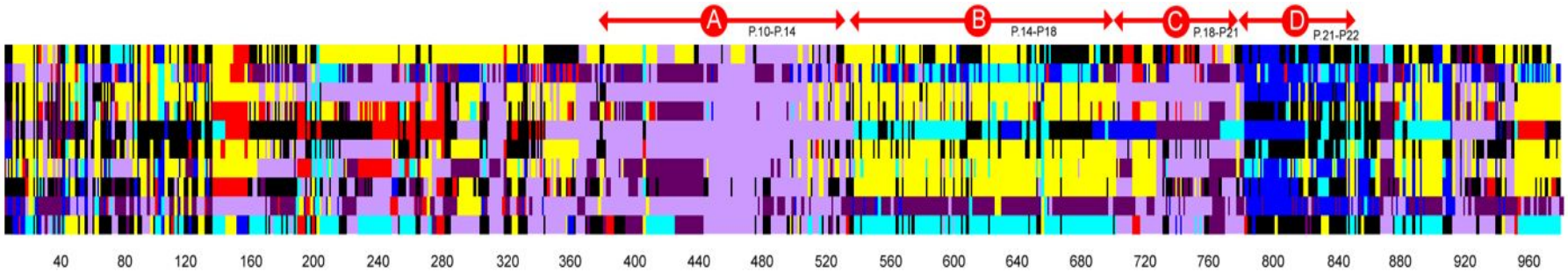
(cf cours #1)



Exemples :

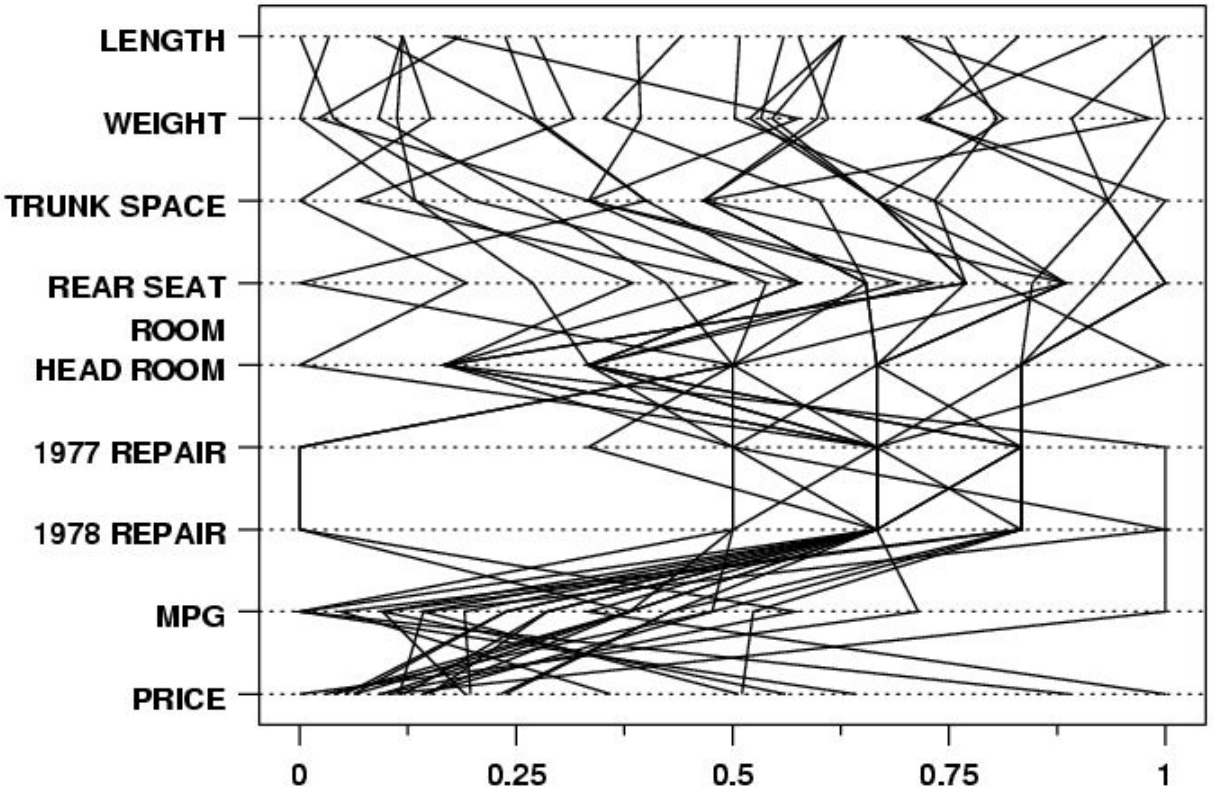


http://hcil.cs.umd.edu/trs/2005-20/2005-20.html



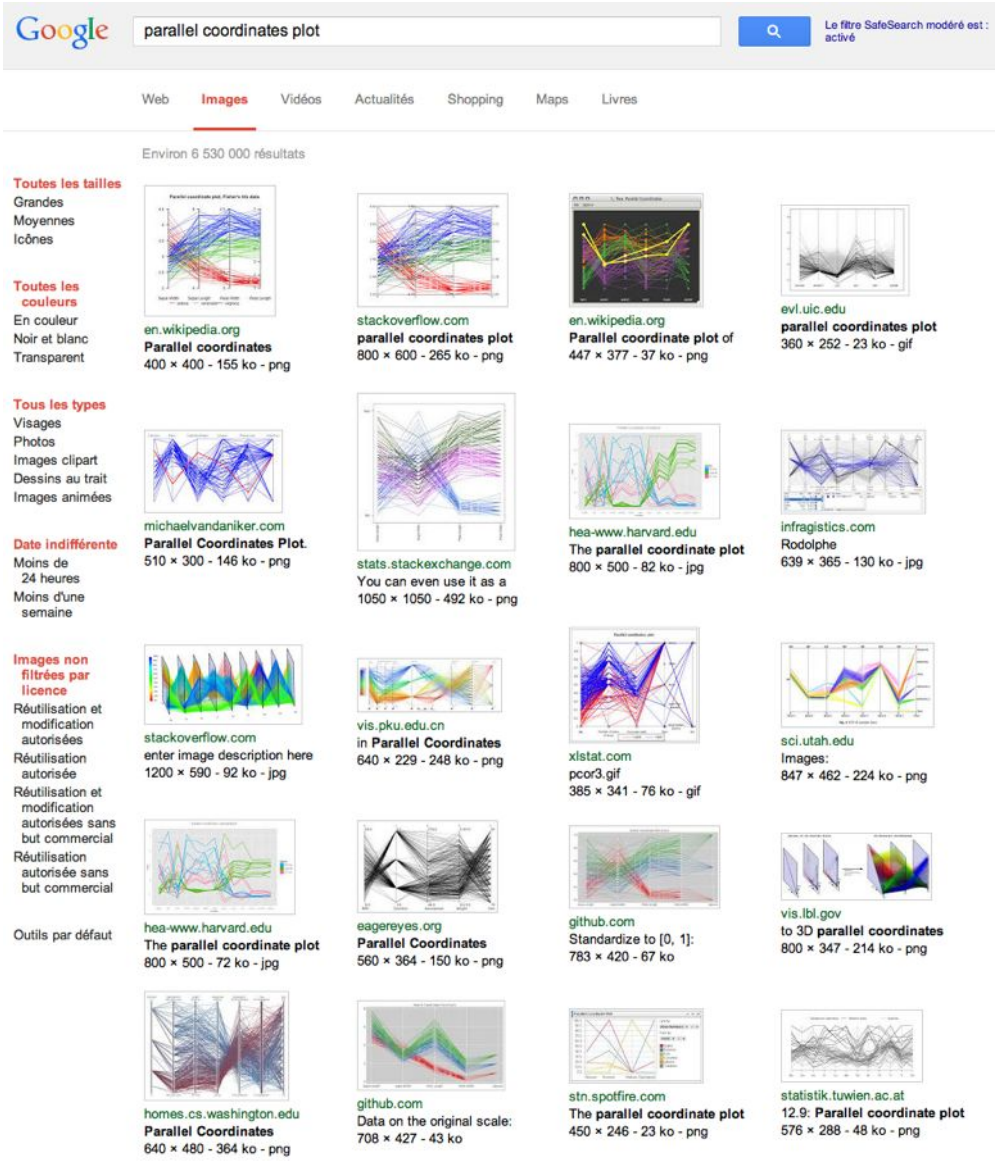
Hsu & Cubaud, HCI'2009

Parallel coordinate plot



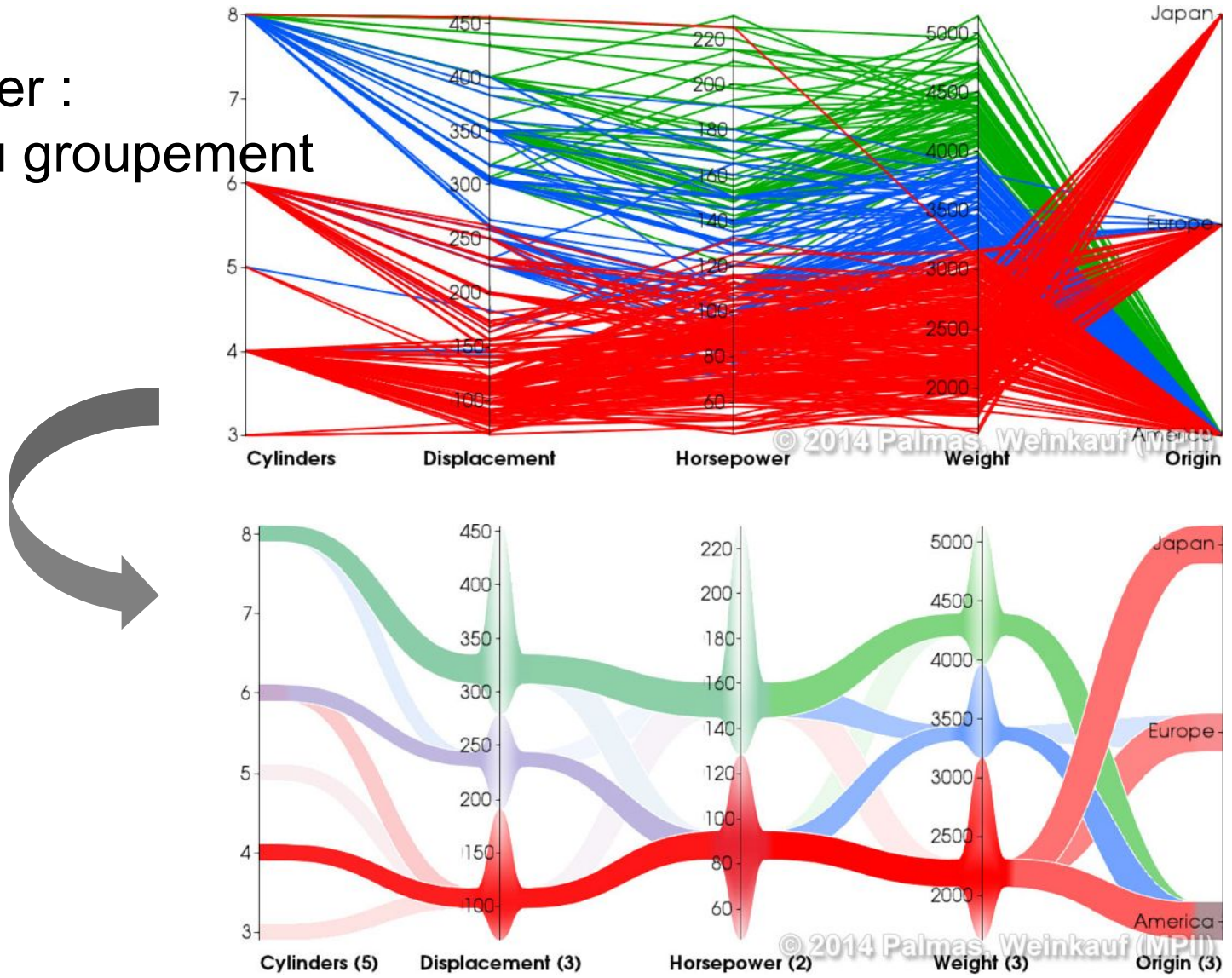
A. Inselberg,1959

Nombreuses variantes de rendu

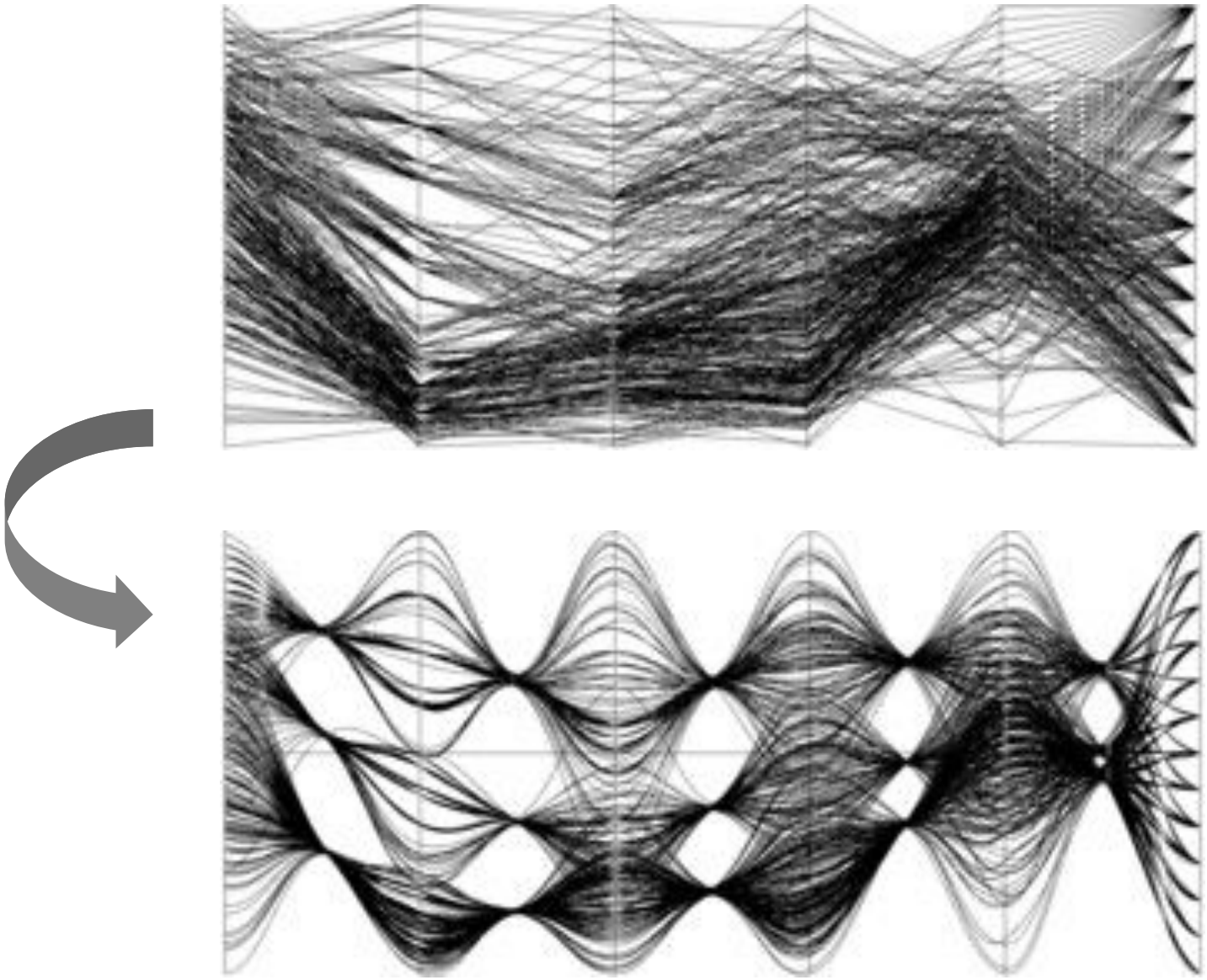


recherche d'images
dans Google
sur le terme

En particulier :
question du groupement
(bundling)



http://www.csc.kth.se/~weinkauf/



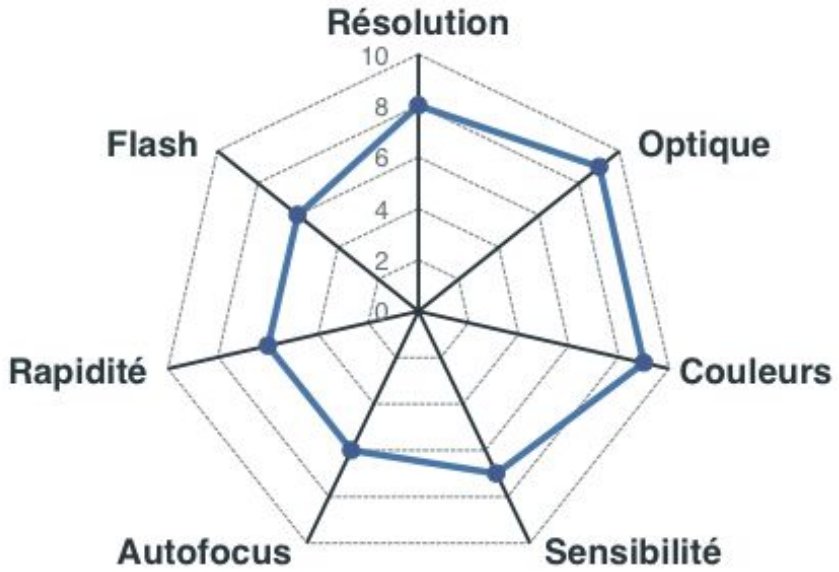
https://www.vis.uni-stuttgart.de/forschung/infovis-visualanalytics/parallel-coordinates.html

Diagramme en étoile

(ou : star plot, radar, diagramme de Kiviat ...)

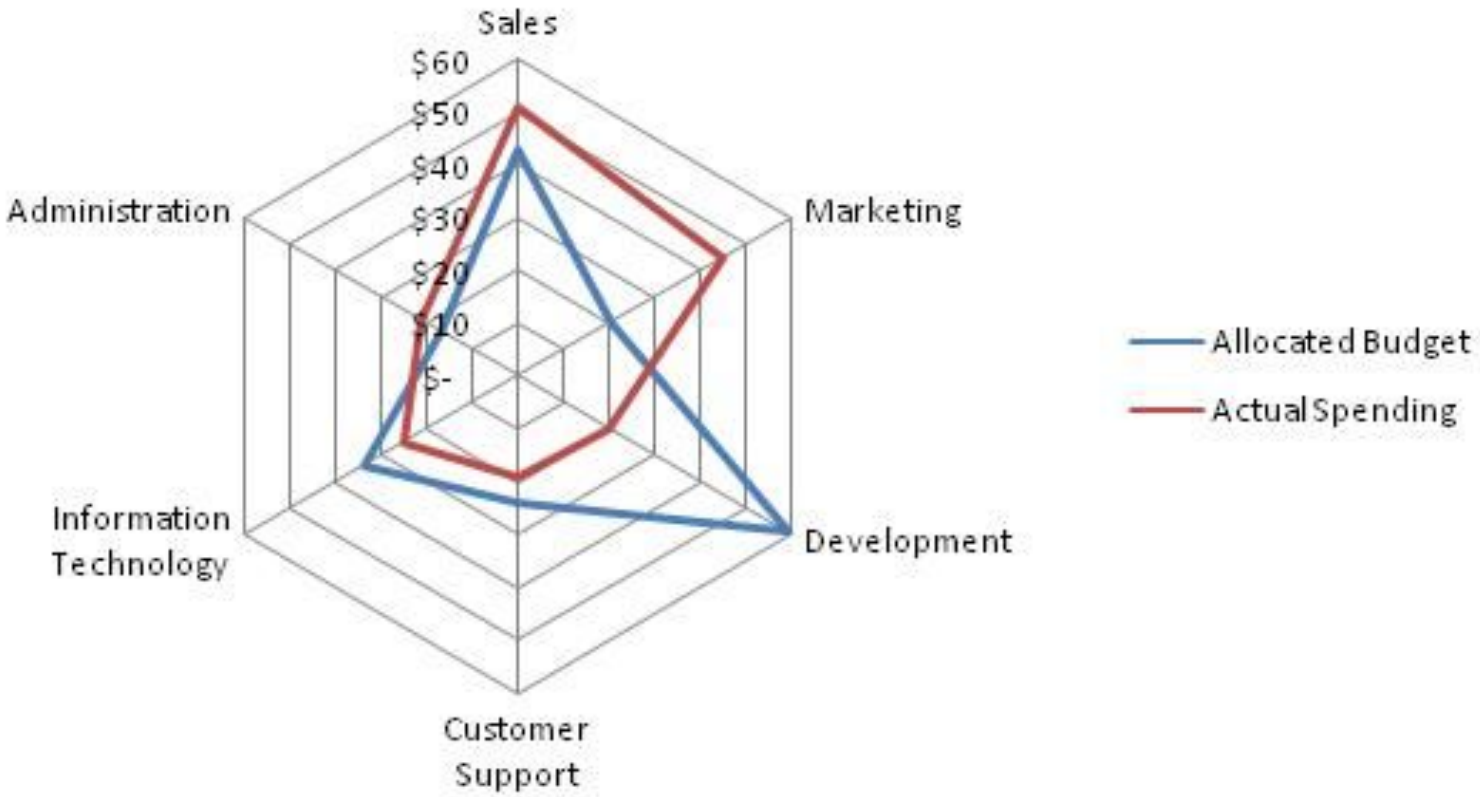
Labo Fnac

s abordable est doté d'un capteur au format
7,7 mm) et d'un écran de 2,7" (6,7 cm) affichant
inition du capteur est de 15,9 millions de pixels
a obtenu de bons résultats aux tests optiques,
grand-angle de 24 mm et d'un zoom optique
mode macro permettant une mise au point à
ısung WB35F a décroché des notes correctes
ın et de sensibilité et une excellente note de
Son autofocus manque un peu de réactivité
balement, la vitesse n'est pas son point fort.
communiquant et intègre Wi-Fi et NFC pour
s photos et vidéos directement ou au travers
l peut filmer des vidéos en 720p à 30 images/s.



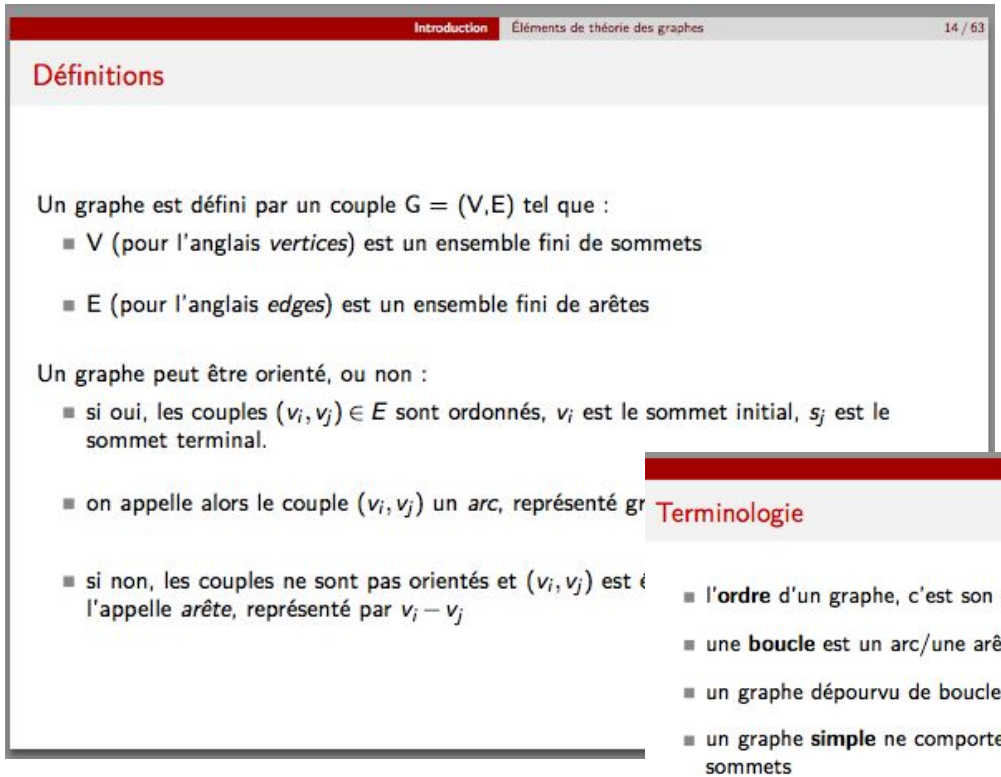
http://multimedia.fnac.com/multimedia/editorial/labo/dossier_compacts_bridges.pdf

en superposition :

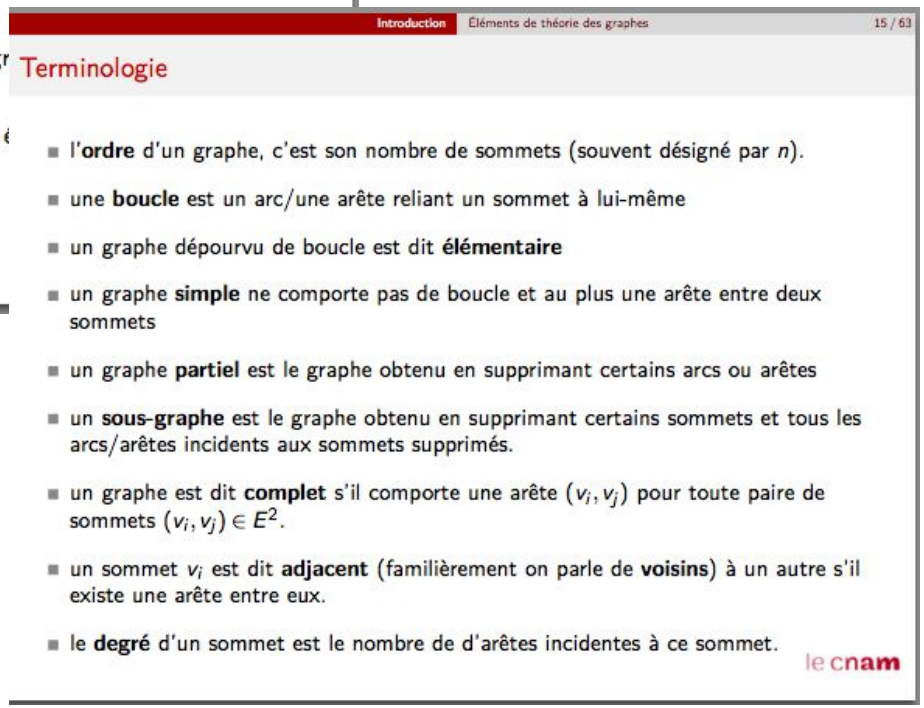


http://upload.wikimedia.org/wikipedia/commons/1/18/Spider_Chart2.jpg

Les graphes

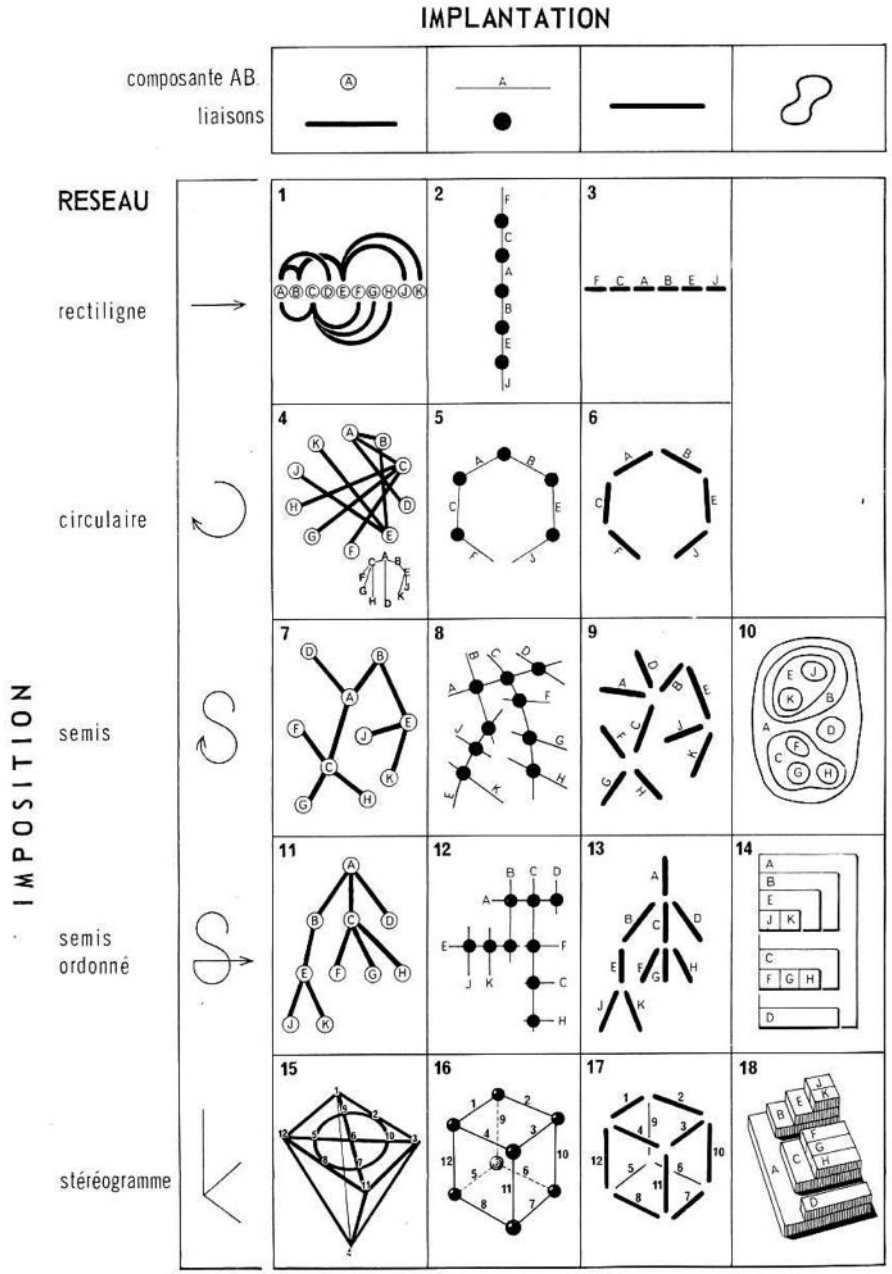


cf cours
sur la fouille
de graphe



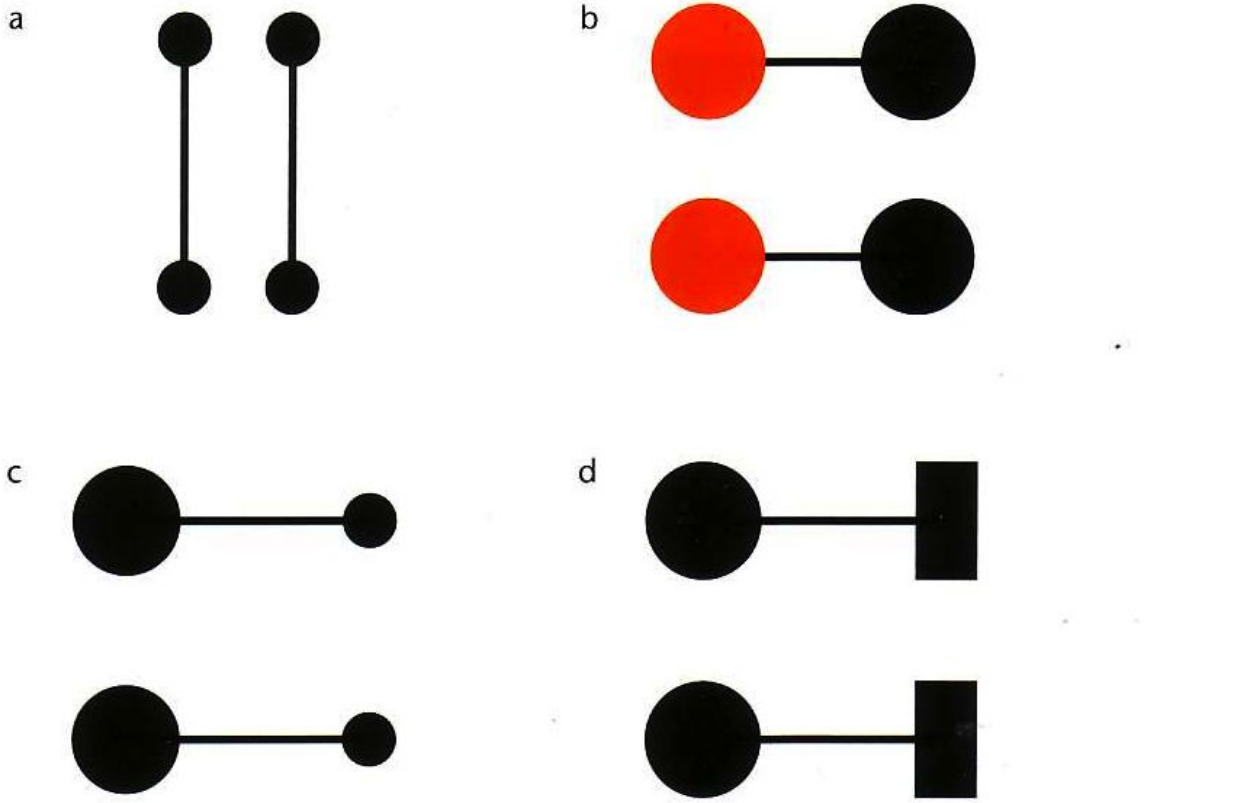
Représentation des graphes

[Bertin2]



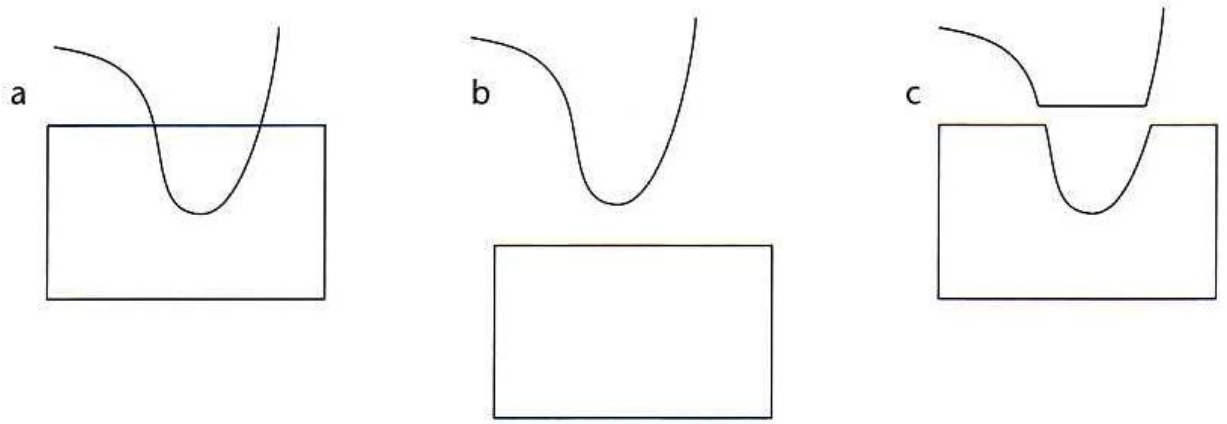
arbres ok

Les relations

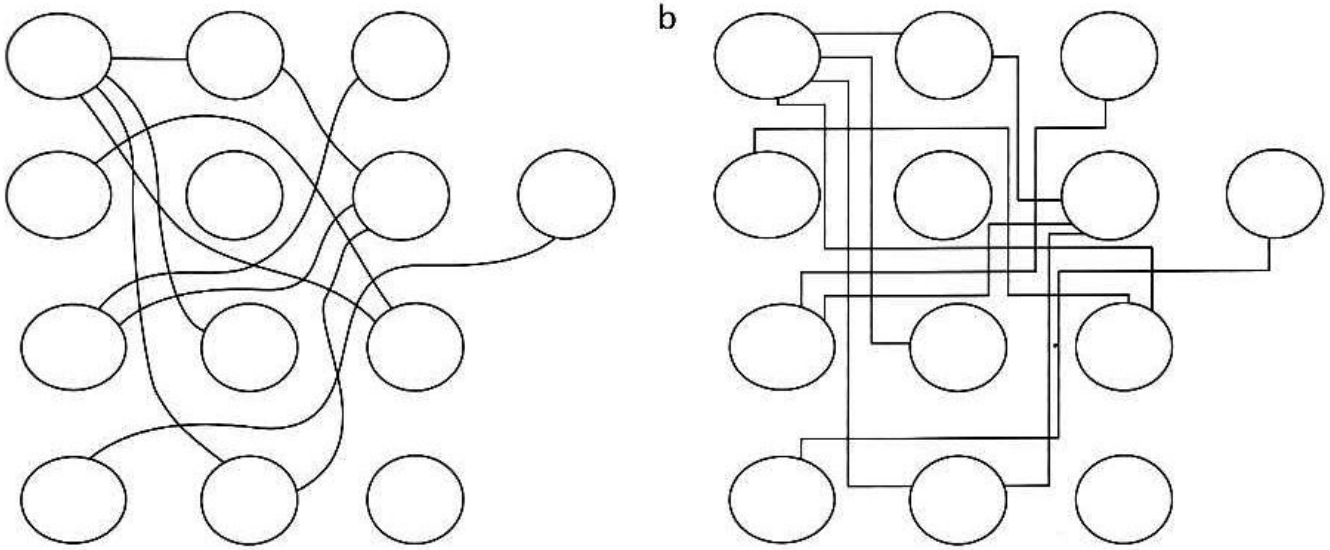


Connectedness is a powerful grouping principle that is stronger than (a) proximity, (b) color, (c) size, or (d) shape.

[Ware]



The pattern on the left (a) is perceived as a curved line overlapping a rectangle (b) rather than as the more angular components shown in (c).



[Ware]

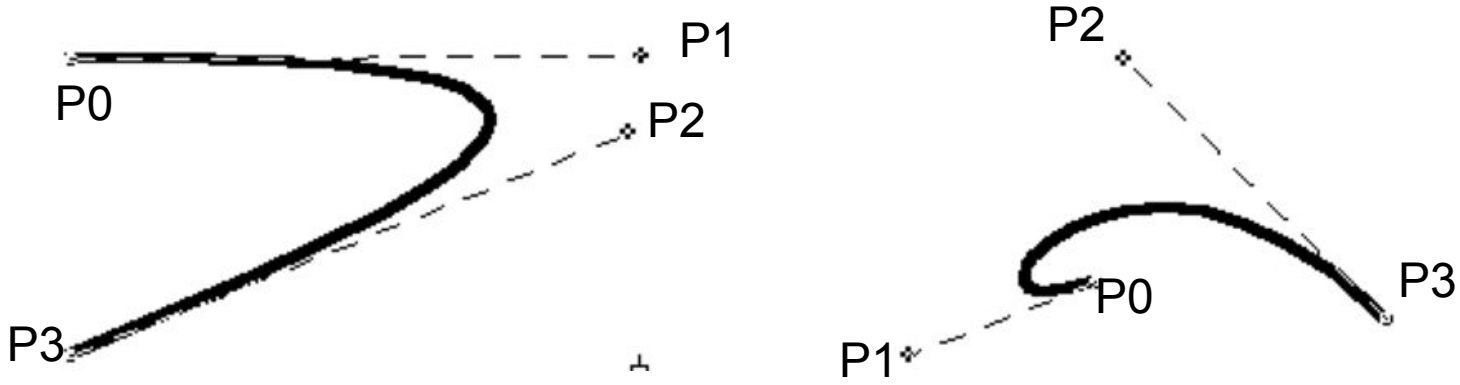
In (a), smooth continuous contours are used to connect the elements, whereas in (b), lines with abrupt changes in direction are used. It is much easier to perceive connections when contours connect smoothly.

Remarque sur les arcs non rectilignes :

utilisation des courbes paramétrées (Bézier, Splines)

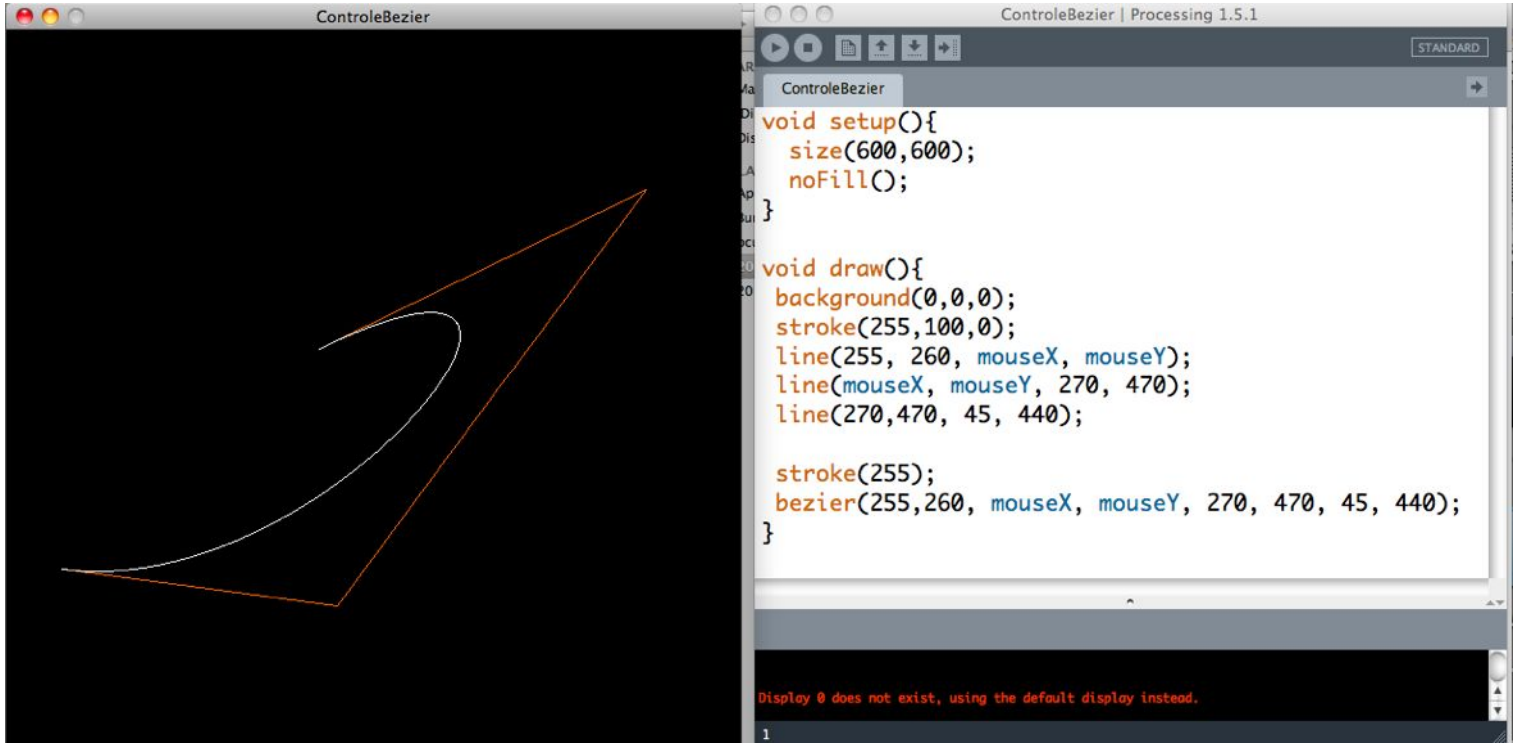
$$f(u) = \sum_{i=0}^{3} B_i(u)\vec{P}_i$$ polynôme de degré 3

$$= \vec{P}_0(1-u)^3 + 3\vec{P}_1 u(1-u)^2 + 3\vec{P}_2 u^2(1-u) + \vec{P}_3 u^3$$



voir cours NSY116 (chapitre sur les techniques graphiques 2D)

Primitive bezier() de Processing

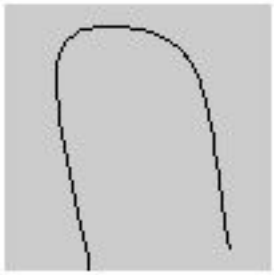


Spline de Catmull-Rom sous Processing :

Name

curveVertex()

Examples



```
noFill();
beginShape();
curveVertex(84,  91);
curveVertex(84,  91);
curveVertex(68,  19);
curveVertex(21,  17);
curveVertex(32, 100);
curveVertex(32, 100);
endShape();
```

Description

Specifies vertex coordinates for curves. This function may only be used between **beginShape()** and **endShape()** and only when there is no MODE parameter specified to **beginShape()**. The first and last points in a series of **curveVertex()** lines will be used to guide the beginning and end of a the curve. A minimum of four points is required to draw a tiny curve between the second and third points. Adding a fifth point with **curveVertex()** will draw the curve between the second, third, and fourth points. The **curveVertex()** function is an implementation of Catmull-Rom splines. Using the 3D version of requires rendering with P3D or OPENGL (see the Environment reference for more information).

3. Petits multiples

[Tufte – Envisioning …]

Conclusion

Well-designed small multiples are

- inevitably comparative
- deftly multivariate
- shrunken, high-density graphics
- usually based on a large data matrix
- drawn almost entirely with data-ink
- efficient in interpretation
- often narrative in content, showing shifts in the relationship between variables as the index variable changes (thereby revealing interaction or multiplicative effects).

[Tufte – Envisioning …]

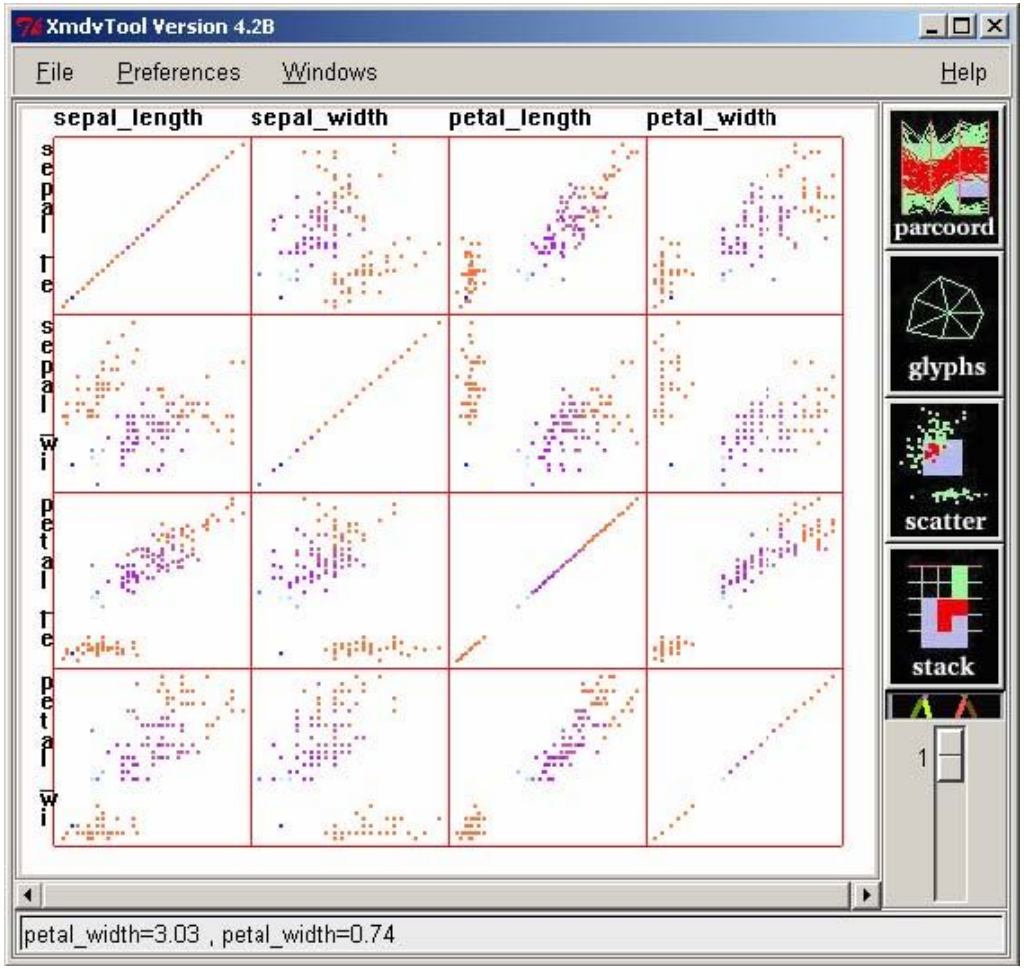
Small multiples reflect much of the theory of data graphics:

For non-data-ink, less is more.

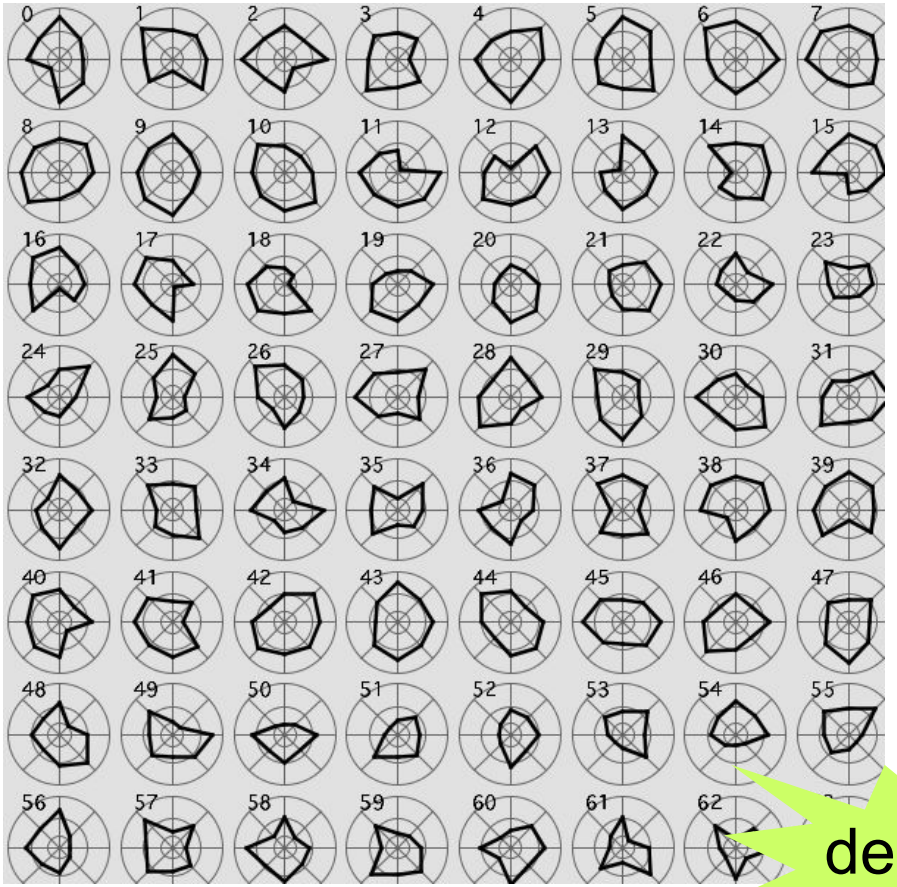
For data-ink, less is a bore.[6]

[6] The two aphorisms on the meaning of "less" are, respectively, credited to Ludwig Mies van der Rohe and to Robert Venturi, *Complexity and Contradiction in Architecture* (New York, second edition, 1977), p. 17.

PM avec les nuages de points

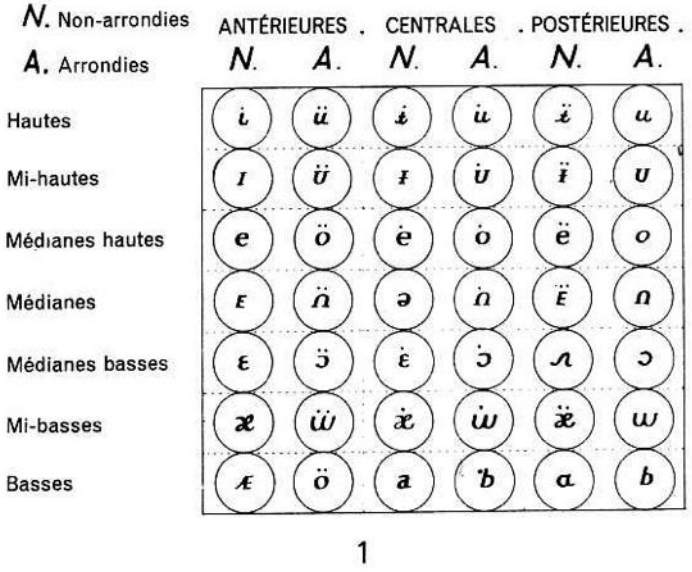


PM avec les radars

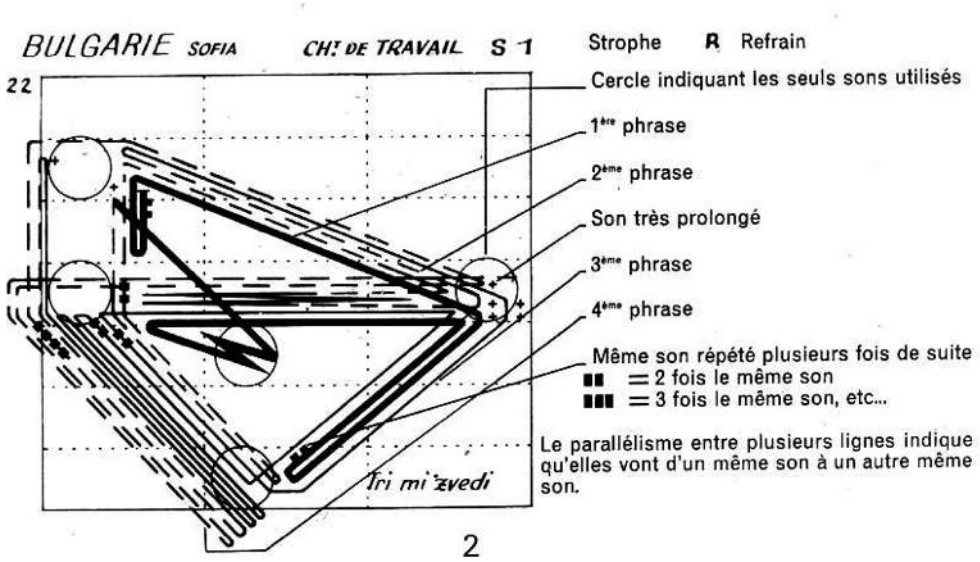


demo

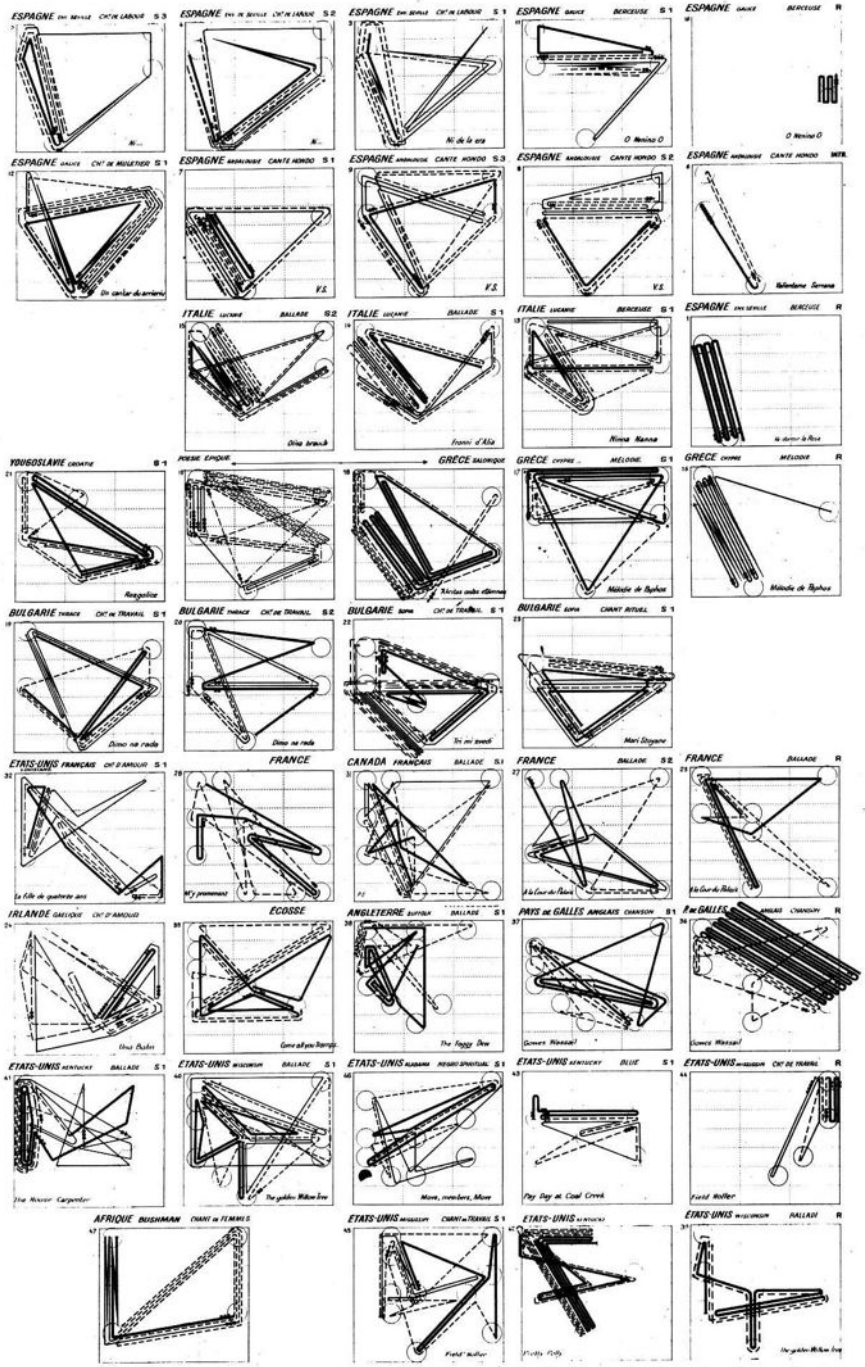
Exemple dans [Bertin]



1

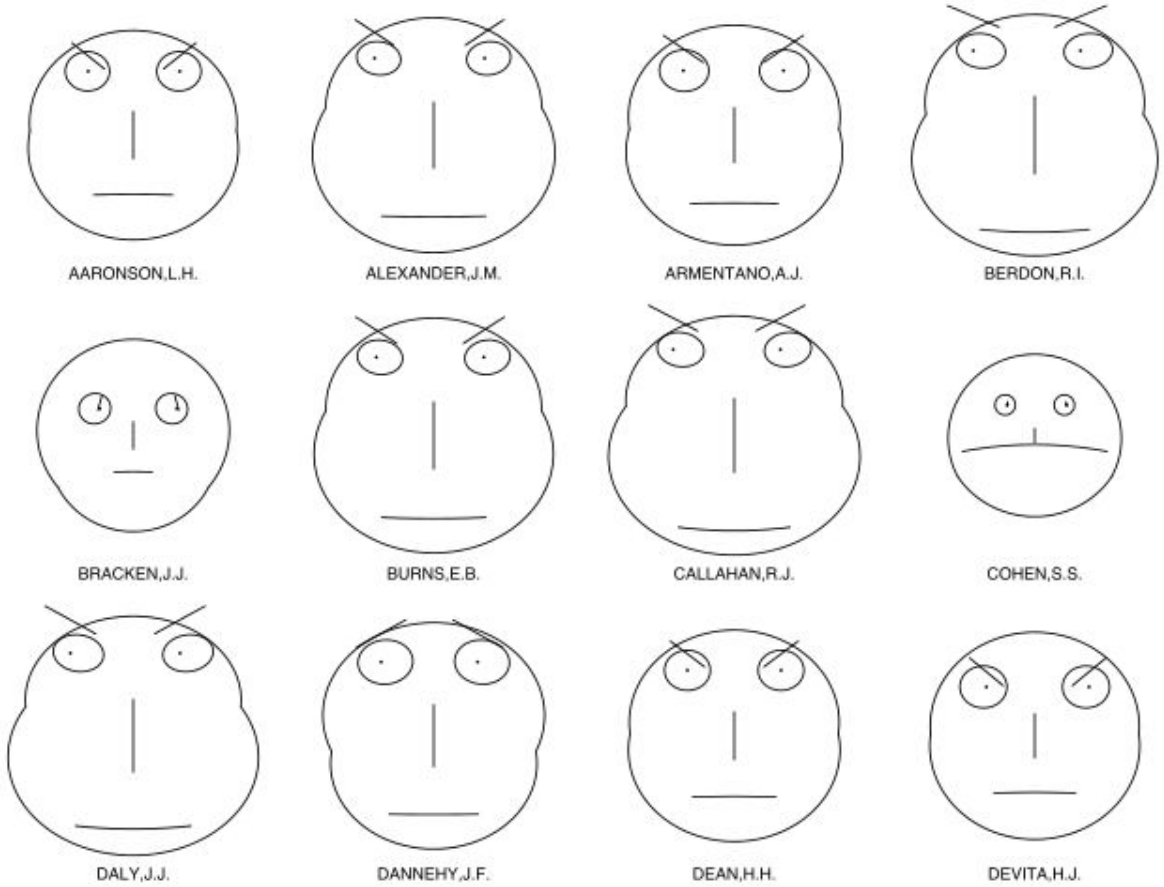


2



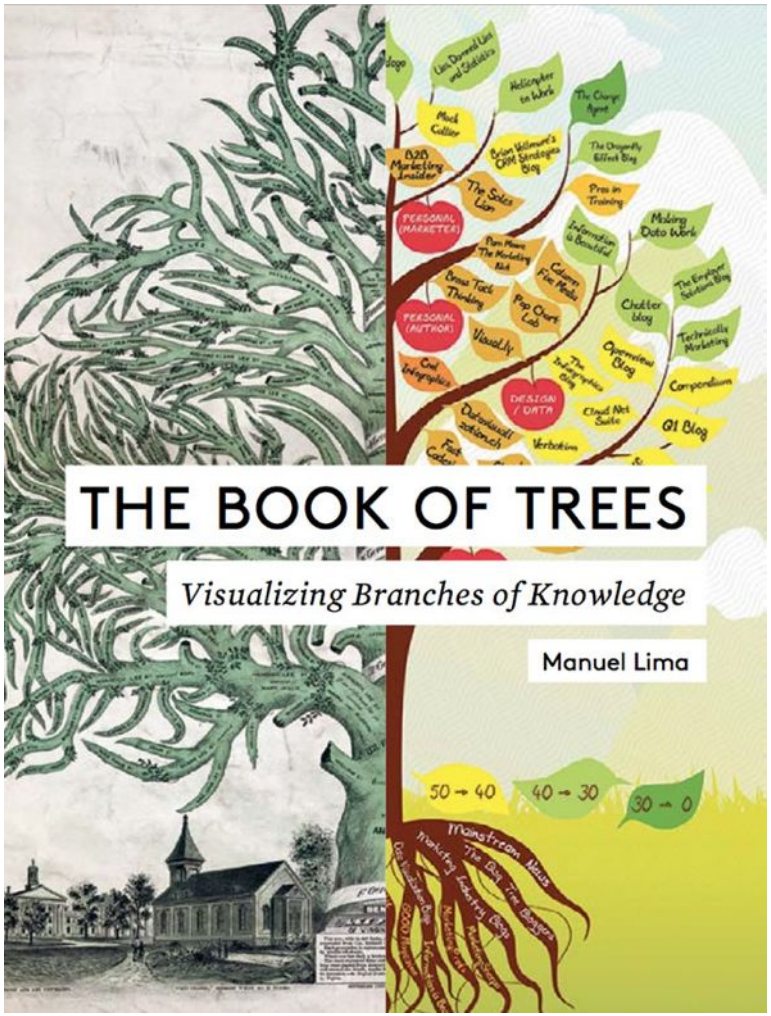
Laboratoire de Cartographie de l'Ecole Pratique des Hautes Etudes

au passage : les visages de H. Chernoff (1973)

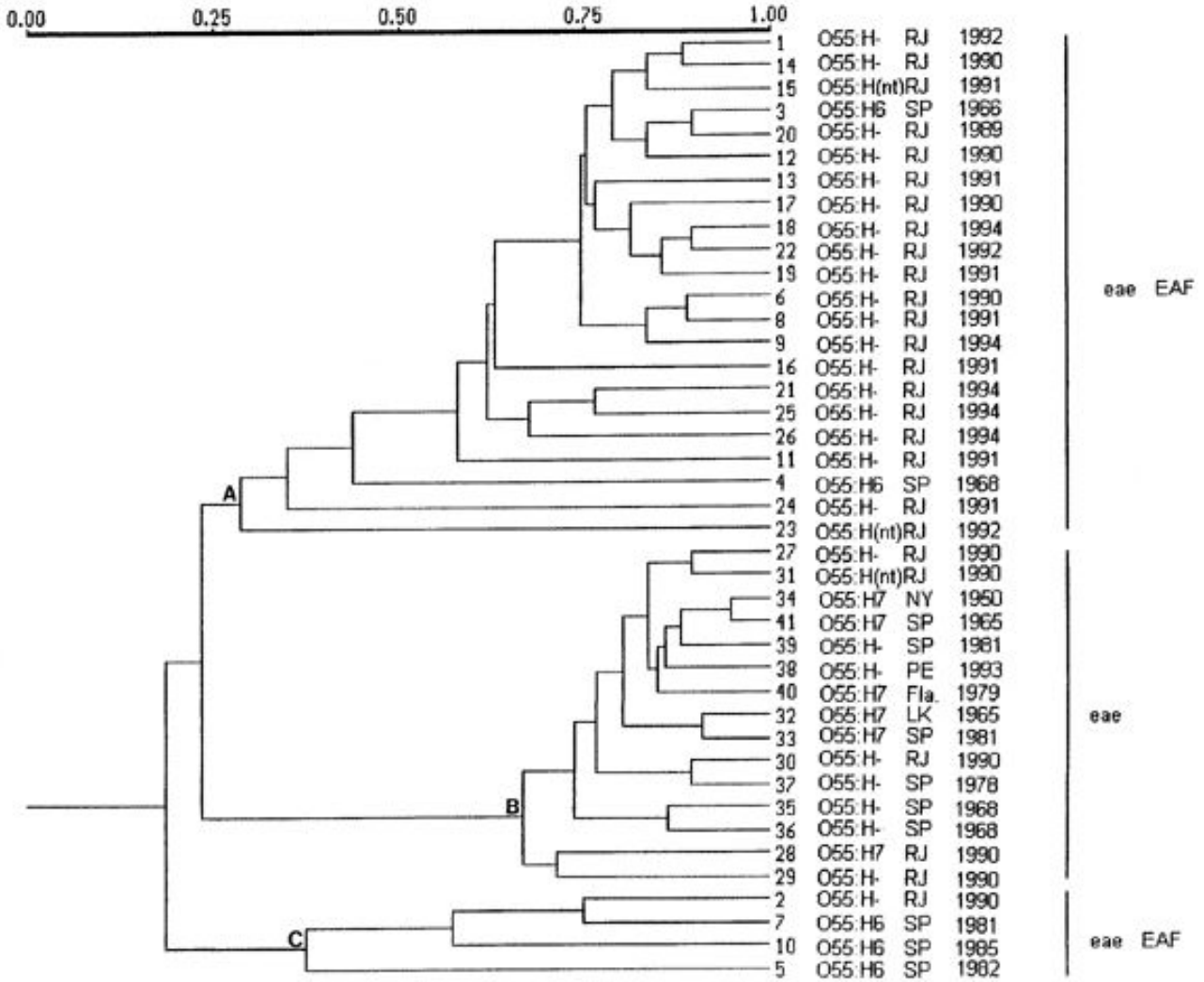


http://en.wikipedia.org/wiki/Chernoff_face

4. Les arbres

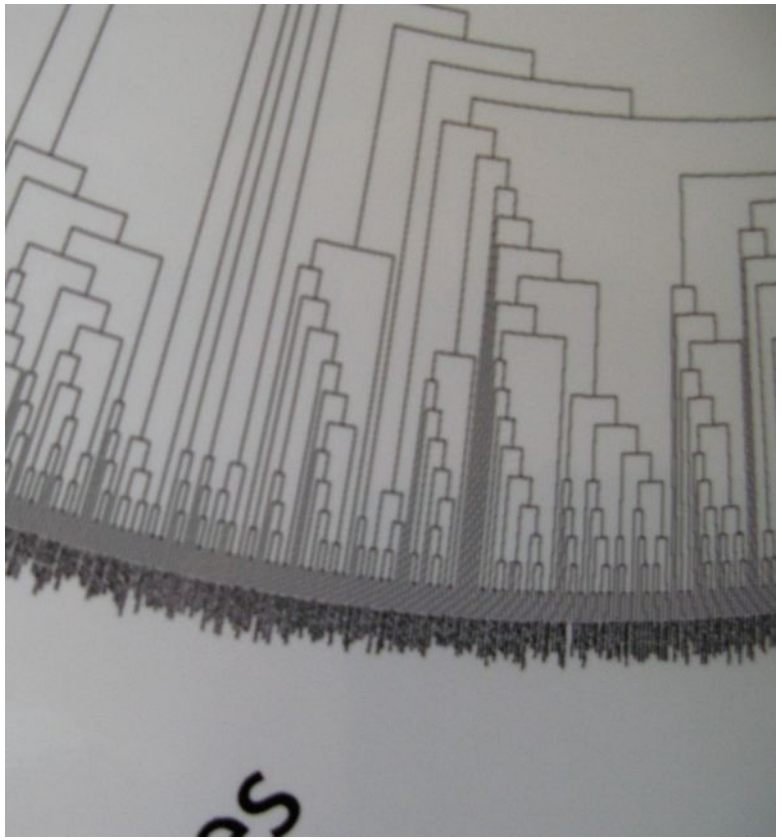

THE BOOK OF TREES
Visualizing Branches of Knowledge
Manuel Lima
50 → 40
40 → 30
30 → 0

Dendogrammes



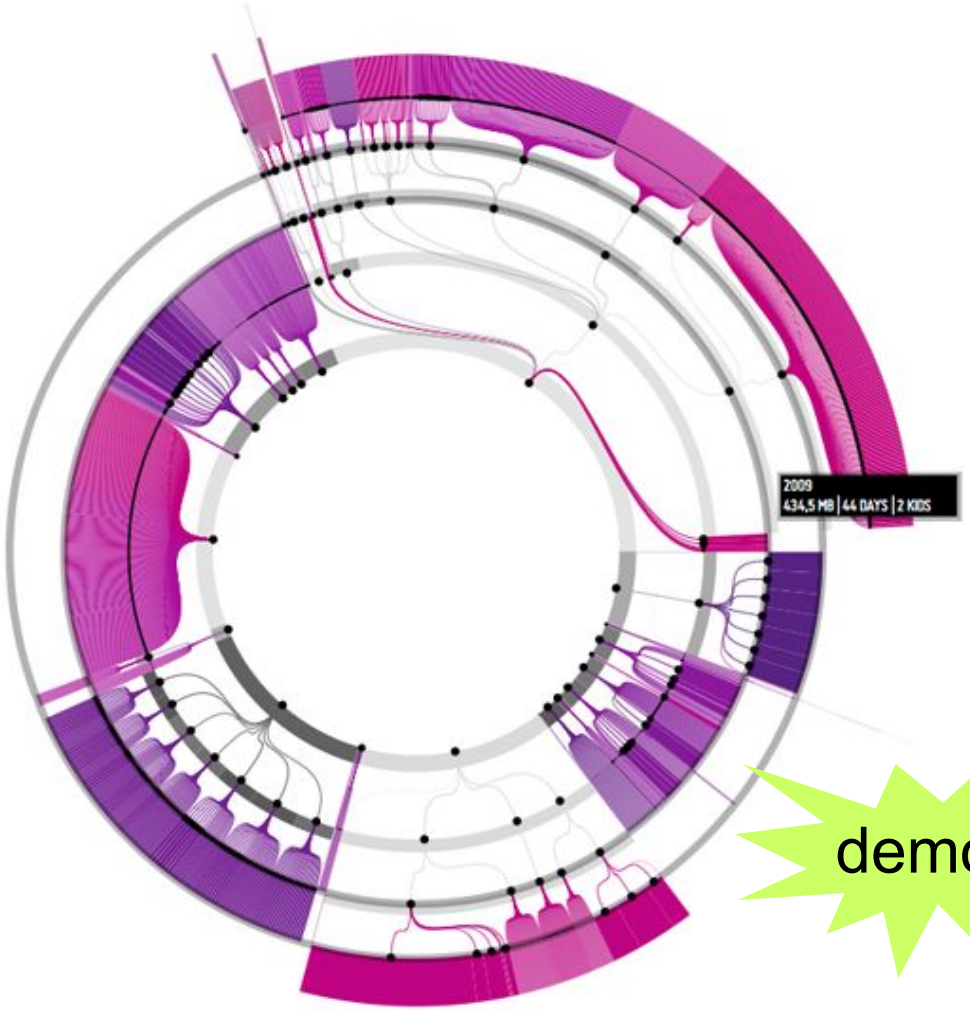
Représentations radiales

Un exemple : classer les espèces vivantes sur Terre



Panneau 1.50x1m env.
Noms illisibles => IHM

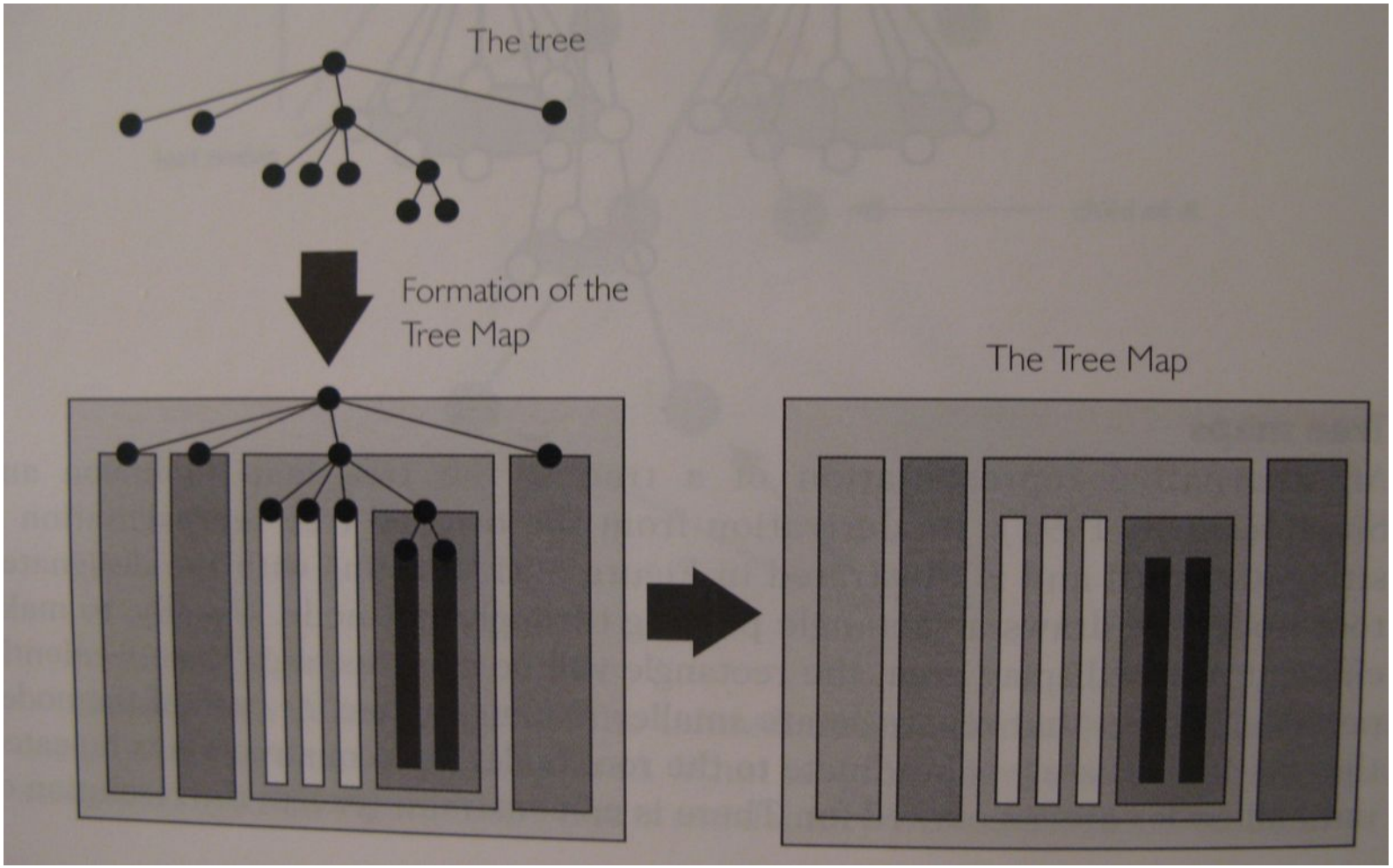
Chapitre M.5.0 de "Design génératif"



demo

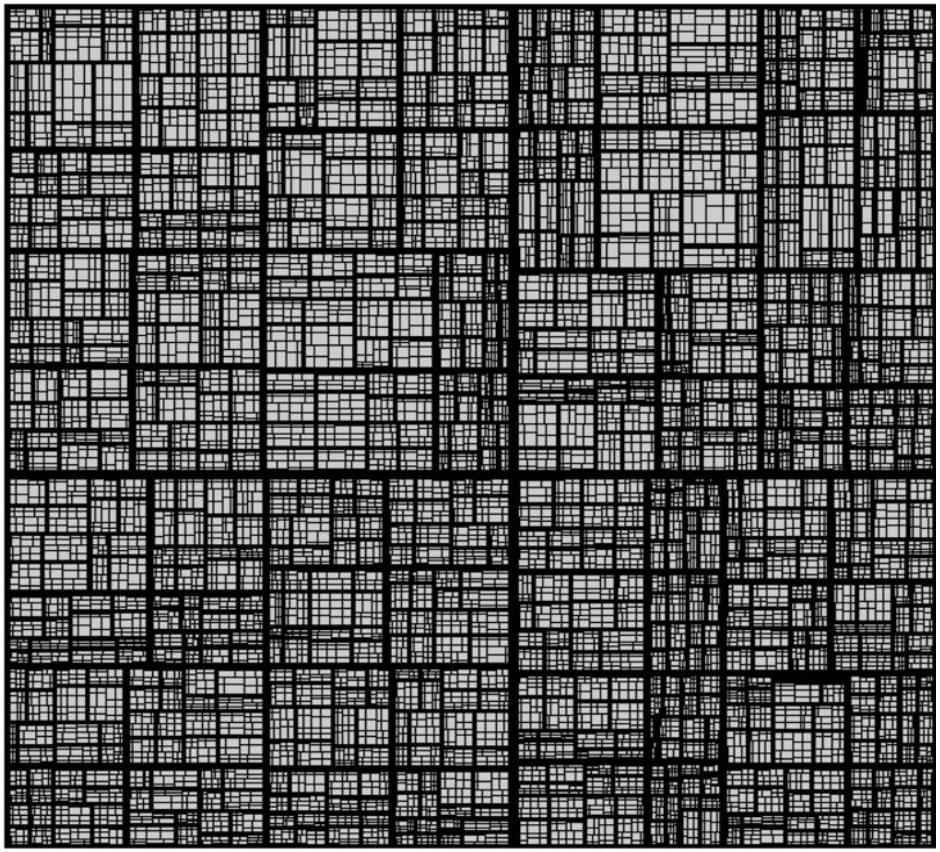
Programme Processing très complet (M_5_5_01_TOOL)

Tree-maps (Johnson & Schneiderman, 1991)



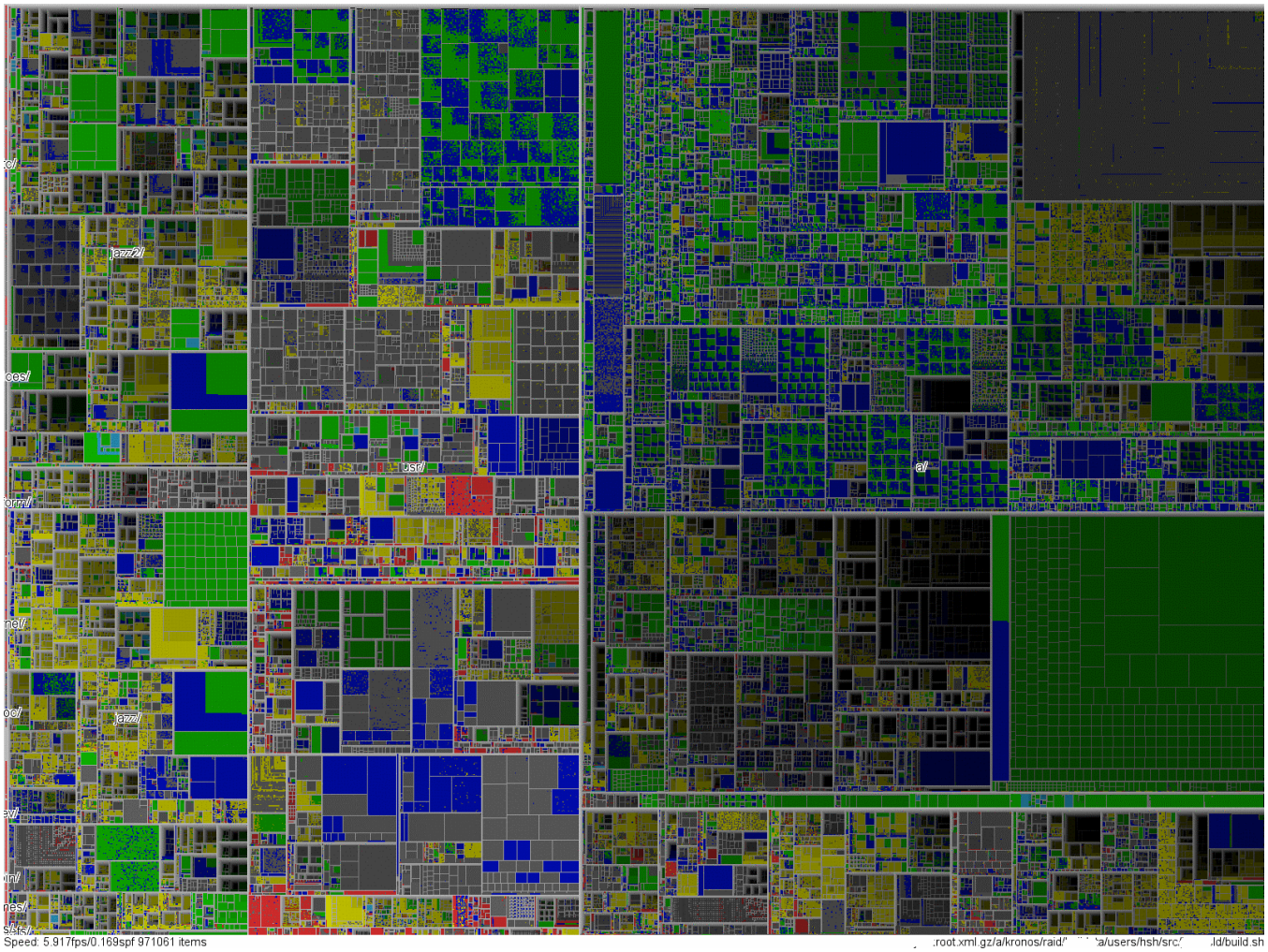
[Spence p. 86]

rappel du TP#1 : subdivion récursive du plan



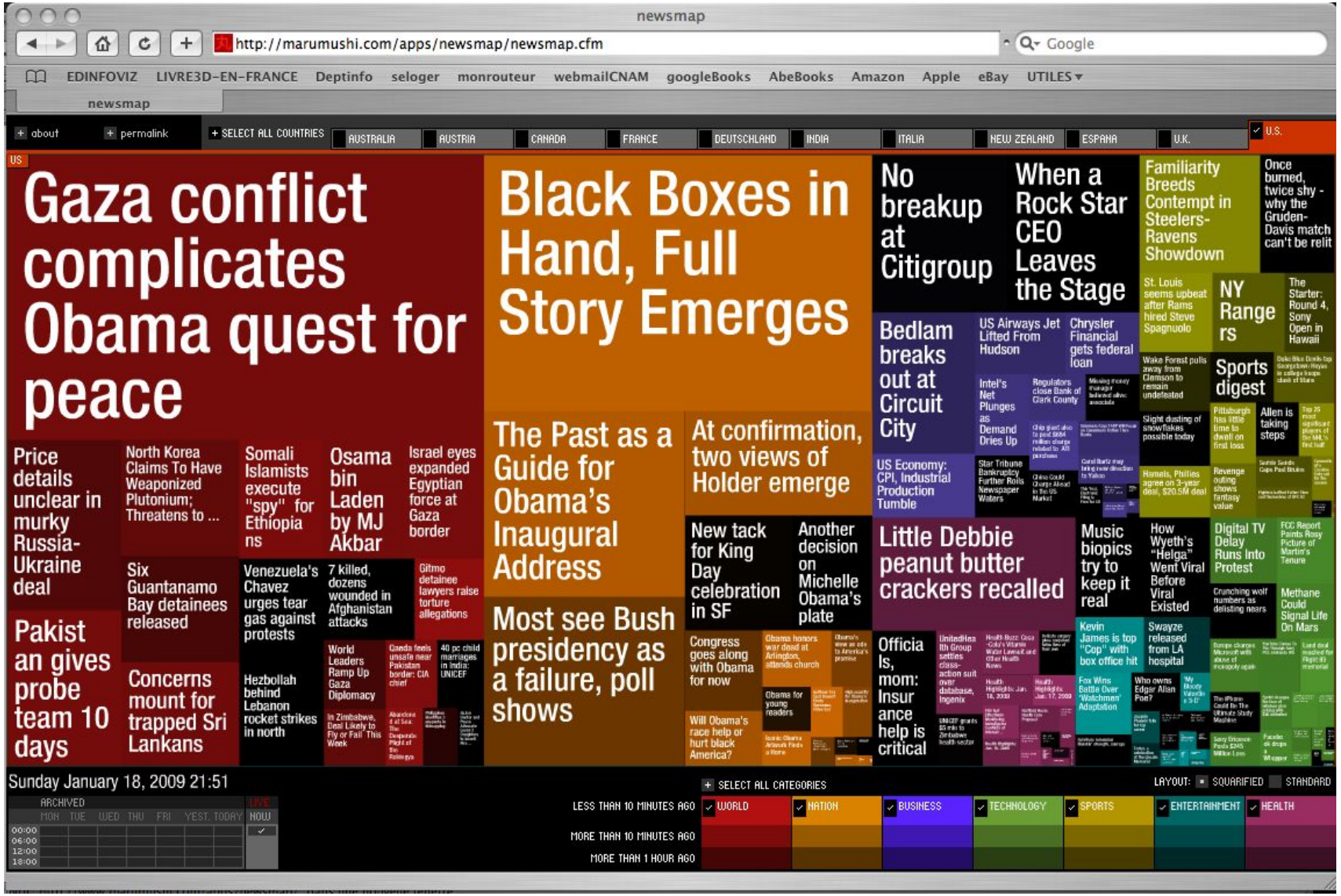
algo. à étudier au TP#4

Treemap avec un million d'items (Fekete, Plaisant – 2002)

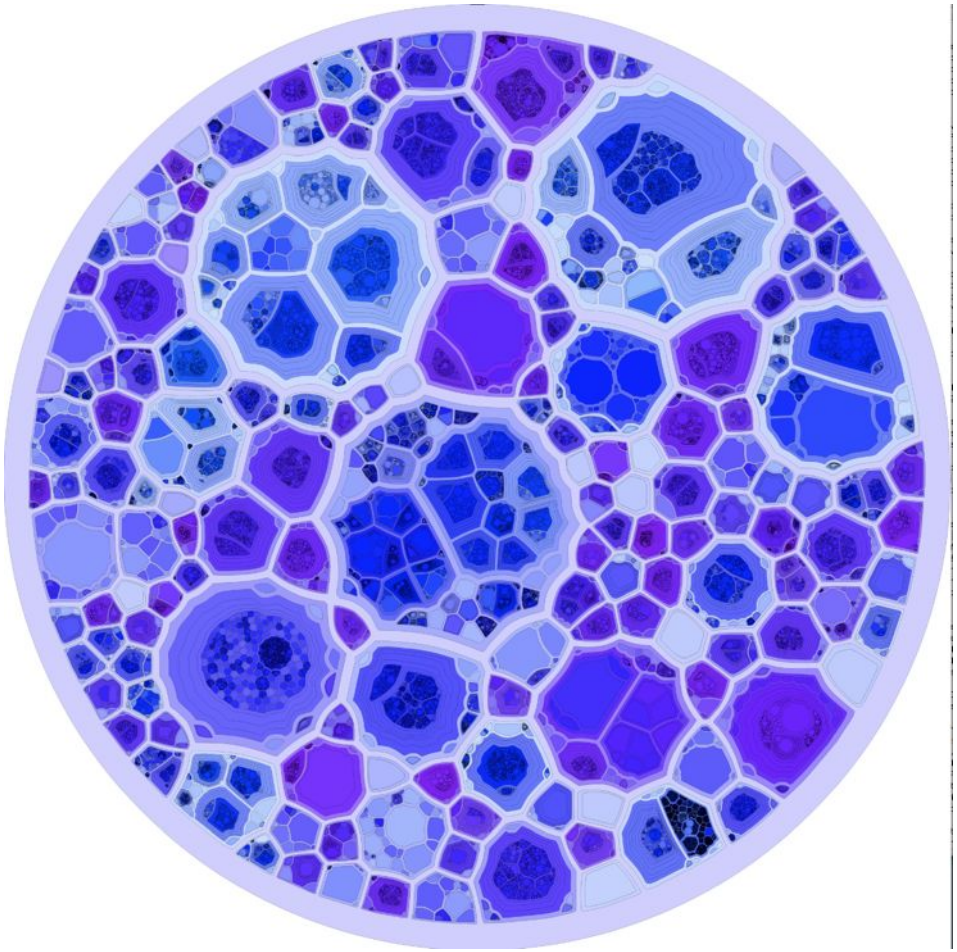


code source et infos : http://www.cs.umd.edu/hcil/millionvis/

Autre exemple : newsmap

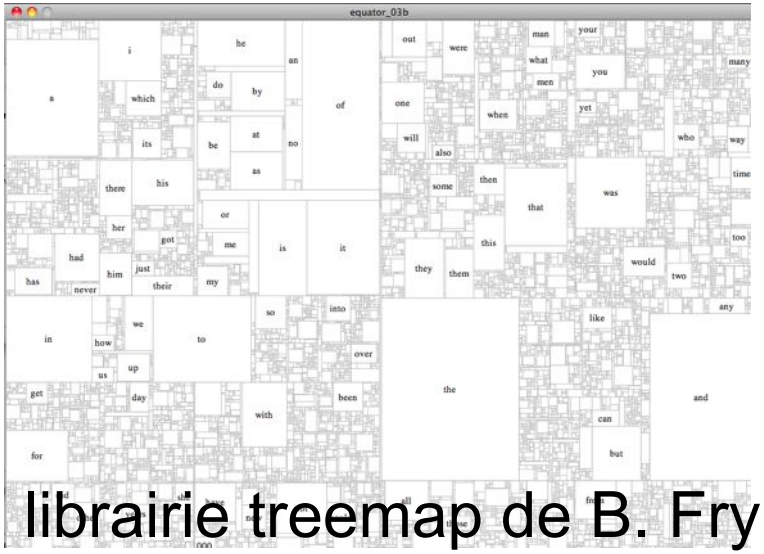


Nombreuses variantes



http://www.informatik.uni-konstanz.de/deussen/mitarbeiter/oliver-deussen/olivers-kunschtversuche/

http://grandperspectiv.sourceforge.net/

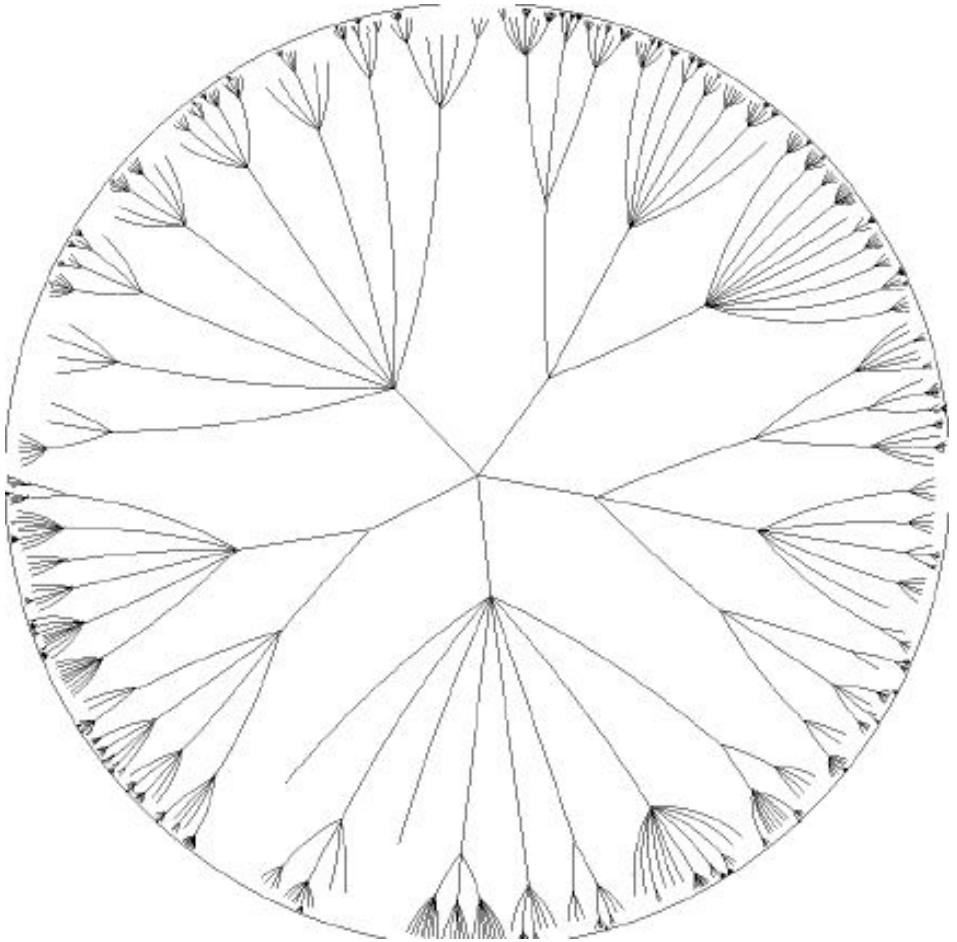


librairie treemap de B. Fry pour Processing

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

1004 sommets, distrib. Poissonienne du nbre de fils

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) ...
385 x 395 - 10 ko - gif
coli.lili.uni-bielefeld.de

... Abb. 11a: **Hyperbolic Trees** (1) ...
411 x 437 - 12 ko - gif
coli.lili.uni-bielefeld.de

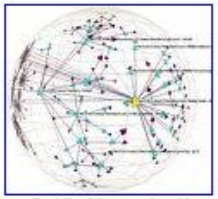
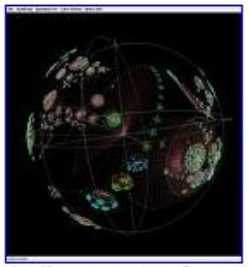
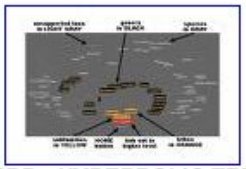


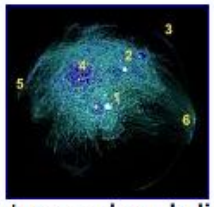
Figure 2-15: **Hyperbolic tree**.
336 x 308 - 50 ko - gif
www3.sympatico.ca



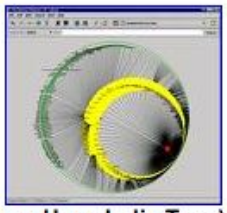
Hyperbolic geometry: Spectacular ...
888 x 964 - 198 ko - png
www.infovis.net



CGDP - **HYPERBOLIC TREE** KEY
600 x 404 - 31 ko - gif
www.flmnh.ufl.edu

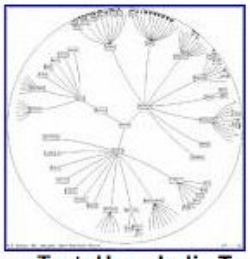


... are two more **hyperbolic tree** ...
300 x 288 - 111 ko - jpg
dd.dynamicdiagrams.com

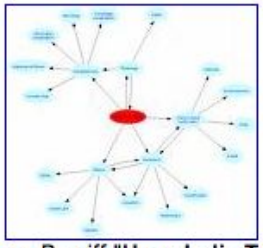


... Eye or **Hyperbolic Tree** Viewer is ...
400 x 368 - 58 ko - gif
www.sorice.com

Hyperbolic Tree
350 x 339 - 76 ko - png
vw.indiana.edu



Tree Text: **Hyperbolic Tree**
729 x 743 - 174 ko - jpg
www.itl.nist.gov



... zum Begriff "**Hyperbolic Tree**" ...
864 x 804 - 16 ko - png
beat.doebe.li

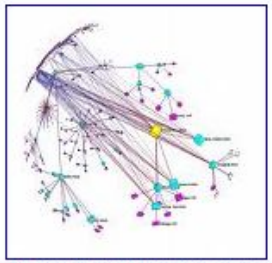
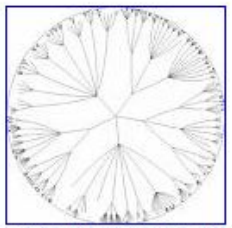
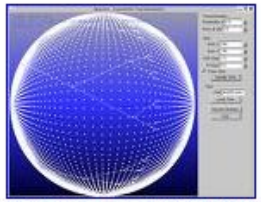


Figure 3.19: Non-**tree** links

Hyperbolic trees - InfoVis:Wiki



an original **hyperbolic tree** with



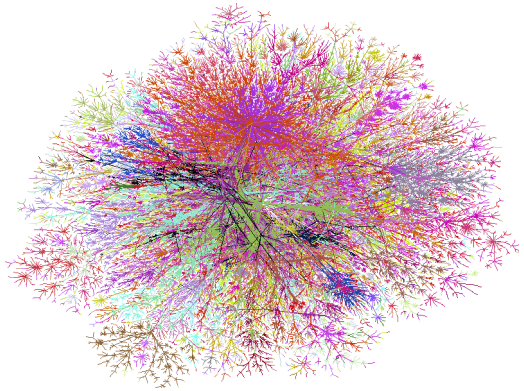
Hyperbolic Tree Visualization

We will use the **hyperbolic tree**

Ouvrir "http://images.google.com/imgres?imgurl=http://beat.doebe.li/bibliothek/ref_w/w0083...Dhyperbolic%2Btrees%26svnum%3D10%26um%3D1%26hl%3Dfr%26client%3Dsafari%26rls%3Dfr%26sa%3DN"

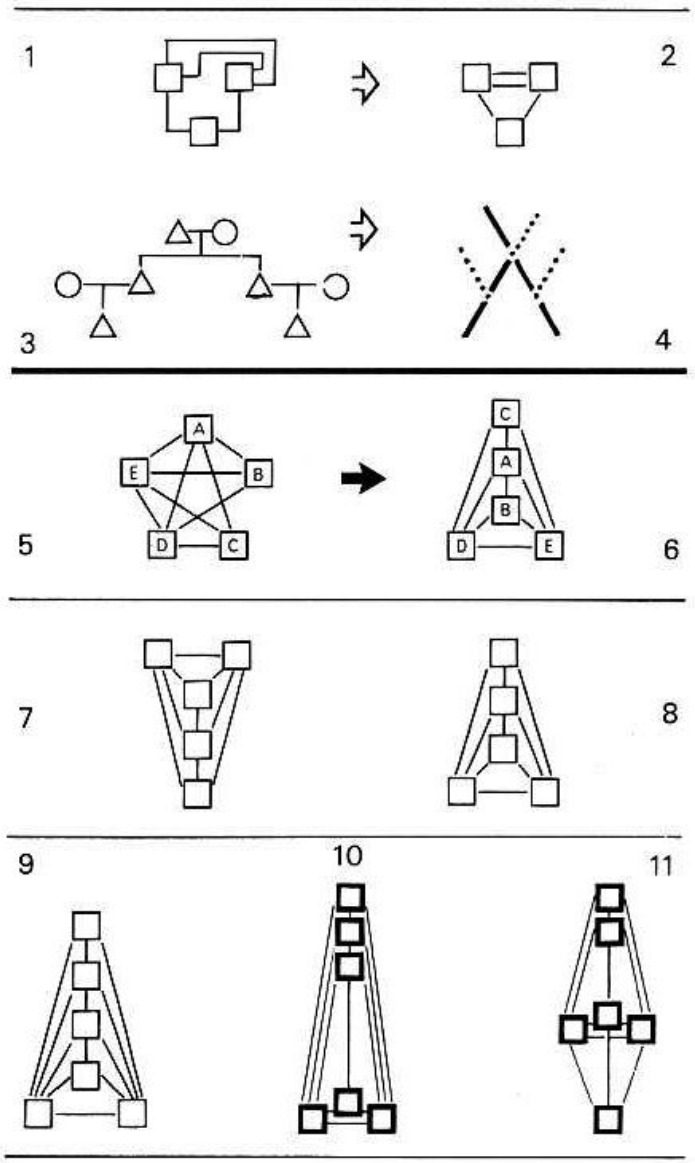
5. Les graphes généraux

[wikipedia – article Ramen]



(image Lumeta
vue cours #1)

Dessiner un graphe ?



Simplicite
du dessin

TRANSFORMATION

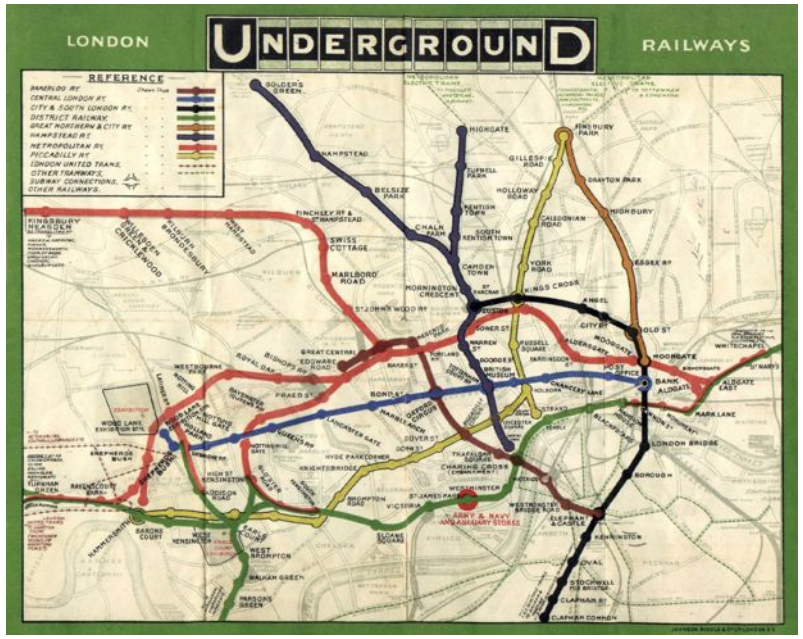
Simplicité de
disposition

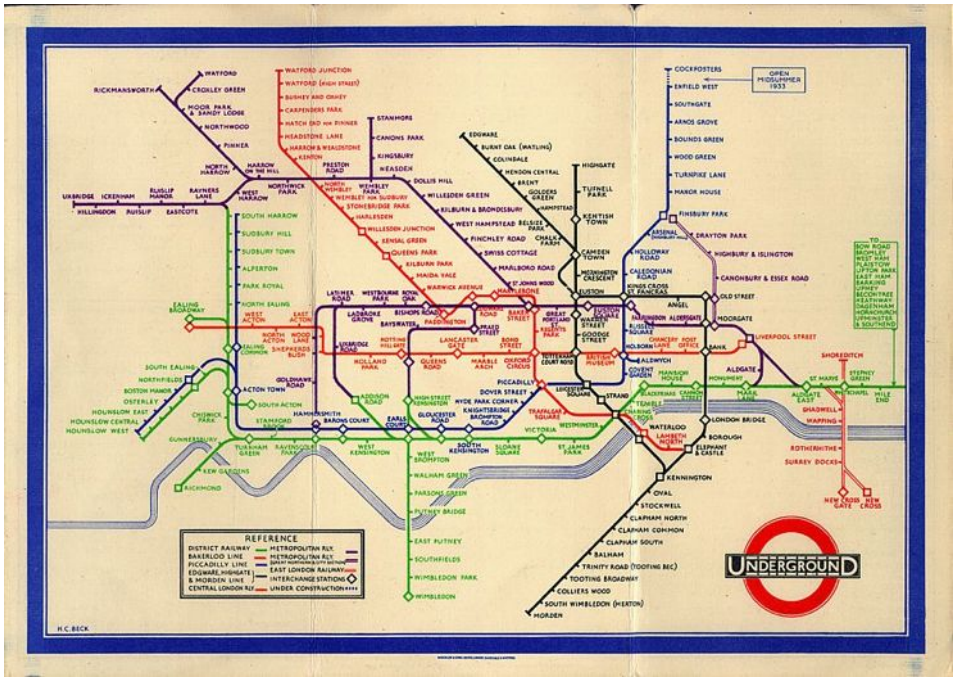
Ordre significatif

Groupements
significatifs

[Bertin2]

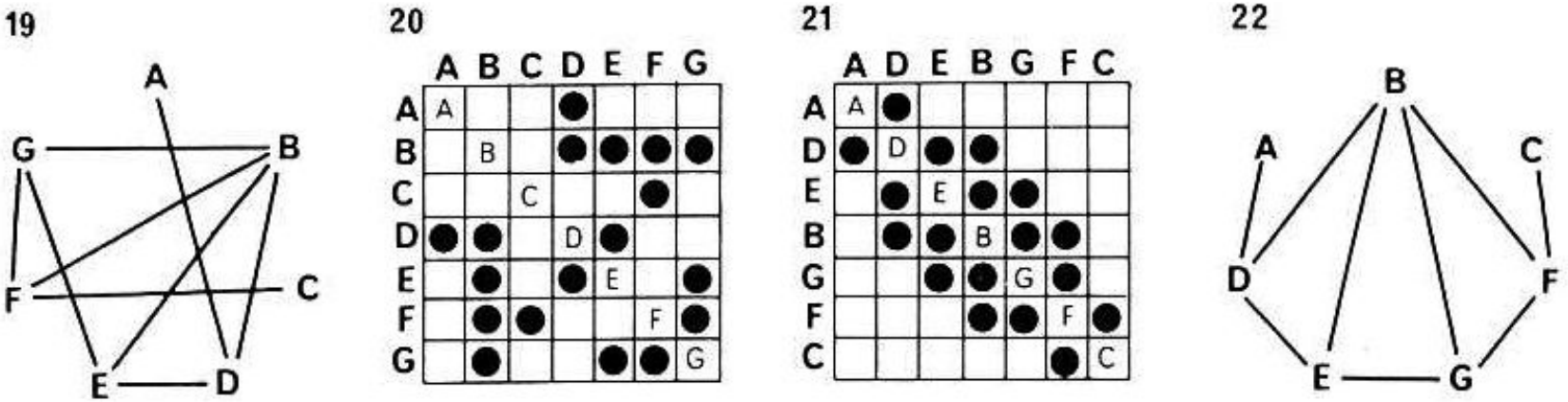
Harry Beck et le plan du métro de Londres (1933)





Dessin automatisé

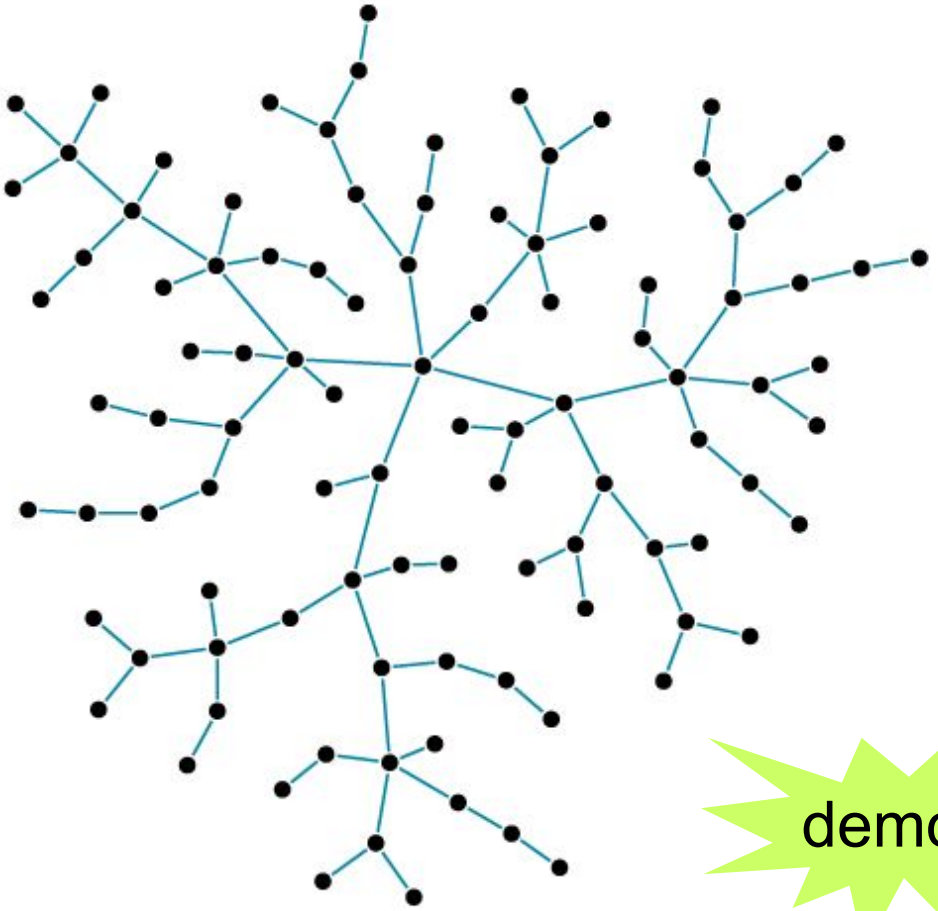
Méthode semi-manuelle (?) de Bertin



Depuis : nombreux algorithmes

pour une revue : http://en.wikipedia.org/wiki/Graph_drawing

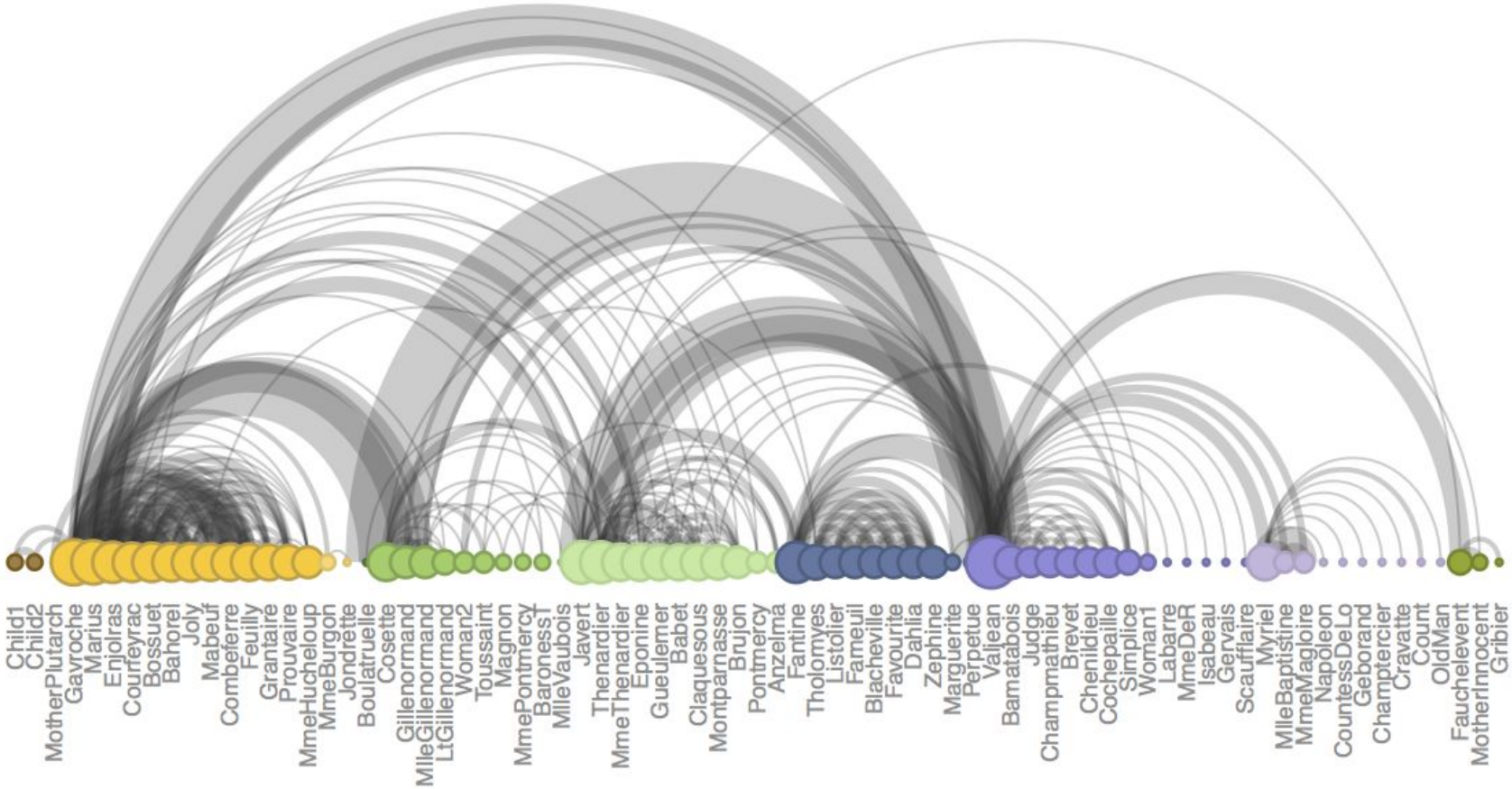
Exemple extrait de "Design generatif" (prog. M_6_1_03)



demo

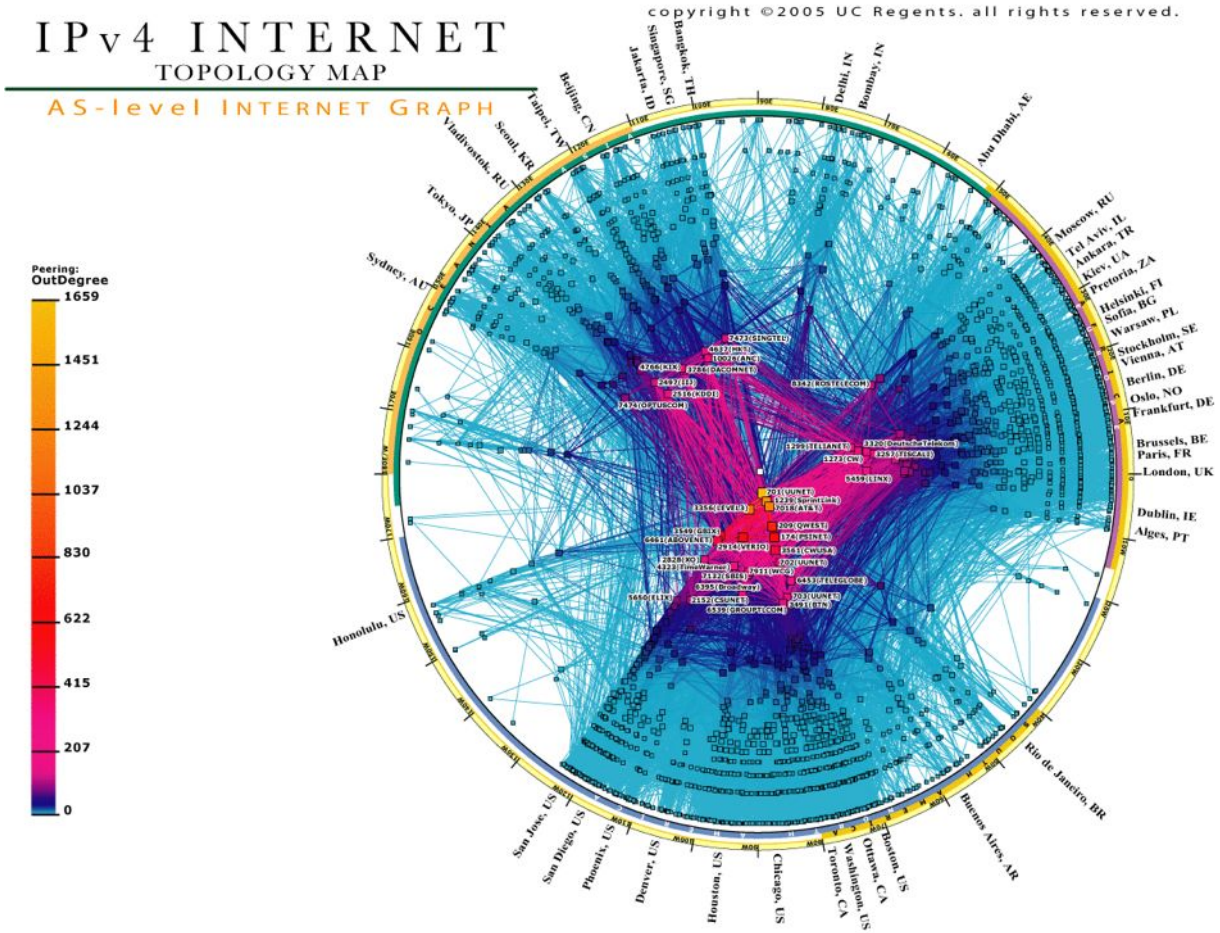
Représentations linéaires

"arc diagrams"

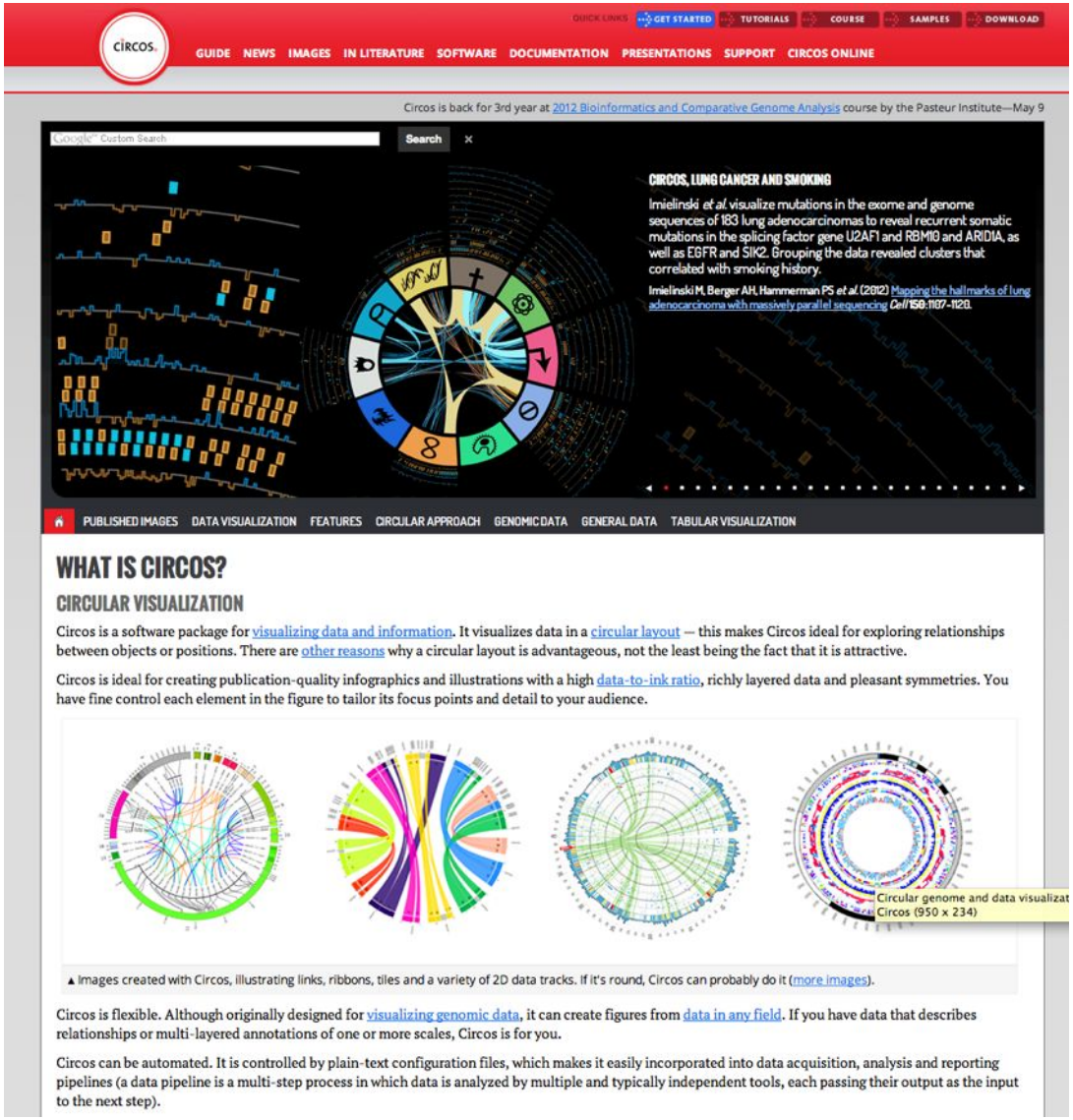


http://gastonsanchez.com/blog/got-plot/how-to/2013/02/02/Arc-Diagrams-in-R-Les-Miserables.html

Représentations radiales

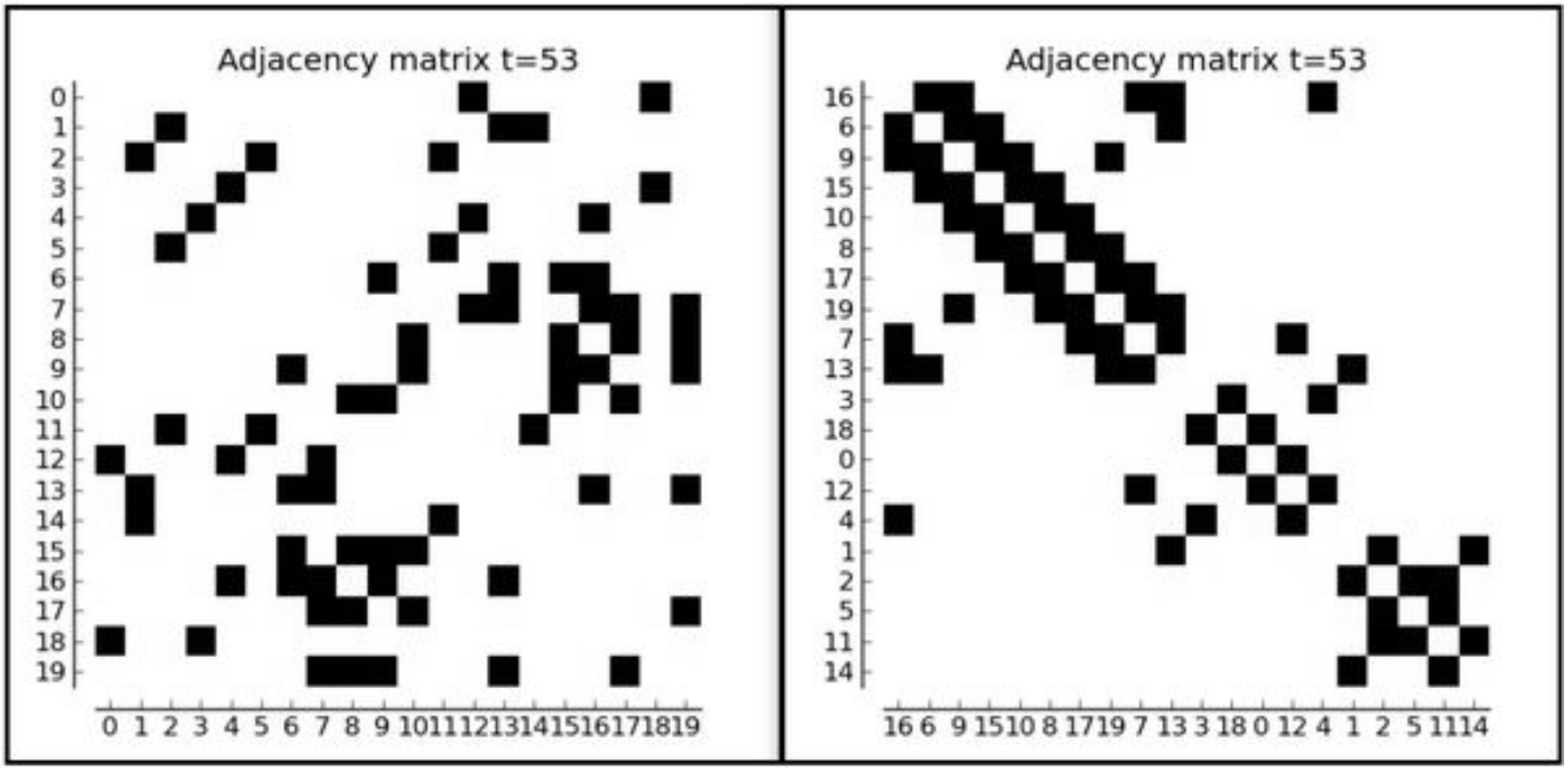


CAIDA : routage dans l'internet



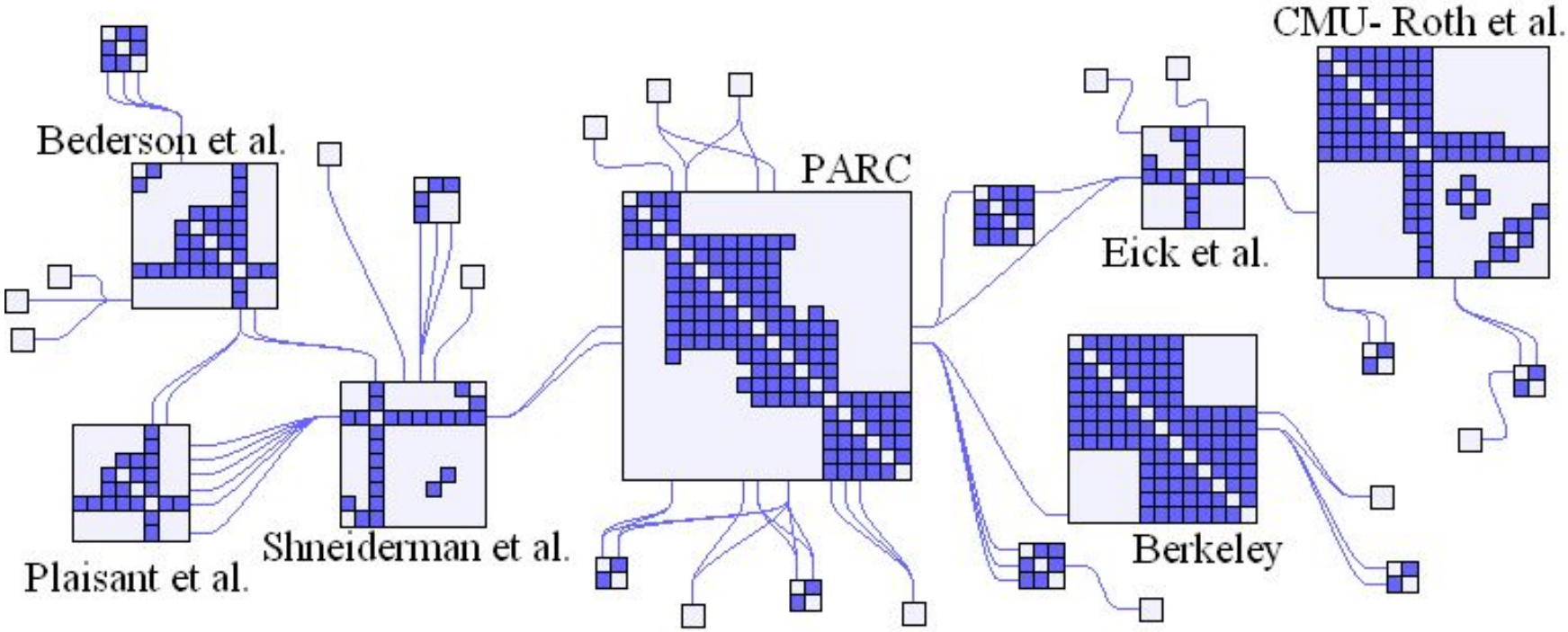
un logiciel http://circos.ca

Matrice d'adjacence



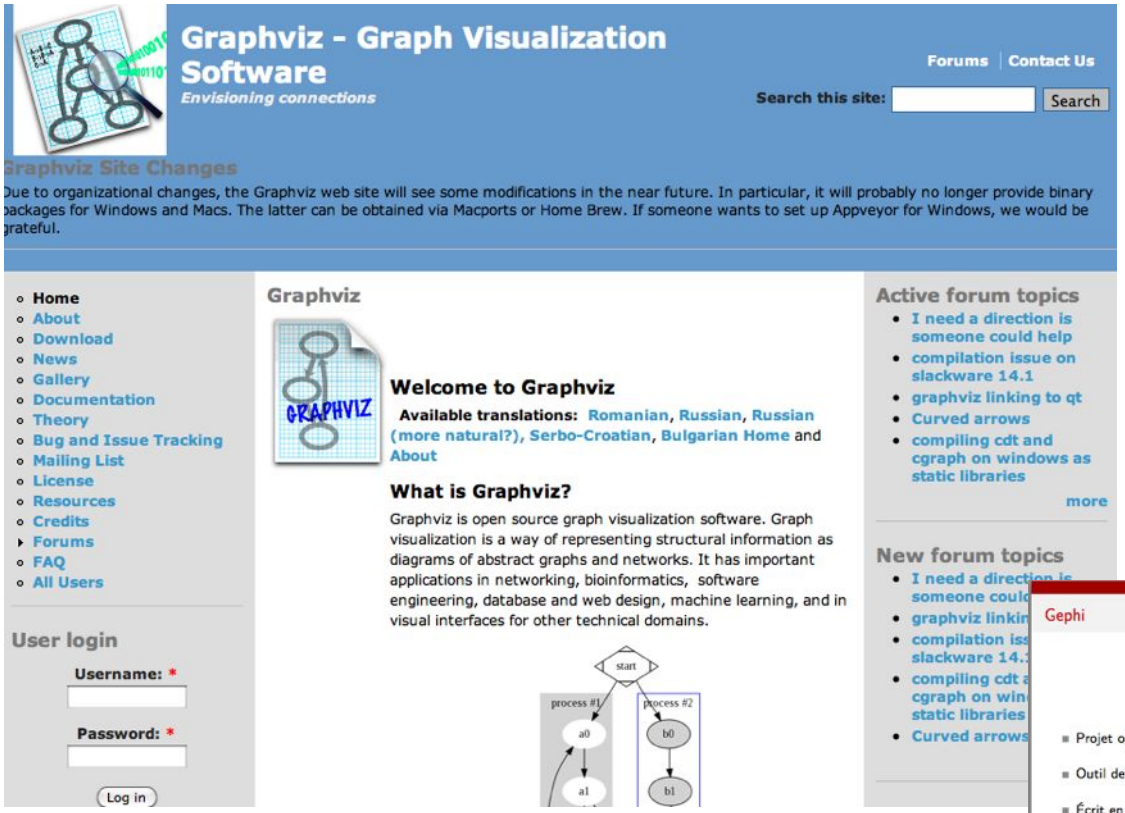
https://twitter.com/stefvandenelzen/status/520147126102556672

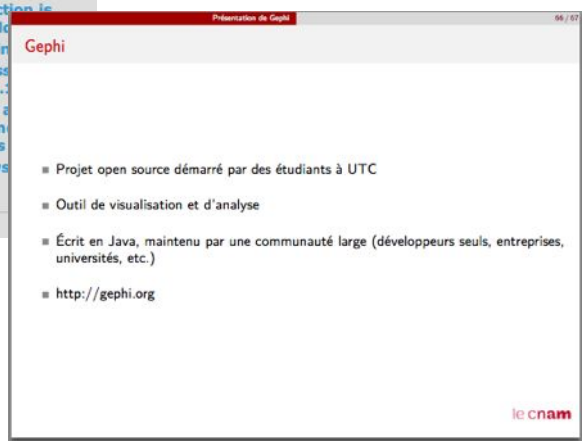
Approche mixte (graphe-matrice)



Equipe AVIZ de l'INRIA
http://www.aviz.fr/wiki/pmwiki.php/Research/Nodetrix

Outils logiciels





et Gephi (cf cours sur la fouille de graphe)