special visualisations

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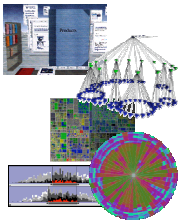
overview

Note NOT a comprehensive overview
- selected visualisations relevant to DL

- book inspired visualisation
- hierarchical data
  - classification trees, etc.
- multiple attributes
  - exploration and visualisation
- very large datasets ...



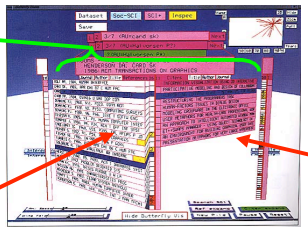
the book as metaphor

- book shelves, page turning, etc.
  - e.g. webbook
- properties of physicality
  - bookmarks, page corners
  - flicking, skimming
  - natural movements
  - thickness of pages

butterfly browser

- 3D visualisation of citations and references

'open' book represents a document

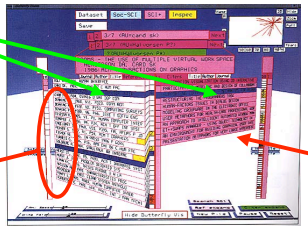


left page lists references to older docs.

right page for citations from newer docs.

but gratuitous 3D ???

hard to read angled text and ...

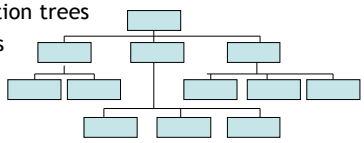


worst distortion at left edge most imp. for readability

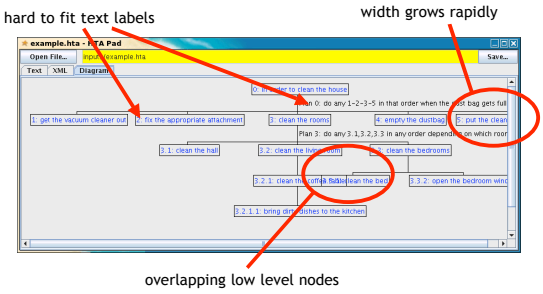
right page often blank whilst searching for citations

hierarchical data

- hierarchies are everywhere!
  - file systems
  - organisation charts
  - taxonomies
  - classification trees
  - ontologies
  - xml

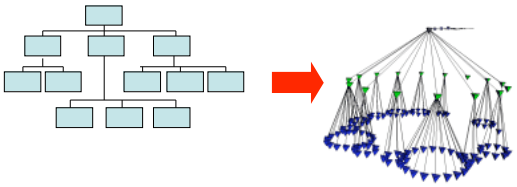


problems with trees …



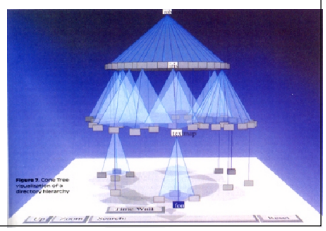
use 3D?

- cone tree
  - use stacked circles of subtrees



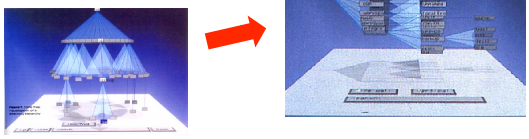
good use of 3D

- still have occlusion …
  but 'normal' in 3D
- shadows help to disambiguate
- but text labels difficult



cone trees → cam trees

- horizontal layout makes labels readable
- small things matter!

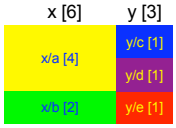


disect 2D space - treemaps

http://www.cs.umd.edu/hcil/treemap-history/

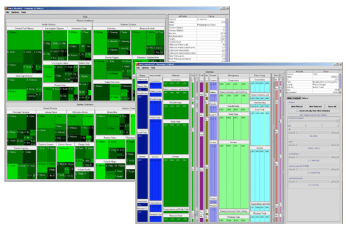
- takes tree of items with some 'size'
  - e.g. file hierarchy, financial accounts
- alternatively divides space horizontally/vertically for each level, proportionate to total size

x
  x/a – 4
  x/b – 2
y
  y/c – 1
  y/d – 1
  y/e – 1



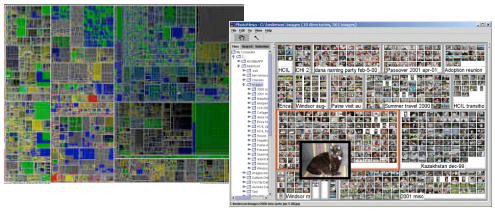
treemaps (2)

- later variants improved the shape and appearance of maps



treemaps (3)

- plus algorithms for vast data sets, for thumbnail images, etc. etc.

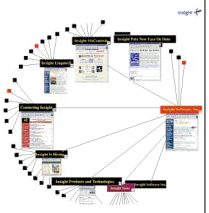


… for digital libraries

- could use treemaps where
  - hierarchy is document categorisation
  - 'size' is number of hits in search or popularity of section

distort space …

- tree branching factor b:
  - number of nodes at depth d = b^d
- Euclidean 2D space:
  - amount of space at radius r = $2\pi r$
  - not enough space!
- non-Euclidean hyperbolic space:
  - exponential space at radius r
- hyperbolic browser
  - lays out tree in hyperbolic space
  - then uses 2D representation of hyperbolic space



multiple attributes

- often data items have several attributes
- e.g. document:
  - type (journal, conference, book)
  - date of publication
  - author(s)
  - multiple keywords (perhaps in taxonomy)
  - citation count
  - popularity

traditional approach … boolean queries

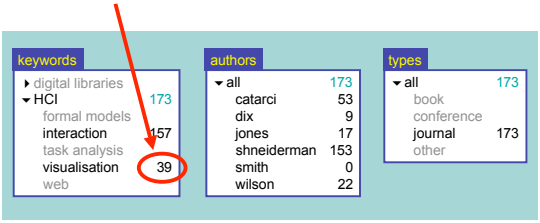
```
> new query
? type='journal' and keyword='visualisation'
= query processing complete - 2175 results
  list all (Y/N)
> N
> refine query
  refine: type='journal' and keyword='visualisation'
+ author='smith'
= query processing complete - 0 results
```

HiBrowse

- multiple selection boxes
  - 'or' within box - 'and' between boxes

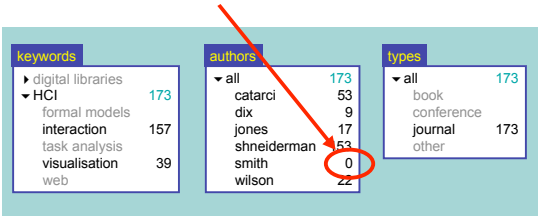
HiBrowse (ii)

- shows how many items with particular value
  e.g. 39 documents with keyword='visualisation' and type='journal'



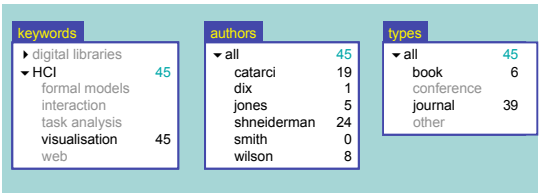
HiBrowse (iii)

- can predict the effect of refining selection
  e.g. selecting 'smith' would give empty result



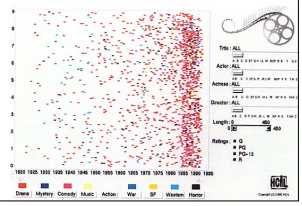
HiBrowse (iv)

- refining selection updates counts in real time



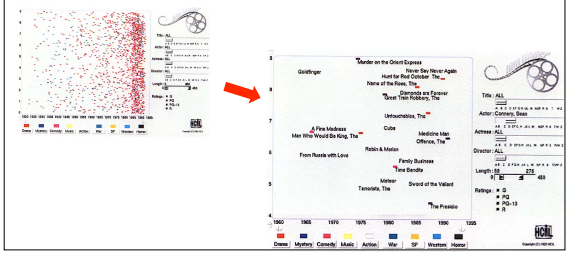
starfield (i)

- scatter plot for two attributes
  colour/shape codes for more
- adjust rest with sliders
  dots appear/disappear as slider values change
- **dynamic filtering**



starfield (ii)

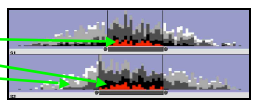
- when few enough points more details appear



Influence Explorer (i)

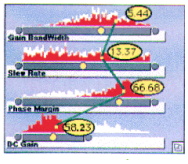
- developed for engineering models
- like Starfield ...
  but sliders show histogram
- how many in category (like HiBrowse)
  ... and how many 'just miss'

red = full match
black = all but one attribute
greys = fewer matching attr's



Influence Explorer (ii)

- some versions highlight individual items in each histogram
- similar technique has been used to match multiple taxonomic classifications



Information Scent

- Starfield
  shows what is *currently* selected
  - explore using trial and error
- HiBrowse and Influence Explorer
  show what *would* happen
- Pirolli et al. call this Information Scent
  - things in the interface that help you know what actions to take to find the information you want

very large datasets

too many points/lines to see

solutions ...

- space-filling single-pixel per item
  Keim's VisD
- random selection
  (see Ellis & Dix, AVI2002)
- clustering
  visualise groups not individuals