



Design method of visualization techniques

**(1) Modifiable Treemaps
Containing Variable-Shaped Units**

**(2) Visualization of the results
of a query submitted
to a search engine on the WWW**

**Laurence Nigay Glasgow University
Frédéric Vernier MERL**

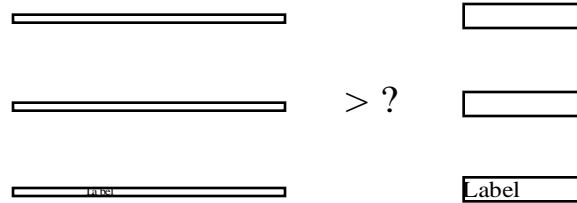


- s **Motivation**
- s **Algorithm**
 - Treemap [Johnson & Shneiderman]
 - Extension
- s **Working example: PARENT**
 - Features
 - Demonstration
- s **Conclusion**



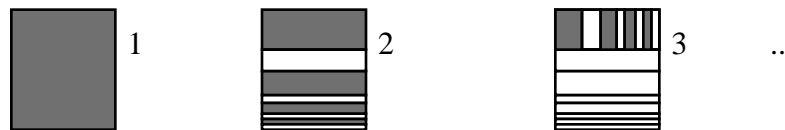
Motivation

- s Treemap: In real time Treemap: Each node as a rectangle

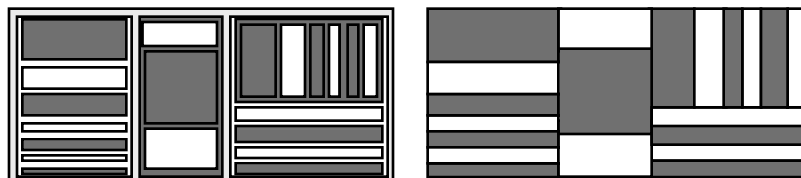


Treemap [Johnson & Shneiderman]

- s Slice / Dice approach



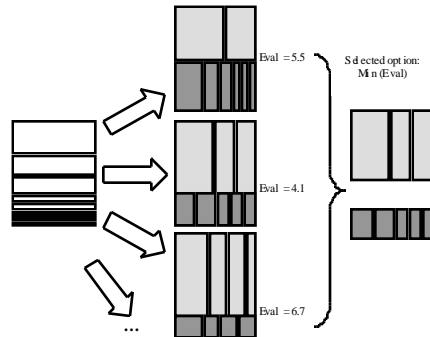
- s Nested Treemap / Non-nested Treemap





Extension

s Recursive re-arrangement



s Evaluation function $f(\square, \square) = 0.75$

- Ratio width/height

$$\square = 1/2 \quad \square = 1/4$$



PARENT

s Directory tree

s Shape, Color & text

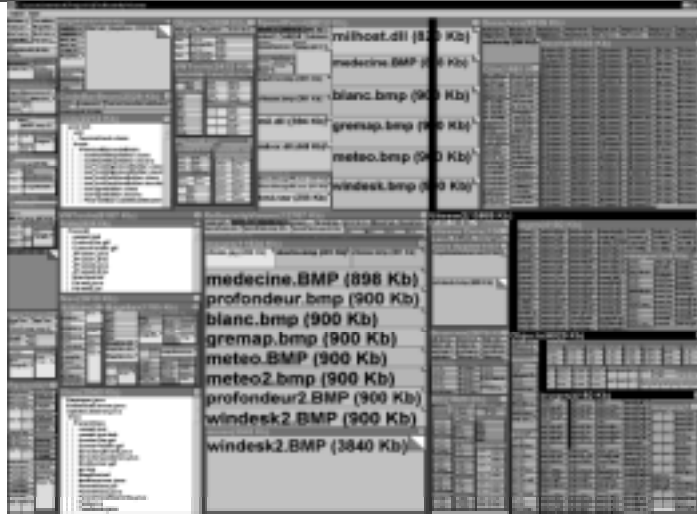
- File/Folder: Box proportional to its disk usage
- Hue: Type of a file
- Brightness: File age
- Label : File name

s Interaction

- Drag & Drop for moving a file
- Double clicking for opening a file



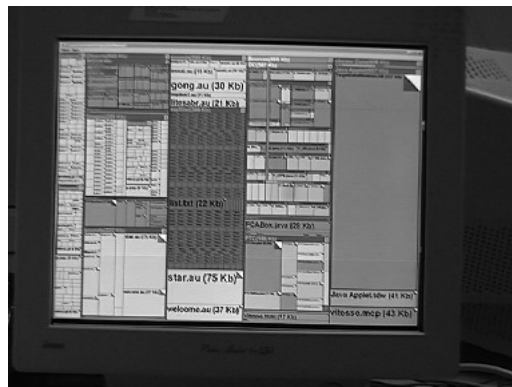
1st Snapshot



- Fixed ratio = 0.2
- Black stairs (path)
- 1400 files
- Alternative view

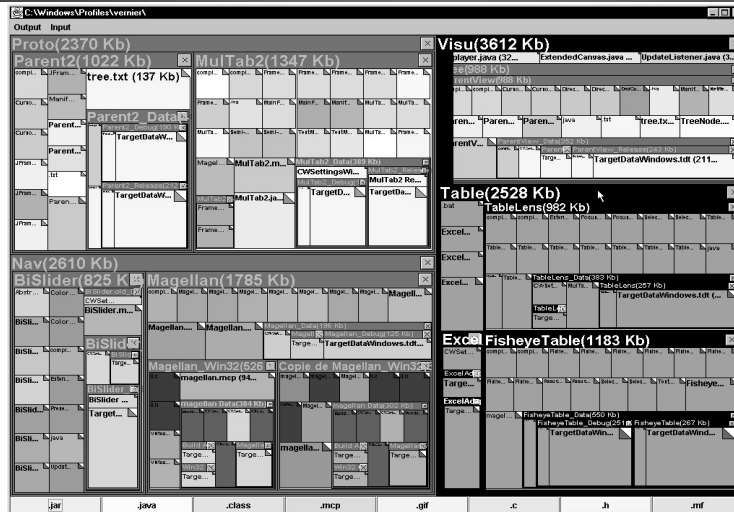


PARENT





2nd Snapshot



- Fixed ratio = 1.0
- Selected Folder
- 240 files
- 8 hues, brighter at the top



Comparison



- The same hierarchy using the Nested Treemap algo.



Conclusion

- § **New method to visualize hierarchical information**
 - Based on Treemaps
 - Containing Variable-Shaped Units
- § **New challenges**
 - Selection for multiple files (zone)
 - Animation to show a reorganization



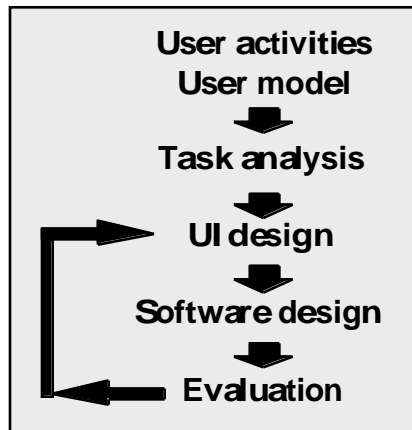
Visualization of the results of a query submitted to a search engine on the WWW

- § **Goal and Design Approach**
- § **Navigational techniques**
 - Navigational tasks
 - UI design approach
 - Human Factors criteria
 - Characteristics of the output modalities
 - Properties and design space
 - Design rules
- § **Example: our VITESSE system**
 - UI design
 - Software design
- § **Usability testing of VITESSE**
 - Experimental evaluation of VITESSE
 - Survey of the WWW



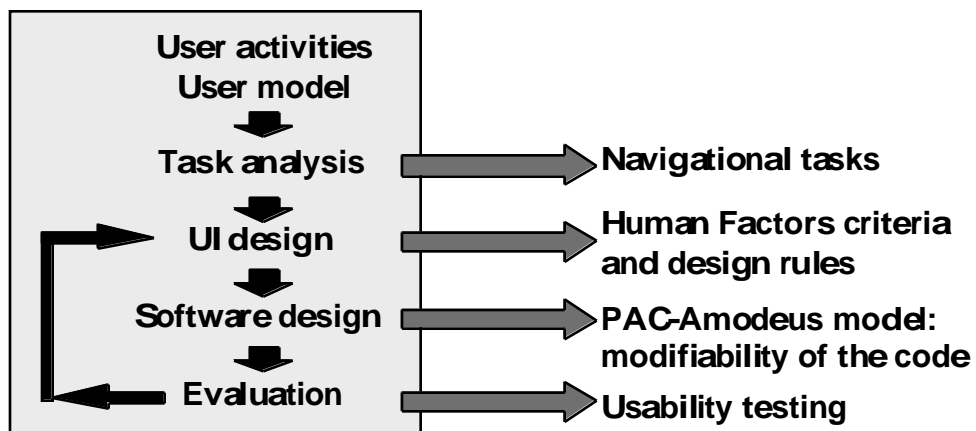
Goal and Design Approach

- s Better understanding of the design of interaction techniques for large information spaces
- s Design approach (Top-Down and Bottom-Up)



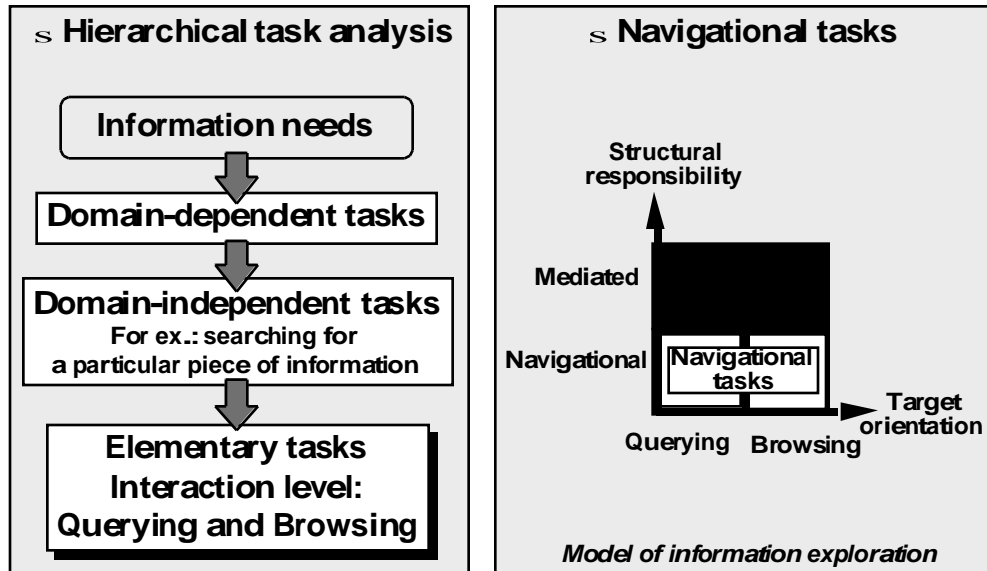
Navigational techniques

- s Focus on the design of navigational techniques

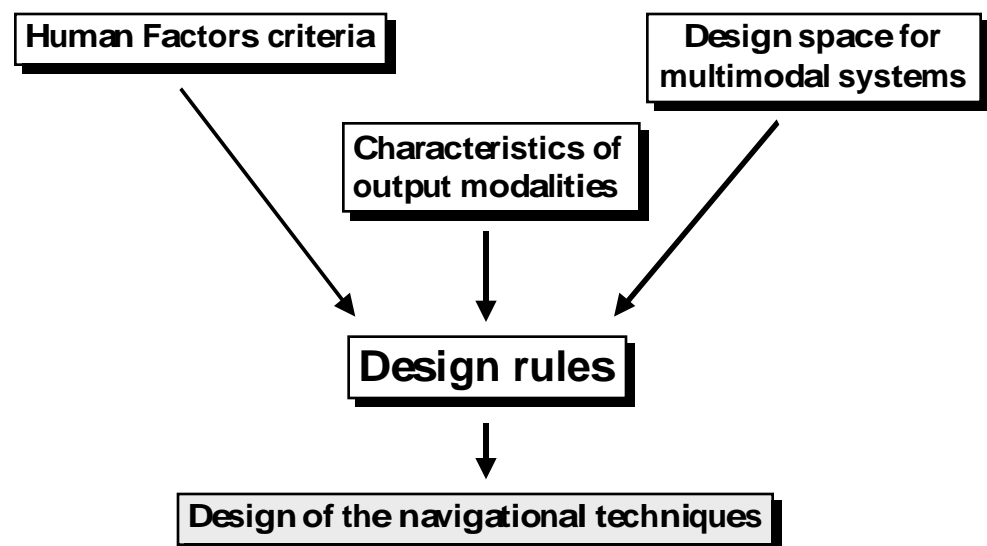




Navigational tasks



UI design approach





Human Factors criteria

s Observability

Ability of the user to evaluate the internal state of the system from its perceivable representation

- Observability of the "Focus + Context"
- *"The useful information is drawn from the overall relationships of the entire set"* Jacques Bertin
- Observability of the links and paths
- *"The navigator is guaranteed to always find shortest paths to targets if the outlink-info is everywhere well-matched"* George Furnas CHI97

s Representation multiplicity

Flexibility for state rendering. Each representation provides a perspective on the internal state of the system

Multiple visualizations of the same space



Characteristics of the modalities

s Modality = Output interaction technique (Visualization)

s Examples of characteristics

- **Global / Partial**
 - Ability of visualization to show the whole space
- **Precise / Vague**
 - Ability of visualization to show all of the data of each item in the space
- **Distortion / Non distortion**
 - Existence of a distortion function (e.g., Fisheye views)



Design space: The CARE properties

- s **Complementarity, Assignment, Redundancy, and Equivalence of modalities (visualizations) available in an output multimodal user interface**

s **Complementarity** } → **Combination of modalities**
s **Redundancy** }

s **Assignment** } → **Choice of modalities**
s **Equivalence** }



Design rules

s **Selection rule** → **pure modality**

- S1 The modality used to visualize the focus of interest must be precise

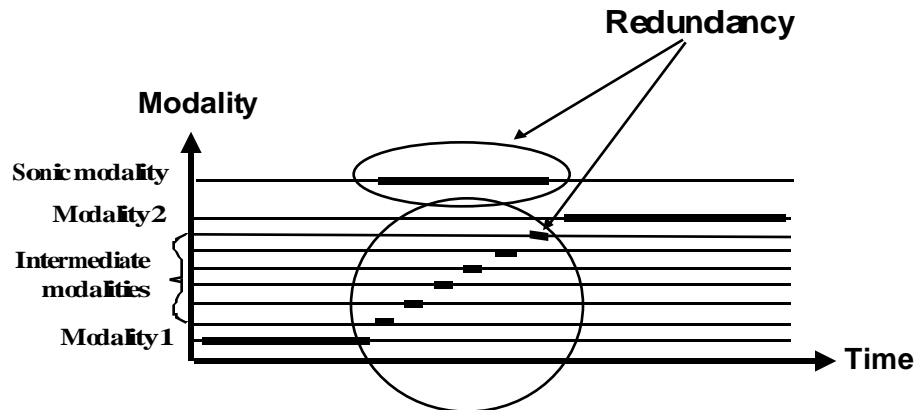
s **Combination rules** → **combined modality**
Complementarity

- C1 A precise modality must be used in a complementary way with a global modality (focus + context)
- C2 Spatial continuity: Visual continuity between two modalities used simultaneously in a complementary way
- C3 Temporal continuity: Visual continuity while changing modalities



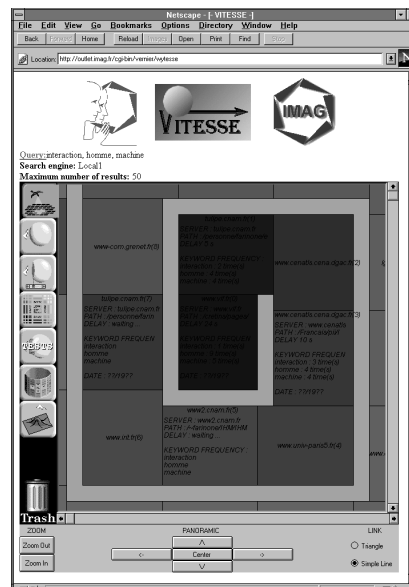
How do we apply the rules

s C3 Temporal continuity



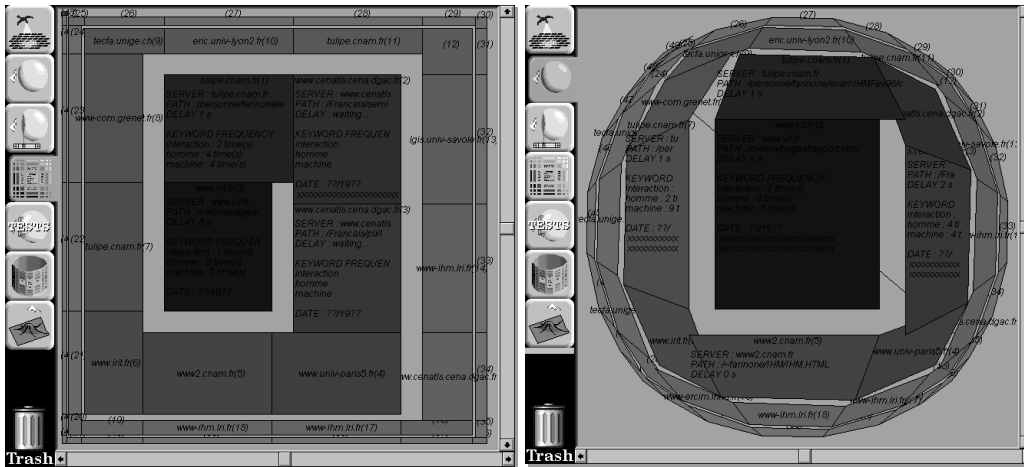
The VITESSE system

- s VITESSE visualizes the results of a query submitted to a search engine on the WWW
- s 7 modalities (visualization techniques)
- s Animation computed to guarantee visual continuity
- s Same navigational tools





Pure modality

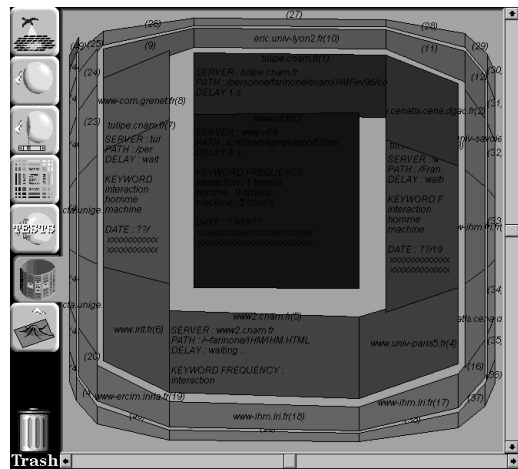


Planar transformation

Polar transformation



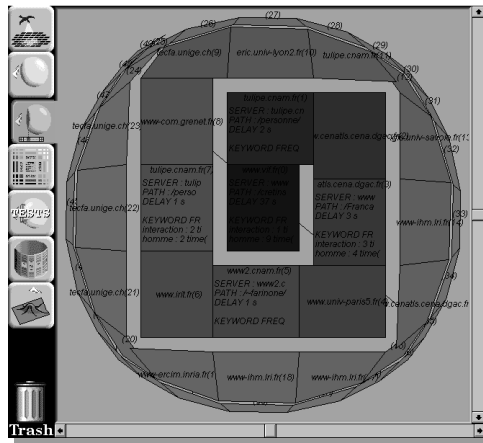
Pure modality



**Polar transformation on the X-axis
Planar transformation on the Y-axis**



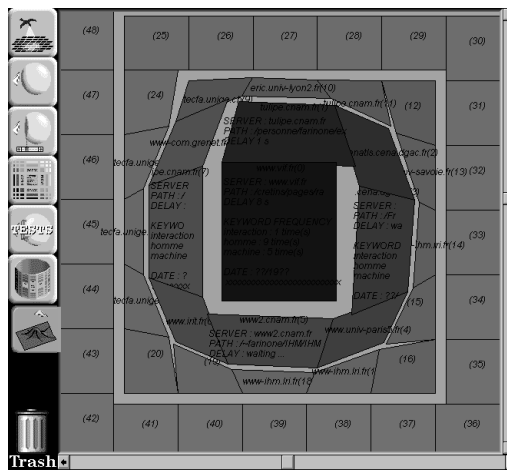
Combined modalities (complementarity)



- C1 A precise modality must be used in a complementary way with a global modality (focus + context)
- C2 Spatial continuity: Visual continuity between two modalities used simultaneously in a complementary way

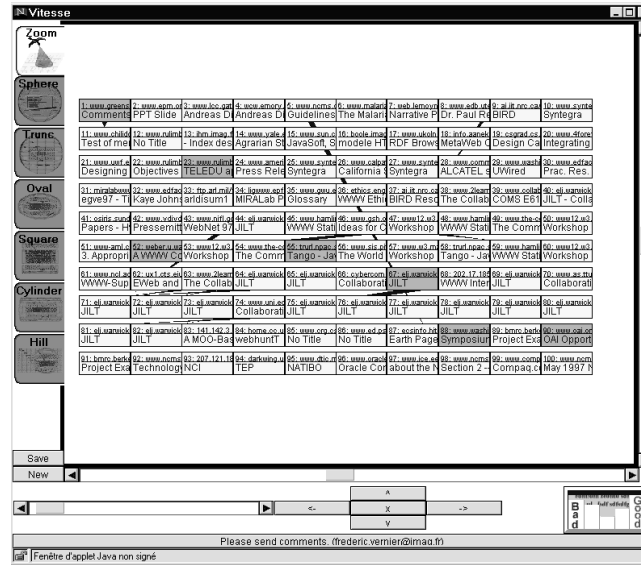


Combined modalities (complementarity)



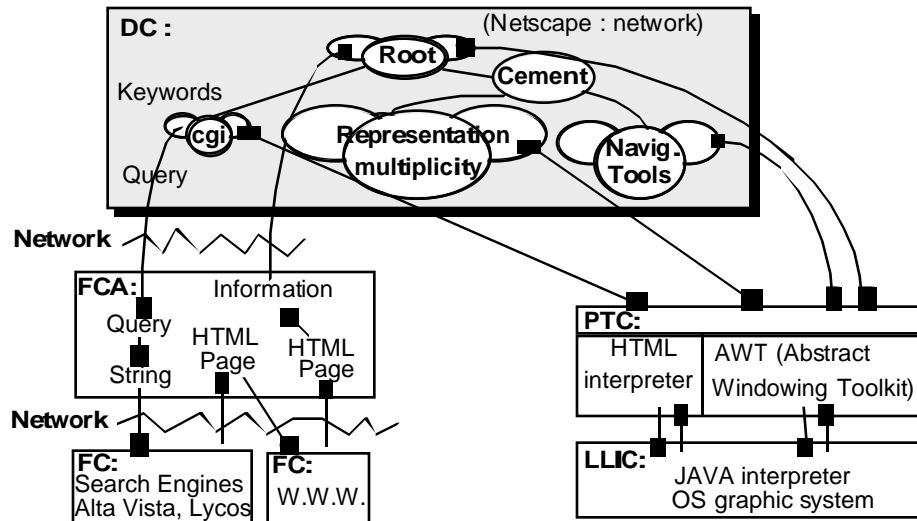


The VITESSE system



VITESSE: Software design

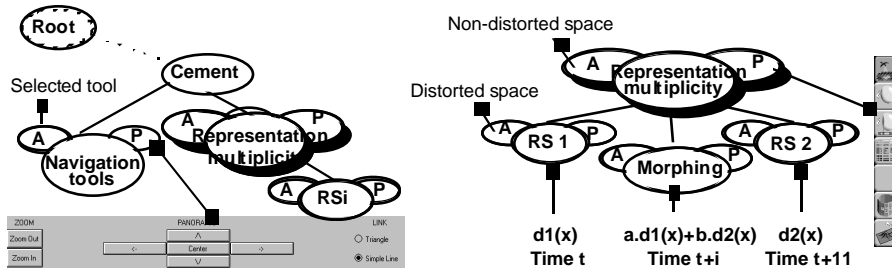
s PAC-Amodeus model





VITESSE: Software design

s The Dialogue Controller

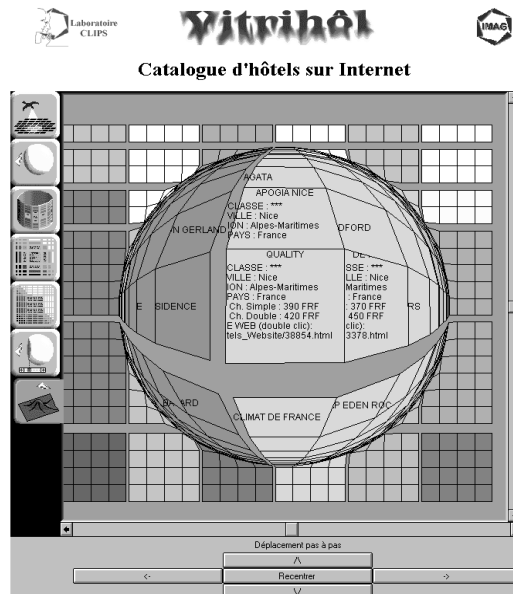


- s PAC-Amodeus provides the design rules/ergonomic criteria.
- s PAC-Amodeus supports the assessment of the design rules/ergonomic criteria.



Experimental evaluation of VITESSE

- s 600 hotels in a local database





Experimental evaluation of VITESSE

- s **Based on scenarios (600 hotels in a local database), including the two navigational tasks : querying and browsing**
- s **17 participants, non computer scientists**
- s **Four types of usage:**
 - 1- Exclusive usage of the birdeye view**
 - more elementary actions and more time
 - 2- Combined usage of the birdeye view with another one**
 - after time the users did not return to the birdeye view (cognitive map)
 - 3- Exclusive usage of a distorting view**
 - spherical view (familiar shape)
 - 4- Test/Retry usage**
 - visiting web pages without previously obtaining information



Survey on the web

- s **Predictability criterion:**
 - **Icon study: Could users understand the icons without testing the program?**
 - <http://ihm.imag.fr/demos/IconStudy/>
- s **Observability criterion:**
 - **What are the information types to be presented?**
 - **What do you expect from the WWW Search engine ?**
 - <http://ihm.imag.fr/demos/UserStudy/>



Observability: Survey on the web

Information Priority

When you perform a search task on the internet, the computer must indicate the pages it found in the search. Different search engines return different types of information about each page. We are interested in the type of information you want to see about each web page returned from a search.

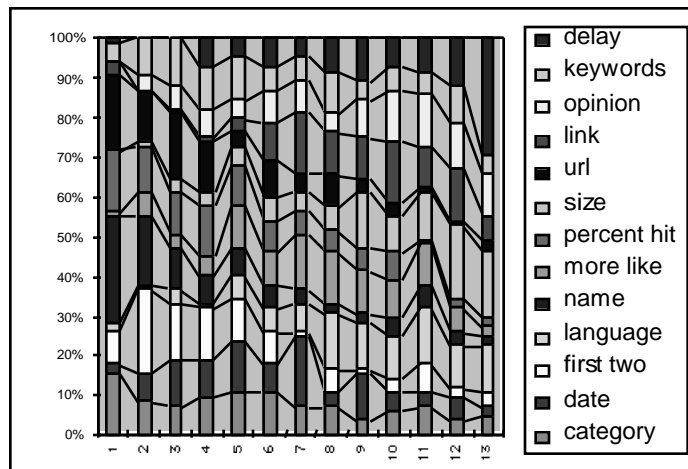
The list below is comprised of different sorts of information that can be displayed about a specific page. Please rank these items from 13 with 1 indicating the information most relevant to you, 2 the second most and so on.

- Category - general category of the web page
- Date - date the page was published
- First two lines of text in the page - sometimes called summary
- Language - the language the page is written in
- Name - the name given to the web page by the author
- "More like this" - link to others Web pages with the same properties
- Percent Hit - percentage of the words searched for found in the page
- Size - file size of the page listed in either bytes or Kb
- URL - the web address of the page
- Link - the web links between retrieved pages
- Opinion - opinion of the other users who retrieve this page with the same keywords
- Keywords - the exact number of each keyword in the page
- Delay - an estimation of the connection delay to reach the page



Observability: Survey on the web

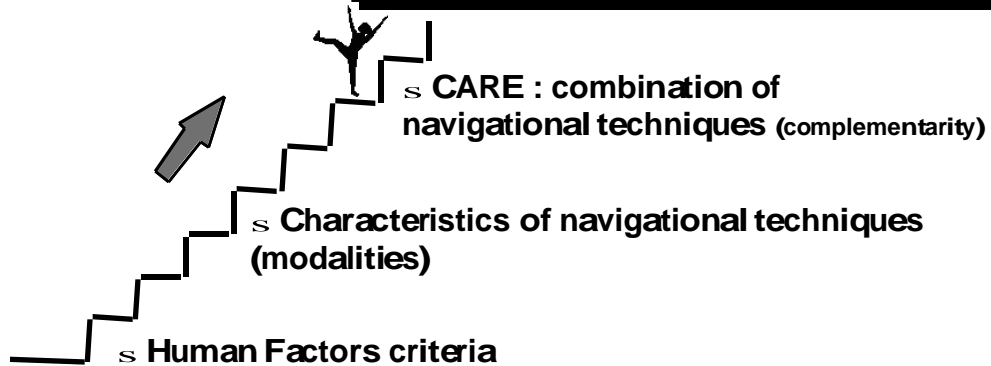
s Name, URL have their rankings clustered close to the top of the order.





Conclusions

A comprehensive set of design rules

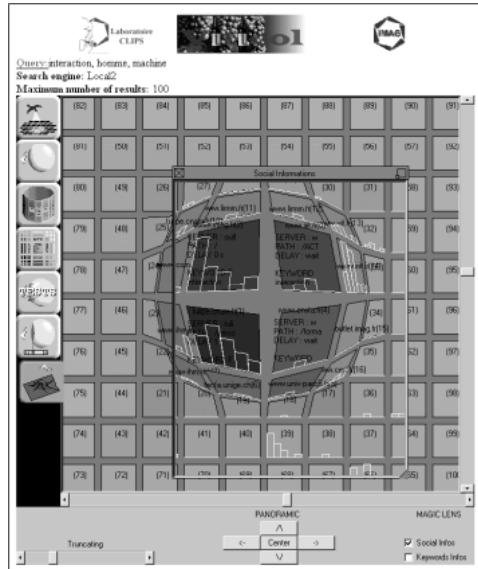


Future work

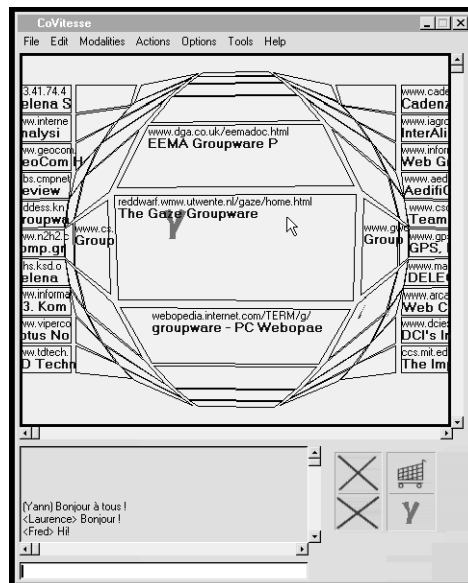
- s **Extensions of VITESSE :**
- s **Collaborative navigation**
 - Asynchronous collaborative navigation :
 - opinions of others about a web page
 - Synchronous collaborative navigation



Extension: Asynchronous collaborative navigation



Extension: Synchronous collaborative navigation





If you want to test it...

<http://iihm.imag.fr/demos>