Is a Virtual Environment feasible to support Knowledge Sharing?

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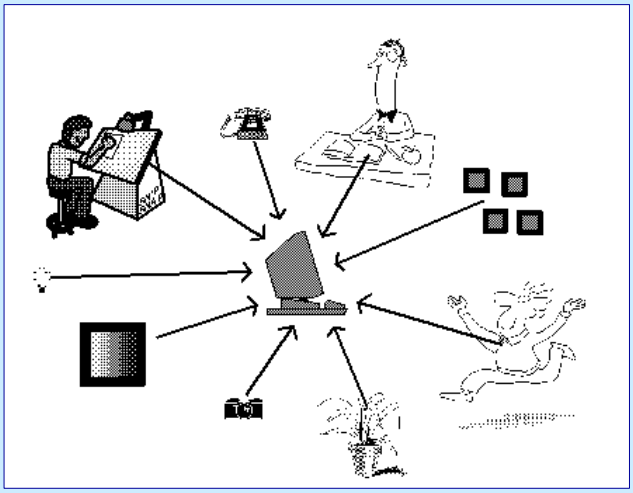
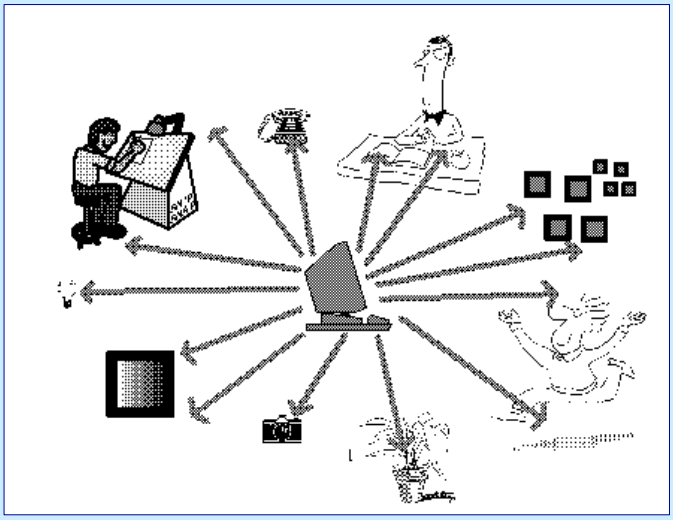
Way One: virtual reality

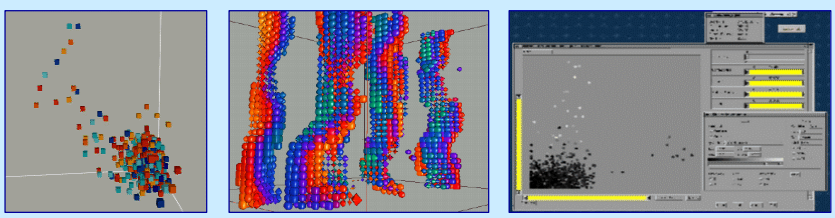


Way two: ubiquitous computing



“Two way” integration: visualisation

- definition: use of images and animations to convey information
- goal :effectively convey information to the user
  - transforms the abstract and symbolic into the geometric
  - harnesses the human perception system (visual?)



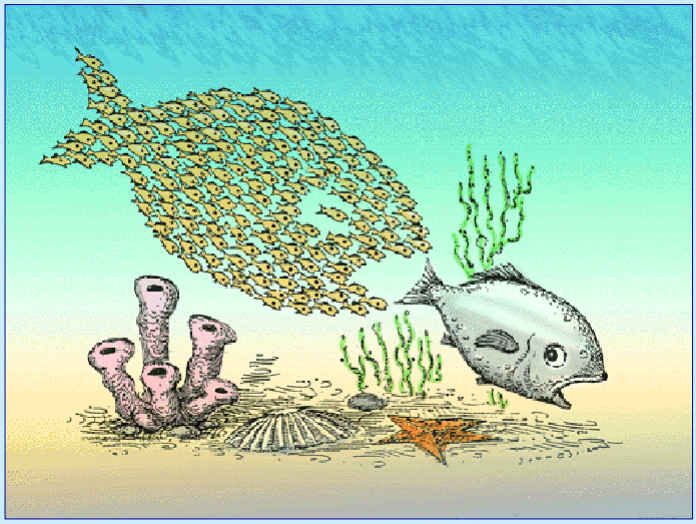
Motivation

- different representations can enhance the understanding level of a particular problem [*Tufte*].
- the form of representation makes a dramatic difference in the ease of the task [*Norman*].
- Norman proposes that external representations, that can be part of a workspace shared with others, require some sort of constructed device to support them: an artefact.
- is proposed an interface that tries to remove the computer as an object of perception, allowing the user to interact directly with the generated environment as discussed by [*Hubbold et al*].

Semantic Maps

- strategy for graphically representing concepts, portraying the schematic relations that compose a concept
- assumes that there are multiple relations between a concept and the knowledge that is associated with the concept
- for any concept there are at least these types of associations:
    - class: the order of things the concept falls into;
    - property: the attributes that define the concept;
    - example: exemplars of the concept.

Collaboration allows better performance



Semantic Maps

- a general procedure to develop a Semantic Map is by having a group discussion where the three types of concept associations emerge.
- its major purpose is to allow students organise their prior knowledge into formal relations and thus provide a basis for understanding what they are about to read and study.
- comprehension can be thought of as the elaboration and refinement of prior knowledge.
- provide a graphic structure of knowledge to be used as the basis for organising new ideas as they are understood.

Visualisation (why?)

- 3D visualisation can offer a more convenient and natural way for people to interact with information spaces (as distinct from environments that are naturally 3D) [*Tufte, 1990*] and [*Benedikt, 1992*].
- to date, there is not much evidence to support it, other than in cases where the information has a natural spatial component [*Hubbold et al., 1995*]
- many problems still exist, as user sense of position that can be lost if the layout changes [*Ingram and Benford, 1995*]

Visualisation (task approach)

- an application for testing the visualisation design:
  - information discovery: support user efforts to find relevant information within a given knowledge domain [*Li-Jen and Gaines, 1998*]
  - setting up a context, a query generation tool and an Information Visualisation [*Card et al., 1999*]; providing context and information about a particular data source for analysis and comparison.
- based on a given context shared as a 3D interactive visualisation, users can be assisted to retrieve information and analyse it information discovery [*Baeza-Yates and Ribeiro-Neto, 1990*]

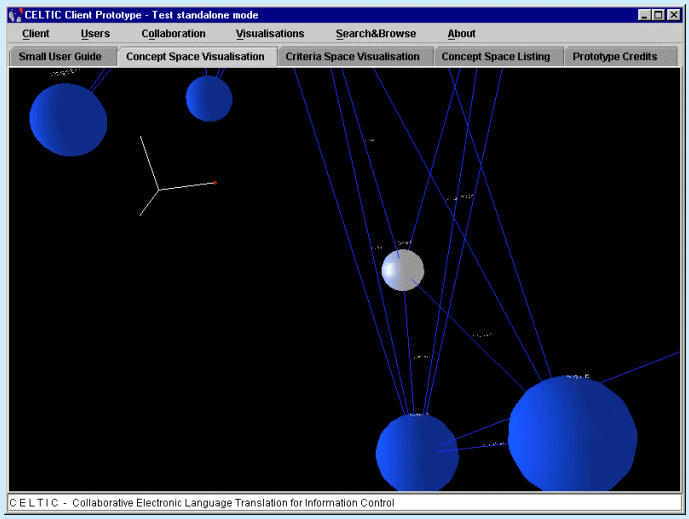
Goals

- prototype (3D interactive visualisation) goals:
  - convey information about a structure for knowledge sharing
  - test how this could support knowledge sharing by proposing a particular system to give support to users in information discovery
  - help users to build their own queries by using a textual search engine based on information from the structure for knowledge sharing
  - allows the visualisation of data source information within the visualisation design and displaying of results using an HTML browser

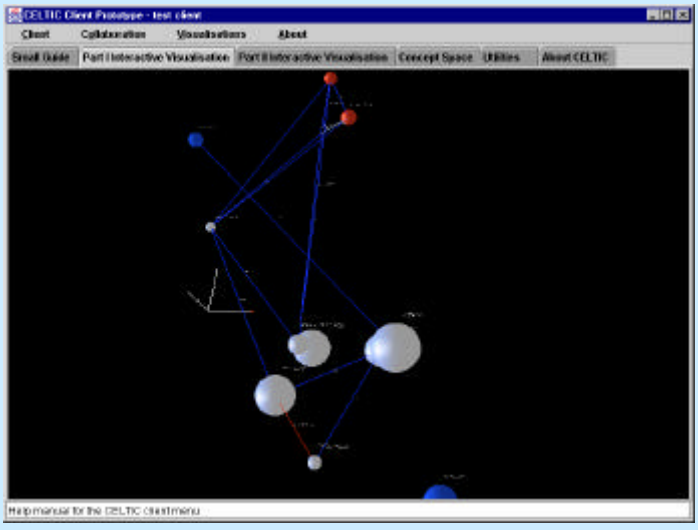
Goals and rationale

- advantages are greater when data sources do not have an underlying structure and a query returns a vast amount of results as is the case of the Web
  - information overload occurs...
- based on a shared interactive representation of a knowledge theme that can be used to construct queries and compare a data source with the domain representation
  - allow user individual application of shared context
- basic *support for collaboration* is implemented to share the knowledge domain representation and to enhance it
  - using a voting system

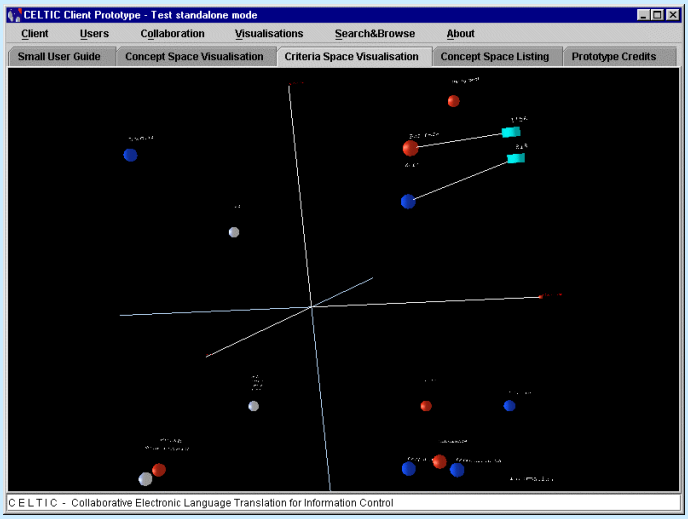
Concept space visualisation



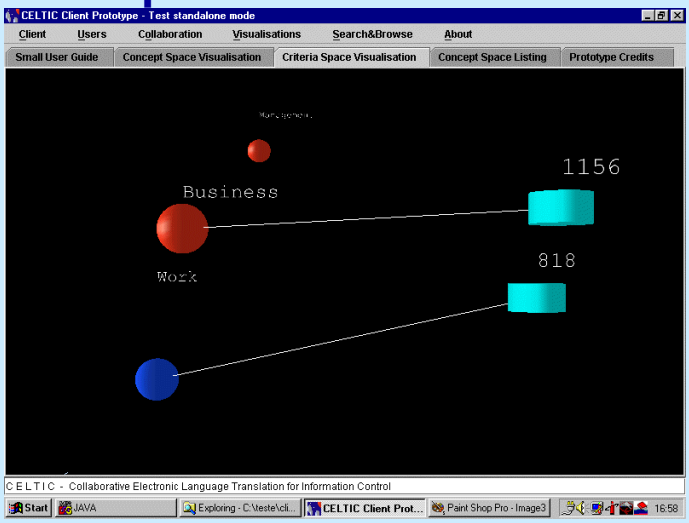
Concept space visualisation



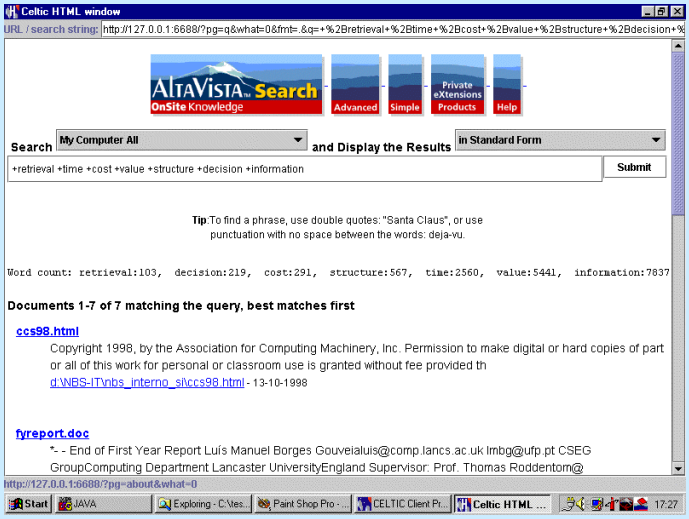
Mapping concepts in criteria space quadrants



Information Visualisation in criteria space



Accessing results



The evaluated prototype

The prototype implements:

- a *concept space* as a 3D interactive visualisation;
- a visualisation design composed by two distinct visualisations: a *concept space*, representing the structure, and a *criteria space* that allows spatial positioning by specifying up to three criteria;
- data source integration by using an *Information Visualisation* within the criteria space visualisation;
- displaying of results using a *search engine* (the *AltaVista Search Personal eXtension 97*).

Evaluation

- selected 11 undergraduate students from UFP
  - the subjects were volunteers and no payment has been made for their participation
  - the knowledge domain was *Information Management*
  - the subjects were asked to use the prototype in six activities covering the following issues:
    - use the concept space;
    - use the criteria space;
    - analyse one concept relations;
    - create a criteria space;
    - perform a concept search;
    - perform a keyword search;

Evaluation factors

- asking each student:
  - what they have *learned* (as measured by a multiple-choice questionnaire);
  - how they think the system *helped* them (like/dislike rating);
  - what is their *opinion* about using the system (like/dislike rating);
- taking the *time to complete* of the six activities;
- performance is examined taking into account students own rating as low or high in:
  - Web expertise
  - Knowledge domain expertise (*Information Management*)

Concluding remarks

- people *learn* more when they had already some *expertise* in the knowledge area
- the importance of using the *web* before was moderate although not so important as the *knowledge* expertise to explain questionnaire results (*learn*)
- the users feeling about how the system *helps* them has not any impact from their *web* or *knowledge* expertise
- when considering user *opinion* about the system, *knowledge* expertise seems to have some importance, regardless of the *web* expertise

Concluding remarks

- operation of the system seems to be influenced by the users *web* expertise in a very important way
  - *knowledge* expertise also assists users in system operation
- overall, the system tends to better support people with some *knowledge* expertise and little *web* expertise
  - seems to show some potential as an interface to access information for people that have already some *knowledge* expertise - more evaluation needed!

Concluding remarks

- use of visualisation techniques can improve the interface by supporting familiar cues to user perception
  and
  thus convey information for knowledge sharing
- people were able to use the proposed visualisation design

The birth of a concept?