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Implementing CrossConcept:
A Computer Software Supporting Creative Thinking

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Abstract

In the model of CrossConcept[5], a concept is simply represented as a list of items. When two lists are arranged as axes of a table, the arrangement of the table seems to inspire users to find out some relationships between the lists and to find some improvements of each list. In this way, users externalize those concept operations that they perform in their brains. CrossConcept supports users to handle lists and tables in this way. And through these handlings, CrossConcept supports users' creative thinking convergently and divergently.

In this paper, we report the concept operation model implemented by CrossConcept and consider how people's creative thinking are supported by in the model.

Keywords: Creative Thinking, List, Concept

1. Introduction

Lists and tables are commonly used in documents to represent thinking processes and results. They match the smooth flow of sentences, and attract readers' notice as well. Concepts represented in the form of lists and tables are easy to read, and easy to use as the criteria for decisions, e.g. as the checklist. In these ways, they work in human communications by documents. This functionality of the list structure works generally regardless of its contents and they have proper and common writing methods and typesetting.

It seems that lists and tables have these functions because the structure and the usage of them have close and mutual relationships with human thinking processes. So, we are trying to represent and simulate, i.e. *externalize*, human thinking processes as operations of lists and tables, so as to improve creativity in the thinking processes.

Externalization of thought process

We make a point of externalizing thinking processes that subsist in conventional written matter. There may be more thinking processes lying in the structures of texts other than lists and tables.

Information technologies for thinking processes and knowledge have been developed in:

· idea processors representing thought and thinking processes[2]
· typesetting and rendering texts on computer displays
· searching and retrieval of information
· standardization of data formats to share information

However, we think that those technologies for using a thought result in the process of another thought are left behind. In the present situation, you have to read information which you have got on the Web and use it only in your brain, except for numerical or coded data.

So, we have adopted a simple model of concepts. In that model, a concept is represented as a list of items. Because of the conventional functions of lists and tables, the arrangement of lists and tables seem to inspire users to find out some relationships between the concepts represented by lists and to find some improvements of each concept. We have developed CrossConcept and on that software, thinking processes of using information are represented as operations of lists and tables.
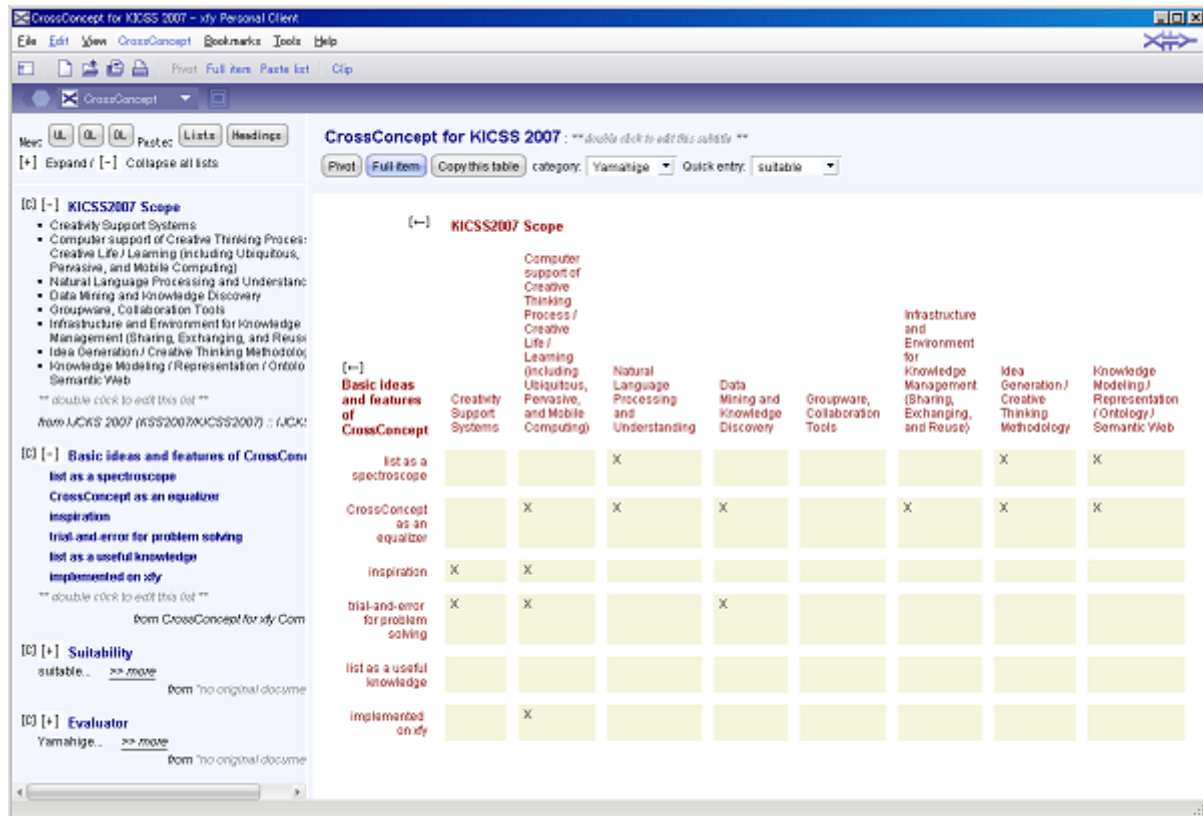
Fig.1 CrossConcept overview.

2. Basic features of CrossConcept

CrossConcept's functions are simple as follows:

- create lists
- select one, two or three list(s) and arrange them as axes of a table
- input contents into the cells of the table
- revise the lists
- get and put lists in XHTML formats from and to web pages through the clipboard.

And with these functions, users:

- describe a concept as a set of some elements, e.g. a list consists some items.
- confront the concept with other concepts which are also described as lists, as axes of a table.
- consider the relatioinship between the two concepts from these concepts
- revise the concepts by considering the relationship of other concepts

- get concepts from the Web and put new or revised concepts to the Web

As illustrated in Fig. 1, using CrossConcept, users select two lists as axes of a table from a list of lists in the left hand frame by simple drag and drop operation. CrossConcept forms a table on the right hand frame from the selected lists: one list set as a row axis and the other as a column axis. And users can fill the cells with evaluations, annotations, dates on which the tasks are done, suitability of the associated items, and so on. It is left to users what the content of the cells mean.

CrossConcept is implemented on xfy[4].

Table operation

Rows and columns can be swapped together with the filled cells with Pivot button. So if a user considers the row axis as subjects and the column axis as predicates, these roles assigned to the lists are easily swapped with Pivot button so that the user can change the point of view.

List operation

In the lists frame, user can edit lists: add, delete, change the items in the list and add new list and delete the existing list. In this way, users can create and edit a description of a concept as a list.

Standard format for lists and tables

Users can paste a new list copied from other XHTML documents, Web pages, so that they can use them as check items, refer them as design patterns, and so on. So it is a better way to represent a concept, knowledge, in the form of list, marking up with the list tags of XHTML: ul(unordered list) element, ol(ordered list) element and dl(definition list) element, because they will be operational knowledge with this kind of software.

3. Convergent and divergent thinking

Let us look at a case that a user is designing his paper for a conference as a case study.

3.1 Convergent thinking

The first list describes the system which the user developed:

"Features of my system"

- implemented on xfy
- metaphor
- list as a concept
- table which inspires new ideas
- laws of humans
- trial-and-error process

And the second list describes the scope of a conference:

"Scope of Conference"

- Computer support of Creative Thinking Process
- Natural Language Processing and Understanding
- Data Mining and Knowledge Discovery

Arranging these two lists as two axes of a table, the first list is confronted to the second:

	Creative Thinking Process	NLP and Understanding	Data Mining
implemented on xfy			
metaphor		x (another point of view)	
list as a concept	x		
table inspires new ideas	x		
laws of humans			x(contrary)
trial-and-error process	x		

At the end of this consideration, he has dropped the issue of "implemented on xfy", has felt that the difference from data mining should be noticed, so that he has got the third list which describes the issues for the conference:

"Issues for the conference"

- metaphor
- list as a concept
- table inspires new ideas
- laws of humans
- trial-and-error process

Through this consideration, he *used* the second concept "Scope of Conference", i.e. the first concept "Feature of my system" has *converged* on the second concept "Scope of Conference".

3.2 Divergent thinking

One day, he was surfing the Web, and has found a photo of a rainbow and a web page which explains rainbow:

"Rainbow"

- derivation of the name "rainbow"
- number of the colors
- spectrum
- folklore

Arranging the fourth list with the first, he has this table:

	derivation	colors	spectrum	folklore
implemented on xfy				
metaphor				
list as a concept			diffraction!	
table inspires new ideas				
laws of humans				
trial-and-error process				

It seems that the layout of the table itself asks the user, "What is the relationship of your system with rainbow?" And he has got an idea of resolution of a list, i.e. resolution of a concept, so that the first concept has been revised to this:

"Features of my system (v2)"

- implemented on xfy
- metaphor
- list as a concept
- resolution: a concept distinguishes other two similar concepts [new!]
- table which inspires new ideas
- laws of humans
- trial-and-error process

Through this consideration, he used the fourth concept "Rainbow", so that the first concept "Features of my system" *diverge* to have a new item for it's constituents.

In the same way, he can use any other concepts to diverge his concept of "Feature of my system": what is the relationship with "Web 2.0"?, with "A walk in the park"?, with "Soba noodles"?

3.3 List as form of knowledge

To use a concept on CrossConcept, the only requirement for the concept is that it should be described as a list of items. And the easiest way to make a list from a sentences is simply to split those into some fragments. So the Web is a huge repository of concepts which are available to converge and diverge your concept.

Note that these convergence and divergence are able to be controlled by selecting the lists, i.e. concepts, to use.

4. Consideration

In this section, we compare CrossConcept with some existing technologies.

4.1 Data analysis

In data analysis or data mining, so to speak, "the laws of the world" is used to process large amounts of data automatically. The laws of the world is objectively right so that this automatic organizing is reliable[3].

CrossConcept does not require these objectiveness.objectiveness for lists representing concepts or operations described above, so that it will accept human's subjective and personal and temporary concept and externalize it to consider.

4.2 Idea processors

Idea processors have succeeded to help users in organizing and visualizing their concepts' complicated internal structure[2].

We make a point of externalizing the operations of concepts, specially the interaction between arbitrarily selected concepts, so that any concepts can be used in convergent and divergent thinking process. So, we have adopted a simple form for concepts, "list" to represent any concepts and the relationship of them in a simple form of "table".

5. Conclusion

We have shown the simple function of CrossConcept and its model for concept.

We will investigate more thinking processes lying in the structures of texts other than lists and tables.

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