Abstract

Analogy and metaphor can be a powerful instructional strategy when used as cognitive tools. In a previous work, we have described a learning environment based on analogy and metaphor and on concept mapping as instructional strategies. In this paper, we concentrate on the hypermedia part of this environment, and we describe the analogy links, the adaptation to the user and a prototype realized for the domain of computer networks. The source domain and target domain documents are linked with semantic analogy links. This implies a high complexity of links, so a mechanism has to be provided in order to manage the links. The hypermedia is adapted to the learner according to his preferences on the metaphors.

1. Introduction

Metaphors and analogies are a very common and powerful reasoning mode. They can be seen as models to describe a system [1] and are commonly used in teaching and in design activities. However, it seems that few work has been done on implementing this instructional strategy in hypermedia learning environments.

The principle of metaphors as an instructional strategy is to base knowledge to be learned (target domain) on previously acquired knowledge in other domains (source domains). This strategy potentially involves a lot of knowledge domains: one target domain and several source domains. We have defined a learning environment fully based on metaphors as an instructional strategy and also based on hypermedia and concept mapping [4]. Metaphors are used as a cognitive tool, which means that they are explicit and that the learning environment provides learning activities based on metaphors. We also consider that metaphors should be numerous, coming from several source domains, and that a same target concept can have several analog source concepts.

2. Semantic analogy links and adaptation to the learner

The principle of the hypermedia part of the learning environment is to have several source domains linked to one target domain through semantic analogy links. The importance of semantic hypertext links for learning environments has been raised in [5].

This environment enables the learner to navigate from one knowledge domain to another through analogy links. We distinguish three types of analogy links:

- Analogy links between analog concepts
- Analogy links between analog images
- Analogy links inside the text

As the concepts in the target domain can have several analog concepts in the source domains, this hypermedia is characterized by a high complexity of links. Then we must provide an adequate mechanism with a convenient user interface, to let the learner navigate easily through the links. Two main mechanisms at least can be used.

The first one is a pop-up menu attached to a concept (or image) of the target or source domain, containing a list of analog concepts (or images), the user can choose from.

The second one is an adaptive hypermedia mechanism [2]: each source domain can be seen as a point of view on the target domain. The user chooses a current source domain, for example the one he is the most familiar with, and the hypermedia is adapted according to this domain. Analogy links are dynamically set according to the source domain which is the current point of view. So this adaptation concerns the hypertext links.
3. Description of the prototype

A prototype was designed for a specific target domain, routing in computer networks, which is characterized by a high complexity and a high metaphor richness. This prototype implements the point of view mechanism.

Dynamic links are visualized by "[ ]", for example the analog of "Sorting office" is "Router" (Figure 1). They are implemented with JavaScript functions: we have build specific functions for analog links, upon an existing library "Connection System", designed by J.-H. Réty [3], initially for literary hypertexts.

4. Conclusion

This prototype is based on a specific instructional strategy, metaphors as a cognitive tool. This pedagogy implies several types of analogy links and a great complexity of links, due to multiple knowledge domains, which must be managed by an adaptive hypermedia mechanism.

The learner profile is for the moment rather simple because it takes into account only one current source domain. A more sophisticated learner profile would have valuations for each source domain, for example by ranking the helpfulness of each source domain. Those valuations can then be used by the system to activate or not relevant analogy links.

Further work will be to extend the navigation features of the prototype and to evaluate them with learners.

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6. References


